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An Historical Study of Teaching Biology to Science-Illiterate Students in Eighteenth-Century France: Instructional Strategies Employed by Madame du Coudray - Royal Midwifery Educator

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AN HISTORICAL STUDY OF TEACHING BIOLOGY TO SCIENCE-ILLITERATE STUDENTS IN EIGHTEENTH CENTURY FRANCE: INSTRUCTIONAL STRATEGIES EMPLOYED BY MADAME DU COUDRAY – ROYAL MIDWIFERY EDUCATOR

A Dissertation
Submitted to the Graduate Faculty of the Louisiana State University and Agricultural and Mechanical College in partial fulfillment of the requirements for the degree of Doctor of Philosophy in The Department of Educational Theory, Policy, and Practice

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ABSTRACT

In August 1767 King Louis XV of France appointed Madame du Coudray, a 52-year-old midwife, to teach midwifery “throughout the whole extent of the Realm.” In so doing he acknowledged the “science and experience” and “high degree of perfection” that she had obtained in midwifery. Over the next 20 years Madame du Coudray traveled throughout France teaching midwifery to illiterate peasant women. It is estimated that she taught over 4,000 students. How did she teach midwifery to these women who had no previous experience with science? Could modern biology educators learn from her methods? This case study addressed these questions by studying her tools: a set of 26 teaching illustrations, a mannequin which served as an obstetric simulator, and a manual which contained her lectures. The illustrations were analyzed using Tufte’s theory of graphic design. This analysis revealed that they are excellent examples of Tufte-style graphic illustrations. They minimize chartjunk while maximizing data ink. They use color appropriately. They are surprisingly truthful according to modern medical standards, and they use the principle of small multiples to teach the process of childbirth. The features of the mannequin were studied for their potential use for active learning and brain-based learning. This study revealed that the mannequin has a good fidelity, particularly for the eighteenth-century, and could have easily been used for active learning and brain-based learning. The manual was content analyzed for teaching methods. This study revealed that Madame du Coudray’s method of teaching relied heavily on applications to real-world situations. It also showed that she taught her students their social and cultural responsibilities. In Vision and Change: A Call for Action, the AAAS recommends that biology students in the twenty-first century should have experience with simulation and understand the role of science in society. It appears that modern biology instructors could learn much from Madame du Coudray.
CHAPTER 1. INTRODUCTION

In 1957, the Soviet Union stunned the world by launching Sputnik, an earth-orbiting satellite. The event sent shock waves through the U.S. scientific community (Matthews, 1994). At the time the U.S. and Soviet Union were “fighting” the Cold War; a war that was not fought with weapons, but with fear and psychological intimidation. Sputnik clearly demonstrated that the Soviets were getting ahead. The event immediately focused attention on science education. What had gone wrong? How did the Soviets get so far ahead? Science education became a matter of national security. The U.S. government and professional scientists became concerned about science education. They found the science education community in an ongoing debate concerning the best approach for teaching science.

In the eighteenth-century, the French faced a similar threat to national security. They had been at war with England in what would become known as the Seven Years War. They were losing men. To compound the problem, many prospective soldiers died in childbirth, long before they could be of value as soldiers to the state. The King of France was concerned. He commissioned a French midwife named Madame du Coudray to teach midwifery throughout the country in hopes of decreasing the infant mortality rate (Gelbart, 1998b). Faced with the challenge of educating illiterate, superstitious peasants, what educational methods did she use? And what can contemporary biology instructors learn about teaching science-illiterate students from Madame du Coudray?

Scientific Literacy

In the days following the launch of Sputnik, the government and interested parties found that the science education community was teaching science as “Life Adjustment Education,” a watered down approach which emphasized the interests of young people and everyday activities
(DeBoer, 1991). Science educators were concerned about the situation but divided in a continuing debate about which of three approaches to science education was best: a theoretical approach, a practical approach, or a liberal approach. A theoretical approach emphasized the structure and content of the discipline and used a mathematical approach to science. A practical approach gave priority to application, demonstrating how scientific principles could be used in everyday life. The liberal approach, consistent with the philosophy of liberal education, showed how science was a human endeavor and emphasized its historical aspects and cultural implications (Matthews, 1994). Each of the approaches had advantages and disadvantages, thus leading to a philosophical discussion among government leaders, professional scientists, and science educators, concerning what constitutes a good science education. The outcome of this discussion played a major role in determining how science would be taught at the time and still affects science pedagogy today. A timeline of the major developments in science education since Sputnik is shown in Figure 1.

In response to the perceived threat from the Soviet Union, the U.S. legislature passed the National Defense Education Act in 1957. It provided $94 million for science education reform from 1958 to 1961 and an additional $600 million from 1961 to 1975 (Matthews, 1994). Empowered by funding, the National Science Foundation (NSF) took the opportunity to develop a new curriculum designed to educate a generation of world class scientists. The NSF curriculum used a very theoretical approach to science, emphasizing the structure and content of the discipline. It was designed to produce a generation of superior professional scientists. All references to practical applications and cultural implications were removed.

As the NSF began developing its new curriculum, concern arose about scientific literacy. Simultaneously, three different publications voiced the concern (DeBoer, 2010). The first
1957  Soviet Union launches *Sputnik* and Congress passes National Defense Education Act
     National Science Foundation (NSF) starts developing a theory based science curriculum
1958  Rockefeller foundation, Hurd, and McCurley voice concerns about scientific literacy
1963  National Science Teachers Association (NSTA) survey about meaning of scientific literacy
1971  NSTA identifies scientific literacy as the most important goal of science education
1975  Funding from the National Defense Education Act ends; NSF withdraws from science curriculum reform
1982  NSTA adopts Science-Technology-Society Curriculum
1983  A Nation at Risk: The Imperative for Education Reform is published
1989  National Governor’s conference and Pres. Bush call for national education standards
     AAAS publishes *Science for all Americans* (Project 2061)
1991  NRC establishes NCSESA to oversee national science education standards
1993  AAAS publishes *Benchmarks for Science Literacy* (Project 2061)
1996  NCSESA publishes the National Science Education Standards
1998  AAAS publishes *Blueprint for Reform* (Project 2061)
2000  AAAS publishes *Designs for Science Literacy* (Project 2061)

Figure 1. Timeline of Major Events in Science Education Since *Sputnik*
came in June of 1958 in a report on the state of education in the U.S. funded by the Rockefeller Brothers Fund. It stated—

[J]ust as we must insist that every scientist be broadly educated, so we must see to it that every educated person be literate in science. In the short run this may contribute to our survival. In the long run it is essential to our integrity as a society. We cannot afford to have our most highly educated people living in intellectual isolation from one another, without even an elementary understanding of each other’s intellectual concern. Such fragmentation must lead to a loss of social purpose. (pg.28, italics added)

The second publication came in October of the same year from Paul DeHart Hurd, a science education faculty member from Stanford University. In “Science Literacy: Its meaning for American Schools” he expressed concern that the urgency of the current political situation might jeopardize liberal science education, in particular, the need to teach about science’s relationship with society. He observed, “Modern education has the task of developing an approach to the problems of mankind that considers science, the humanities, and the social studies in a manner so that each discipline will complement the other.” (Paul DeHart Hurd, 1958, pg. 16)

The third publication came a month later from Richard McCurdy, President of the Shell Chemical Corporation in “Toward a Population Literate in Science.” McCurdy said, “[I]t is vital to include some understanding of natural science in a broad liberal education. It will help prepare the student to participate in human and civic affairs, whatever his calling may be.” (MacCurdy, 1958)

Despite warnings about an entirely theoretical approach to teaching science the NSF pressed forward with their curriculum reforms with little regard for concerns from teachers or education faculty. Over the next 20 years the NSF received $1.5 billion in financial support for
its 28 curriculum reform projects, including the Biological Science Curriculum Study (BSCS) which led to biology education reform. (Matthews, 1994)

Although the initial concern for scientific literacy was for liberal education, by 1963 when the National Science Teachers Association (NSTA) surveyed a number of scientists and science educators about the meaning of scientific literacy they found that most thought it referred to science content and not the relationship of science to society. (DeBoer, 2000)

In 1969 Hurd once again voiced concern about the NSF curriculum. After summarizing the strengths of the new curriculum, he noted a number of “OMISSIONS and WEAKNESSES.” The following were his top three concerns:

1. The courses are overly sophisticated and too abstract for the typical high school student.

2. Courses are modeled after pre-professional courses with a career orientation and preparation for further study in the subject.

3. The courses do not motivate the majority of students toward an interest in science.

Among the more frequently cited reasons are:

   a) lack of apparent relevance to the real world;

   b) the separation of science from human and humanistic contexts:

   c) the personal, the social, and the practical applications are missing.

   (Paul DeHart Hurd, 1969, pg. 96-97)

In 1971 the NSTA named scientific literacy as its most important goal in a position statement entitled “School Science Education for the 70s” (National Science Teachers Association, 1971). In it they listed eleven characteristics of the scientifically literate person. The
list contained everything everyone ever hoped for in science education from a theoretical, practical or liberal perspective:

- uses science concepts, process skills, and values in making everyday decisions as he interacts with other people and with his environment
- understands that the generation of scientific knowledge depends upon the inquiry process and upon conceptual theories
- distinguishes between scientific evidence and personal opinion
- identifies the relationship between facts and theory
- recognizes the limitations as well as the usefulness of science and technology in advancing human welfare
- understands the interrelationships between science, technology and other facets of society, including social and economic development
- recognizes the human origin of science and understands that scientific knowledge is tentative, subject to change as evidence accumulates
- has sufficient knowledge and experience so that he can appreciate the scientific work being carried out by others
- has a richer and more exciting view of the world as a result of his science education
- has adopted values similar to those that underlie science so that he can use and enjoy science for its intellectual stimulation, its elegance of explanation, and its excitement of inquiry
- continues to inquire and increase his scientific knowledge throughout his life. (National Science Teachers Association, 1971, pg. 47-48)

In 1975 when the funding from the National Defense Act stopped, the NSF withdrew from curriculum development. However the NSTA continued its efforts to improve scientific literacy. Recognizing the need for a general education curriculum for those students who did not plan to pursue a career in science, the NSTA placed further emphasis on the relationship of

However, before much could be done, the science education community was again shocked when the National Commission on Excellence in Education published, *A Nation at Risk* in 1983. The report commenced thus-

> Our Nation is at risk. Our once unchallenged preeminence in commerce, industry, science, and technological innovation is being overtaken by competitors throughout the world. This report is concerned with only one of the many causes and dimensions of the problem, but it is the one that undergirds American prosperity, security, and civility. We report to the American people that while we can take justifiable pride in what our schools and colleges have historically accomplished and contributed to the United States and the well-being of its people, the educational foundations of our society are presently being eroded by a rising tide of mediocrity that threatens our very future as a Nation and a people. What was unimaginable a generation ago has begun to occur—others are matching and surpassing our educational attainments (National Commission on Excellence in Education, 1983).

Once again professional scientists became deeply concerned about science education. This time the American Association for the Advancement of Science (AAAS) took the lead. Recognizing that quick fixes were ineffective they established Project 2061, an ambitious program to improve science education by 2061, when Halley’s Comet returns. Its premier publication, *Science for All Americans*, set out to establish guidelines for what every American should know about science by the time they graduate from high school. It commenced with a definition of science that is very broad and included the natural sciences, mathematics, technology, and social science. (American Association for the Advancement of Science, 1990).
"Science for All Americans" is divided into four major sections. The first section discusses the nature of science, mathematics, and technology; and defines them as human enterprises with strengths and weaknesses. The second section covers basic knowledge in these three areas. The third section discusses the great episodes in the history of science, and the final section discusses the habits of mind that are important for science literacy. Describing the many facets of scientific literacy it states-

These include being familiar with the natural world and respecting its unity; being aware of some of the important ways in which mathematics, technology, and the sciences depend upon one another; understanding some of the key concepts and principles of science; having a capacity for scientific ways of thinking; knowing that science, mathematics, and technology are human enterprises, and knowing what that implies about their strengths and limitations; and being able to use scientific knowledge and ways of thinking for personal and social purposes. (pg. xvii-xviii)

Realizing that a national curriculum in science, such as the NSF curriculum, would not be politically or legally feasible, Project 2061 set out to influence decisions on science education by advising science educators on what should be in the curriculum but ultimately leaving the specific curriculum development up to the individual educators rather than dictating a curriculum to them (Matthews, 1994).

However, despite the AAAS’s reluctance to dictate standards, in 1989, the National Governor’s Association and President Bush called for national standards in education. The call received attention from a number of different professional associations, including NSTA and AAAS. In 1991, the president of NSTA appealed to the National Research Council (NRC) to coordinate efforts to develop national science education standards. The NRC, with funding from the Department of Education and the National Science Foundation, responded by establishing the National Committee on Science Education Standards and Assessment (NCSESA). This
committee consisted of representatives from NSTA, AAAS, American Chemical Society (ACS),
National Science Resources Center (NSRC), the American Association of Physics Teachers, the
Council of State Science Supervisors, the Earth Science Education Coalition, and the National
Association of Biology Teachers. The effort took several years and went through several drafts
before the final National Science Education Standards were released in 1996 (National Research
Council, 1996).

Meanwhile, the AAAS continued work on Project 2061. In 1993 they published
*Benchmarks for Science Literacy*. Based on the recommendations of *Science for All Americans*,
it outlined goals, or benchmarks as to what students should know or do in science at the end of
the 2nd-, 5th-, and 12th-grade (American Association for the Advancement of Science, 1993).
This was followed in 1997 with *Resources for Science Literacy: Professional Development*, a
publication which addressed the very real problem of the scientific illiteracy of many K-12
teachers. Realizing that a significant hindrance to the implementation of the goals of Project
2061 was the educational system in the U.S. the next publication of AAAS in 1998 addressed
this concern. In *Blueprints for Reform* they explored the educational system which they defined
thus-

> We define the educational system to include more than students, teachers and school
administrators. The organizational structures where these people work and the laws and policies
that affect them must also be included in systemic change. Further, business leaders, textbook and
test publishers, academic and industrial scientists, and many others must be involved if change is
to take place at the necessary scale and depth to make science literacy a reality. (American
Association for the Advancement of Science, 1998, pg. xi)

Then, after years of skirting the issue of curriculum, the AAAS addressed concerns about how to
design curriculum in *Designs for Science Literacy* (2000). Focusing on how to implement the
goals of *Science for All Americans* and *Benchmark* without dictating a national curriculum, *Designs* concentrated on *how* to design curriculum. However, reminiscent of the arrogance shown in developing the NSF Curriculum, the preface states, “The education literature was of little help. And so we turned to fields in which there exists a rich literature on design and abundant examples, most particularly (but not exclusively) in architecture and engineering” (American Association for the Advancement of Science, 2001, pg. ix). Their most recent publication, *Atlas of Science Literacy*, used strand maps to illustrate the sequence of ideas and skills that teachers and curriculum developers could use to develop curriculum based on *Benchmarks* and achieve the goal of K-12 science literacy.

However, over the years since the concept of scientific literary was introduced in 1958, it has come to mean different things to different people. In general it is used to describe the “desired outcome of science education” (DeBoer, pg. 582). However, the desired outcome depends upon the science education goals one is trying to achieve, and there is not a consensus as to the goals of science education. In “Scientific Literacy: Another Look at Its Historical and Contemporary Meanings and Its Relationship to Science Education Reform,” DeBoer illustrates the problem by listing nine different goals for Science Teaching—

- Teaching and Learning about Science as a Cultural Force in the Modern World…
- Preparation for the World of Work…
- Teaching and Learning About Science That Has Direct Application to Everyday Living…
- Teaching Students to be Informed Citizens…
- Learning About Science as a Particular Way of Examining the Natural World…
- Understanding Reports and Discussions of Science That Appear in the Popular Media…
- Learning About Science for its Aesthetic Appeal…
- Preparing Citizens Who are Sympathetic to Science…
Understanding the Nature and Importance of Technology and the Relationship Between Technology and Science… (DeBoer, 2000, pg. 591-593)

For the purposes of this research the term scientific literacy will be defined as described in *Science for all Americans*:

Scientific literacy – which encompasses mathematics and technology as well as the natural and social sciences – has many facets. These include being familiar with the natural world and respecting its unity; being aware of some of the important ways in which mathematics, technology, and the sciences depend upon one another; understanding some of the key concepts and principles of science; having a capacity for scientific ways of thinking; knowing that science, mathematics, and technology are human enterprises, and knowing what that implies about their strengths and limitations; and being able to use scientific knowledge and ways of thinking for personal and social purposes (American Association for the Advancement of Science, 1990, pg. xvii-xviii).

**Research Questions**

I discovered Madame du Coudray during a trip to Paris, France, to visit my son. During the visit, we traveled to Rouen, which is best known as the place where Joan of Arc was burned at the stake. There we discovered the *Musée Flaubert et d’histoire de la medicine*, an eighteenth-century medical museum which is housed in the former public hospital where Gustave Flaubert’s father was the director and surgeon. In this historic museum I was surprised to find a life-sized obstetric mannequin used to train midwives during the eighteenth-century. Upon investigation I learned that it was the invention of Madame du Coudray. I was fascinated by the scientific detail and accuracy of the mannequin. It was built around the skeleton of a female pelvis. The tissue and organs of the mannequin were made of cotton batting and fabric. It was

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1 The author of *Madame Bovary.*
amazingly detailed, including a uterus that had draw strings to simulate dilation during childbirth. Along with the female mannequin, there was also a mannequin of a fetus. Although it was not built around a fetal skeleton, it was built with a rigid body and flexible spine to simulate a skeleton. Each tiny finger and toe was separated so that the students could feel them and determine whether they had the right or left hand or foot of the infant. In addition to the fetus, there were other accessories. There was a cloth reconstruction of the female reproductive and associated organs, including the uterus, ovaries, fallopian tubes, bladder, urethra, and rectum. Each organ was labeled with a cloth tag indicating its proper scientific name. There was also a separate model of twins, which shared a placenta to demonstrate the challenges of delivering twins. Two more accessories were models of the heads of deceased infants which could be felt to learn to identify a dead infant in utero. (musée Flaubert et d'histoire de la médecine - Rouen, 2004).

I was fascinated! Who was this midwife educator? How did she teach illiterate peasant women? Not only were they illiterate regarding science, but many of them could not even read or write. Maybe modern biology educators could learn from some of her methods.

Main Question: What can contemporary biology instructors learn about teaching science-illiterate students from Madame du Coudray, an eighteenth-century royal midwifery educator?

Researching the teaching methods of an historical individual presents certain challenges. For example, it is impossible to observe her teaching or interview her or her students. However, Madame du Coudray did leave several artifacts of her teaching methods. In particular, her midwifery manual contains the lectures which she used to teach her course, as well as 26 teaching illustrations. In addition, an example of her teaching mannequin still exists in the Rouen museum, where it has been skillfully restored and documented (musée Flaubert et d'histoire de la
médecine - Rouen, 2004). This study is based on these artifacts which are examined with the following subquestions:

Subquestion #1: What can we learn from the teaching illustrations Madame du Coudray used in her manuals?

Subquestion #2: What can we learn from the teaching mannequin Madame du Coudray used in her course?

Subquestion #3: What can we learn from the teaching manual Madame du Coudray used in her course?

**Gowin’s Vee Diagram**

The epistemological Vee diagram was invented at Cornell University in 1977 by D. Bob Gowin. It is based on years of research in science and science education as well as the philosophy of both science and science education. It is a tool for visualizing the structure of knowledge and assisting a researcher by helping her “unpack, analyze, and critically evaluate complex knowledge and value claims in the natural sciences” (Mintzes & Novak, 2005). It is particularly helpful in designing research projects (Gowin & Alvarez, 2005).

The Vee diagram is based on the research or focus questions such as the main question and subquestions identified above. The questions are analyzed both conceptually and methodologically to determine what needs to be done to answer them. Accordingly, the diagram is divided into two halves (see Figure 2). The left half illustrates the conceptual analysis, namely, those things that need to be thought about to answer the questions. The right half illustrates the methodological analysis, namely, those things that need to be done to answer the questions. The combination of thinking and doing points the researcher to the events that need to occur to answer the questions.
Conceptual Analysis

The researcher’s worldview influences the entire research project. What is her perspective or point of view? My worldview is that science should serve ordinary people, not just the elite. As the first member of my family to obtain a college education, I am a strong proponent of education for the masses. Historically science or natural philosophy education has been available only to the elite who had sufficient money and leisure time to obtain a higher education. I am convinced that science can be beneficial to ordinary individuals in their occupations and roles in society. In addition, I think nature is predictable and not capricious. Events can be traced to natural causes that are within our ability to understand. These causes are based on natural laws which are constant and apply the same at all times and in all places.

I adhere to the philosophy of realism in that observation of the natural world brings us closer to the truth and that people perceive natural events in similar ways (Audesirk, Audesirk, & Byers, 2008). As a realist, I think there is a real world which we can come to know through our senses. The knowledge that we gain through our senses is an approximation of the real world and it becomes closer and closer to reality as we continue to make observations. Therefore, our knowledge is both tentative and reliable; tentative, in that we may yet make observations which change our understanding of the real world and reliable in that previous observations support our present knowledge.

The theoretical foundations of this research project are based on the Ausubel-Novak human constructivist theory, Tufte’s theory of graphic design, Paivio’s visual-verbal memory theory, and Krippendorff’s theory of content analysis. The Ausubel-Novak human constructivism theory of education states that knowledge is constructed by the individual as they interact with the environment and the instructor only acts as a facilitator (Mintzes & Novak,
This theory is relevant to analyzing the illustrations, the mannequin, and the text of the manual. Tufte’s theory of graphic design (Tufte, 1990, 1997, 2001, 2006) and Paivio’s visual-verbal memory theory were used to analyze Madame du Coudray’s illustrations. Madame du Coudray’s manual was analyzed using content analysis theories of Krippendorff (Krippendorff, 1980).

A principle is a generalization that can apply to more than one situation (Mintzes & Novak, 2005). Principles applicable to this study include the Hippocratic principle, model of practice, and standard care. Hippocrates’ principle encourages health care providers to “first do no harm.” It was a concern for the harm done by uneducated midwives in rural France that motivated Madame du Coudray to embark on her efforts to educate midwives, thus providing an improved model of practice and standard care.

Concepts and constructs are closely related. A concept is an observed regularity that is represented by a sign or symbol, such as language and concepts are “conceptual creations that connect sets of concepts” (Gowin & Alvarez, 2005, pg. 55). One concept that was relatively new at the time was the bony pelvis and how it affects the process of childbirth. In 1816, Hendrik van Deventer included the first detailed diagram of the female pelvis in a midwifery manual. This led to the practice of pelvimetry, in which the pelvis was measured to assure adequate diameter for childbirth (Bendixon, 1995; Houtzager, 2001). This concept affected many others including labor, delivery, pregnancy, detection of complications, and preventative measures. Thus, improving midwifery education was dependent on improving the scientific literacy of the
What can we learn from the teaching manual Madame du Coudray used in her course?

Subquestions

What can we learn from the teaching illustrations Madame du Coudray used in her manuals?

What can we learn from the teaching mannequin Madame du Coudray used in her course?

Knowledge Claims

Madame du Coudray is underrecognized as a biology educator. Her teaching illustrations are visual explanations of cause and effect. Her mannequin provided active brain-based learning for her students. Her manual taught scientific competency and social responsibility.

Value Claims

Ordinary people can benefit from science education that is practical and teaches social responsibility.

Methodological

Figure 2. Gowin’s Vee Diagram of Research
rural midwives. In this study constructs include the female reproductive system, “medicalization” of childbirth, antiseptics, and pain management.

So how can one apply these ideas to answer the research questions in this study? Let us examine the methodological side of the Vee diagram; value claims, knowledge claims, transformations, and records.

**Methodological Analysis**

Value claims and knowledge claims are closely related. Value claims are claims that something of worth is expected to come out of the study. I believe that the work of Madame du Coudray is valuable in that it demonstrates that ordinary people can benefit from science education that is practical and teaches social responsibility. Knowledge claims are tentative answers to the research questions. I think Madame du Coudray is underrecognized as a biology educator and that this study will increase appreciation for her as a science educator. I think that a study of her teaching illustrations reveals that they are visual explanations of cause and effect. The study of her mannequin demonstrates the importance of active brain-based learning and her written manual emphasizes the importance of scientific competency and social responsibility.

Transformations are ways of analyzing or manipulating the available information to produce meaning. The teaching illustrations were compared and categorized according to the recommendations and guidelines of Edward Tufte. The mannequin was studied by characterizing its features. And finally, the manual itself was analyzed using content analysis methods.

The available records about Madame du Coudray’s teaching methods which are still available include the manual of teaching lectures with its illustrations, and photos of her teaching mannequin. These were obtained in France. In addition there is Gelbart’s excellent biography of
Madame du Coudray ("Master of Science Program: Nurse Midwifery") which includes an exhaustive bibliography of relevant records about Madame du Coudray.

After reviewing the conceptual and methodological aspects of this research project, the objects and events that are necessary for the answering of the research questions became apparent. I obtained copies of Madame du Coudray’s manuals in France and arranged for an English translation. I obtained photographs of her mannequin. In addition I obtained a copy of Gelbart’s biography of Madame du Coudray (Gelbart, 1998a) and period histories to cultivate a better understanding of the cultural context in which she lived. Finally, I content analyzed her teaching manual and mannequin images.

Summary

In summary, the purpose of this study was to identify teaching methods used by Madame du Coudray that might be of value to contemporary biology educators. This was accomplished by reviewing and analyzing documents and artifacts left by Madame du Coudray including her teaching lectures, teaching illustrations, and teaching mannequin. In particular, Novak-Ausubel human constructivist theory, Tufte’s graphic design theory, and content analysis were used to study her teaching methods.

Definition of Terms

AAAS – American Association for the Advancement of Science

brevet – a document or letter issued by the king giving the recipient some favor or privilege

BSCS – Biological Science Curriculum Study

NCSESA – National Committee on Science Education Standards and Assessment

NRC – National Research Council

NSF – National Science Foundation
Scientific literacy—which encompasses mathematics and technology as well as the natural and social sciences—has many facets. These include being familiar with the natural world and respecting its unity; being aware of some of the important ways in which mathematics, technology, and the sciences depend upon one another; understanding some of the key concepts and principles of science; having a capacity for scientific ways of thinking; knowing that science, mathematics, and technology are human enterprises, and knowing what that implies about their strengths and limitations; and being able to use scientific knowledge and ways of thinking for personal and social purposes.”

(Rutherford & Ahlgren, 1989, 1990, pg. x)
CHAPTER 2. REVIEW OF LITERATURE

A literature review provides the necessary foundation for any research study. Understanding the educational theory which provides a structure for the study is critical and so several educational theories will be reviewed including Ausubel-Novak Human Constructivist Theory, Bloom’s Taxonomy of Educational Objectives, Michael and Modell’s model of active learning, and modern brain-based learning theory. In addition to understanding educational theory, an historical study requires a thorough understanding of the historical and cultural setting, so an historical study of Madame du Coudray will be presented. In addition, a mini-case study on modern midwifery education will be discussed which should provide a basis for comparison of Madame du Coudray’s methods.

**Educational Theory**

**Ausubel-Novak Human Constructivist Theory**

The premise of the human constructivist theory of education is that knowledge consists of mental models constructed by the individual based on their interactions with their environment (experience). The *quality* of learning is emphasized more than the *quantity* of learning. *Meaningful learning* is emphasized more than *rote memorization* and *understanding* is emphasized more than *awareness* (Mintzes, Wandersee, & Novak, 2005). In constructivism the instructor acts as a facilitator in the process of learning.

Human constructivism has its roots in the work of Piaget on the psychological development of children. Piaget proposed that learning was a biological process and that a child’s ability to learn went through stages as they matured and developed. However human constructivists differ with Piaget in that they think that learning drives development rather than development driving learning (Mintzes, et al., 2005).
Another psychologist who was extremely influential in development of human constructivist theory was David Ausubel and his theory of meaningful learning. He proposed that meaningful learning was significantly different than rote learning. Whereas rote learning is verbatim and arbitrary, meaningful learning occurs when new knowledge is incorporated into the learner’s knowledge structure and can be used to interact with their environment. In order for this to happen, several things must occur,

…the material itself must have potential meaning (i.e., it is not a list of nonsense syllables), the learner must already possess relevant concepts to anchor the new ideas; and he or she must voluntarily choose to incorporate the new knowledge in a nonarbitrary, nonverbatim fashion.

(Mintzes, et al., 2005, pg. 39)

Thus the learner actually constructs their own knowledge structure.

Ausubel’s meaningful learning was in many ways similar to Bloom’s higher level thinking skills. Bloom was a University of Chicago educator who spent a great deal of time and effort trying to understand how we think and learn. He developed Bloom’s Taxonomy of Educational Objectives in 1956 to assist educators in evaluating students’ thinking skills. It was a visual representation of the hierarchal levels of thinking (see Figure 3a). The basis of learning is knowledge which is very similar to rote learning, however the higher levels of learning (comprehension, application, analysis, synthesis, and evaluation) all involve the student’s ability to use the knowledge learned, not just repeat it. In the 1990’s a group of educators lead by Bloom’s student Lorin Anderson updated Bloom’s taxonomy (see Figure 3b). The update did not significantly change the content of the taxonomy, but changed the language from nouns to verbs to demonstrate the important role of student action in gaining knowledge (Mary Forehand, 2005).
Figure 3. Bloom’s Taxonomy of Educational Objectives. a. Original version developed in 1956 by Bloom. b. New version developed in 1990’s by Bloom’s student Lorin Anderson. Source: http://projects.coe.uga.edu/epltt/index.php?title=Bloom’s_Taxonomy
However, it was not until 1977 when Novak published *A Theory of Education*, that human constructivism was proposed as an educational theory and an epistemology of knowledge building. The basic assumption of human constructivism is that human beings are *meaning makers*. However, the process of meaning making is not as simple as excellent communications from a teacher to a student, or direct observation of the environment. Meaning making is an ongoing process in which the learner constructs a mental model of the natural world by interacting with their environment. Thus the responsibility of the learning lies squarely upon the student. In human constructivism the teacher acts as a facilitator which encourages active participation on the part of the student to engage in the learning process.

Michael and Modell discuss the application of human constructivism in *Active Learning in Secondary and College Science Classrooms* (Michael & Modell, 2003). They commence with a list of ten things that we know about learning from a human constructivist point of view. I will discuss those that I find particularly useful.

One of the fundamental ideas of constructivism is that learning is based on building a mental model of the “real” world which allows us to interact with our environment. The foundation of our mental model is the knowledge which we have previously learned. So, to the extent that our previous knowledge contains misunderstandings, or alternative conceptions, our learning experiences can produce unexpected results. In *Research on Alternative Conceptions in Science* (1994) Wandersee, Mintzes, and Novak note that alternative conceptions are tenacious and are not easily eradicated. One cannot simply tell the student they are wrong and go on. The alternative conception does not disappear. A learning experience must be provided for the student to construct a new mental model which works around the alternative conception.
Madame du Coudray dealt with a variety of students. Although she carefully selected young women with no previous experience in midwifery, her students had no uniform training or education; therefore their learning foundation varied significantly. Because of this her students brought with them vastly different views of midwifery. Thus the foundations upon which they built their knowledge may have been (and probably were) based on misconceptions. In order to be successful as an instructor she needed to provide learning situations for them and communicate with her students by giving them feedback so they could improve their mental models.

Early in their book, Michael and Modell also describe two types of learning: descriptive learning and procedural learning. Descriptive learning is often rote memorization, for example learning lists of vocabulary definitions. For descriptive learning to occur the student must build a mental model for themselves. On the other hand, procedural learning is the learning of processes. Procedural learning occurs when the student applies what they know in a situation where they get frequent feedback from the instructor. The training Madame du Coudray’s students received, working with the mannequin, appears to be procedural learning. As the students practiced delivering babies on the mannequin they received feedback from Madame du Coudray. Through this learning activity the students could demonstrate what they had learned and Madame du Coudray could make sure they had developed a sound mental model.

A very useful model of active learning is also proposed in Michael and Modell’s book. The model consists of three parts: input state, learning experience, and output state (see Figure 4a). Although this is a very simple model it is extremely useful because it has many profound implications.
The input state is the knowledge foundation that the student brings to the learning experience. The learning experience is the educational activity in which the student participates. The output state is the end result of the experience. However, because the learning process is iterative, I think the model proposed by Michael and Modell could be improved as shown in Figure 4b.

In constructivism the student learns by comparing her mental model with the “real” world and using the model to solve problems in the “real” world. Thus a learning experience is an opportunity to test her mental model against the real world. This is active learning in which the instructor acts as a facilitator to encourage the student to build useful models. Meaningful learning occurs when a student can apply what she has learned to novel or new situations.

One useful method of testing output is through practical examinations. These are particularly useful for procedural learning and are illustrated by the fact that Madame du Coudray tested her students on the obstetric mannequin. The students were then tested by one of her assistants.

**Brain-Based Learning**

Recent research in *active learning* and neuroscience has led to the development of “brain-based” learning theory. Using recent imaging technologies, such as PET (positron electron tomography) and fMRI (functional magnetic resonance imaging), it is possible to actually image and thus “see” which areas of the brain are active when a patient is performing specific activities, such as learning. Educators have combined these images with information gleaned from cognitive science to create a learning theory which promises to improve both teaching and learning.
Figure 4. a. Michael and Model’s proposed model of learning. b. Author’s proposed improvement learning model shows the iterative nature of learning.
The cerebral cortex is the part of the brain where cognition occurs. In Zull’s *The Art of Changing the Brain* (Zull, 2002) he provides a generalized map of the cerebral cortex illustrating where the major cognitive functions occur. It gives a general idea where the sensory cortex, temporal integrative cortex, frontal integrative cortex, and motor cortex, are located (see Figure 5).

Each area of the brain has its specific function. The sensory cortex is where information from the senses (sight, sound, etc.) is received by the brain. The sensory information is then processed in the temporal integrative cortex where the raw sensory information is compiled to create meaning, such as images (from visual information) and language (from auditory information). The information is then considered by the frontal cortex where the higher level thinking occurs, such as application, analysis, evaluation, and creation (M. Forehand, 2005). Then, based on the results of the cognitive processes it is possible for the individual to use the motor cortex to perform actions.

Zull notes the amazing parallels between the findings of neuroscience and Kolb’s Learning Theory as described in *Experiential Learning* (Kolb, 1984). This theory describes a learning cycle consisting of four parts: concrete experience, reflective observation, abstract hypothesis, and active testing (see Figure 6). He explains that “concrete experience” is really the sensory information which is received by the brain. “Reflective observation” is the process performed by the temporal integrative cortex. “Abstract hypothesis” formation is what occurs in the frontal integrative cortex and finally “active testing” is what occurs when the motor cortex sends information to the muscles to perform actions. In both the neuroscience model and the Kolb model the foundation of learning is sensory input.
Figure 5. Approximate location of functional areas of the brain. 
Source: (Zull, 2002, pg. 16)
Figure 6. Kolb’s Learning Cycle
Jensen’s book, Teaching with the Brain in Mind (Jensen, 1998), also discusses other important ideas which have developed through comparing cognition with the findings of neuroscience. One of them is the important role emotions play in learning. It has long been known that emotion can greatly influence memory. Although psychologists know that we do not have “flashbulb memories,” we do remember very vividly events that are emotionally charged. Neuroscience reveals that the limbic system, in particular the amygdala, is integrally involved in human emotion. Interestingly, when the amygdala is removed, the patient is not just unemotional, but their cognitive processes are greatly impaired, thus demonstrating that emotion is a critical element in learning.

In addition to emphasizing the importance of emotion in learning, Jensen further discusses the role of motion in learning. Research has shown that motion is extremely important in the development of the brain. Things like rocking a baby and playing on a playground promote brain development for cognitive processes. This finding is supported by research in neuroscience which shows that the cerebellum (see Figure 6), which has long been known to be involved in movement, is also connected directly to the cerebral cortex with neural fibers which carry information both from the cerebellum to the cerebral cortex and back. Thus there is anatomical support for the idea that motion (cerebellum) and cognition (cerebral cortex) are interdependent.

In the introduction to her midwifery manual, Abrege de l’Art Accouchement, Madame du Coudray gives a glimpse into her approach to teaching. She says that the biggest obstacle she faced was teaching students who were “unaccustomed to learning except through the senses.” She claims that she decided to teach “their eyes and hands” and she says she took the opportunity to make her lessons “tactile” (Gelbart, 1996). In order to do this she invented an obstetric mannequin upon which her students practiced delivering an infant.
The obstetric mannequin developed by Madame du Coudray is a life-size replica of a female from the lower torso to the mid thigh. It contains the actual bones of the pelvic girdle of a woman. The rest of the mannequin is made of cloth and cotton. It has all the organs (made of fabric) typically found in a woman’s abdominal cavity, including the uterus, ovaries, ligaments, fallopian tubes, vagina, bladder, rectum, etc. Along with the mannequin is a life-size mannequin of an infant. It does not contain the skeleton of an infant, but the rigidity of the spine is simulated with wood and the flexibility of the neck with a spring. There are also accessories that go along with the mannequin which could be used to teach specific topics. For example, there is a model of the female reproductive organs with each part labeled so that the students could learn the proper anatomical names for each part. There is a model of twins so that the students could see how twins sometimes share the same placenta. There are even two models of the heads of dead babies.

Madame du Coudray taught her students through movement. Each student was to practice delivering a baby using the mannequin. Madame du Coudray placed the infant in the uterus in a variety of positions (sideways, feet first, head first, etc.) and the students practiced the different deliveries taught in the course. The mannequins were designed to provide tactile information for the midwife. For example the infant’s fingers (and even toes) are each separate and individual so the midwife can tell which hand (left or right) she has. The infant has a mouth with a tongue so that the midwife can practice the Mauriceau maneuver. In this maneuver a child who is being delivered feet first is turned face down and the midwife places one hand on the occipital bone and a finger of her other hand is placed in the mouth on top of the tongue so that the child’s head can be pulled through the birth canal without cocking it backwards. The umbilical cord has both a firm cord and a flat cord to simulate the circulatory system. The firm cord simulates the artery.
of a living child who is getting blood flow through the umbilical cord. The flat cord simulates the artery of a dead child. Even the two models of the heads of dead infants provide tactile information, one having the fontanels overlapping in the head, and the other a fetid head that has decaying features.

In addition, Madame du Coudray took advantage of the students’ visual senses and included posters in her classroom and illustrations in her manual to remind the students of what they learned in class. To impress upon the students the importance of NOT doing certain things, Madame du Coudray included pictures which evoked an emotional response. For example one of the pictures shows the head of a decapitated infant in the birth canal. This emphasized the importance of the Mauriceau maneuver and the emotional response evoked by the picture ensured that they would remember it.

In summary, although Madame du Coudray had never heard of brain-based learning, she learned from her own experience the importance of the senses and movement in learning. She taught to the students’ “eyes and hands.” She provided them with rich sensory environments to learn and then she actively tested them by having them perform deliveries on an obstetric mannequin.

**Madame du Coudray: Midwifery Educator of the Enlightenment**

In August 1767 King Louis XV of France appointed Madame du Coudray, a 52-year-old midwife, to teach midwifery “throughout the whole extent of the Realm.” In so doing he acknowledged the “science and experience” and “high degree of perfection” that she had obtained in midwifery, and granted her an annual salary of 8,000 *livres* with a 3,000 *livres* per year pension. This was the second *brevet* issued by the king endorsing Madame du Coudray’s skills as a teacher of midwifery. The first, issued in 1759, thanked Madame du Coudray for her
outstanding service in Auvergne where she had trained hundreds of midwives, written a midwifery manual, and developed a mechanical mannequin for training purposes. The *brevet* gave her royal patronage and protection to travel freely throughout France. Provincial officials were encouraged to enlist her services to train midwives in their provinces. (Gelbart, 1998a) Although there had been previous royal midwives, including the well-known Louise Bourgeois, the midwife to Marie de Medici (Perkins, 1996), their primary responsibilities had been to serve as midwives to the royal family. No other royal midwife of France had been charged with educating and training midwives.

**Philosophical Setting**

It was the eighteenth-century, the Modern Age. A paradigm shift was taking place in the Europeans’ worldview. The authoritative role of the Catholic Church was beginning to decline. René Descartes had published his *Discourse on Methods* in the seventeenth-century. In it he used deductive reasoning and rationalism, instead of scripture, to develop his arguments. In England, Bacon was using inductive reasoning and empiricism to explore scientific ideas. The view of the world as holistic and multidimensional gave way to a more linear and progressive view. The scientific revolution had begun. It ushered in the Age of Reason and the Enlightenment. Behavior was no longer governed primarily by superstition, but now behavior more fully incorporated rational thought. The scientific method replaced revelation as the primary means of gaining knowledge and as a result individuals became more autonomous.

Prior to the Enlightenment, education was reserved for the affluent elite. The purpose of an education was to instill Christian values and respect for the authority of the Church. Subjects taught included philosophy, rhetoric, and Latin ("Education," 2003). Higher education, such as that received by physicians, served to maintain their class status as gentlemen. Individuals
typically learned a trade through apprenticeships where they learned from experienced tradesmen by observing them and working alongside them. Guilds guarded the secrets of the trades thus assuring the need for their practitioners. Students were educated one at a time. However, with the scientific and industrial revolution ideas of pedagogy were changing. The Enlightenment philosopher John Locke promoted education of the masses. In Some Thoughts Concerning Education Locke proposed that the function of education was to replace superstition with reason and to produce productive members of society (Locke, 1693). Without discarding the responsibility to instill Christian values, education took on the added responsibility of producing useful, rational citizens who could contribute to society. Educators were also encouraged to train students in a classroom. Many trades which were previously taught as apprenticeships were now taught in classrooms ("Education," 2003). It was the beginning of “conveyor belt” education; the idea was that skilled laborers could be mass produced through a standardized curriculum that was teacher centered. The secrets of the guilds were revealed when Diderot published his 26 volume Encyclopedie, in which he described and illustrated everything from how shoes were made to how babies were delivered.

**Health Care in Eighteenth-Century Europe**

The responsibilities of the various health care professionals in eighteenth-century Europe were quite different than in present-day society. At the top of the hierarchy were the physicians. Unlike today, physicians had no hands-on patient care responsibilities and did not care directly for patients. They were erudite gentleman and part of the aristocracy. They were leaders in their communities and supervised the other health care providers, including surgeons and midwives. Their training in medicine was mostly theoretical with very little practical training. Surgeons, on the other hand, were typically the hands-on health care professionals. One exception to this
general rule was childbirth (Broman, 1995). This was the domain of midwives. Midwives were typically older married women who had themselves given birth (Petrelli, 1971). They were usually trained in apprenticeships with other midwives. Only on rare occasions when something went terribly wrong, was a surgeon called in. These were usually dire emergencies and often resulted in the death of the baby, the mother or both. Women were thus reluctant to call on surgeons because of their association with infant and maternal mortality (Gelbart, 1998a).

The educational reforms occurring throughout Europe had interesting repercussions for the health care professions. Physicians came under pressure to start doing hands-on work. As physicians assumed some of the jobs traditionally done by surgeons, a power struggle occurred in the medical professions and surgeons looked for other opportunities. Delivering babies appeared as a potentially lucrative business, not only because there were so many babies being born, but because once a surgeon was accepted by a family he could keep them as patients for their entire lives (Broman, 1995). Thus the male-midwives, or accoucheurs, emerged on the medical scene in France (Massey, 2005). The groundwork was in place for the professionalization of medicine and the eventual role of the obstetrician.

The competition between the health care professions is exhibited in an interesting event which occurred early in Madame du Coudray’s career, prior to her appointment as the royal midwife. She had been officially licensed as a midwife in Paris by completing a three year apprenticeship with a midwife, Anne Bairsin, and then passing the qualifying examinations at the College of Surgery. Midwives had been admitted to classes at the school of surgery since 1733 to attend demonstrations of anatomy, dissections, and surgical operations; in 1745 the school of surgery closed its doors to the midwives, preventing them from attending the demonstrations, thus jeopardizing their opportunities for study. In an effort to rectify the situation, 40 midwives,
including Madame du Coudray, signed a petition which they presented to the physicians, the rivals of the surgeons, requesting that the decision be overridden (Gelbart, 1998a). The petition received prompt attention from the physicians who were themselves feeling threatened by the surgeons. The surgeons had recently received an endorsement from Louis XV’s first surgeon who, in keeping with the new ideas of the Enlightenment, predicted that because physicians were merely theoretical medical professionals, they would soon be obsolete. Surgeons who combined theory with hands-on practical experience would rise in their stead. It is very possible that the threat to scientific midwifery education in Paris inspired Madame du Coudray to commence her own training programs for midwives.

**Eighteenth-Century Midwifery Education**

The changing Enlightenment ideas about education appear to have influenced Madame du Coudray in other ways. Midwives historically were trained through an apprenticeship program. Madame du Coudray, in fact, early in her career had herself been both an apprentice and a teacher of apprentices. However, the training program Madame du Coudray set up as the royal midwife was not an apprenticeship program, but a classroom program. Whereas previously midwives learned the craft by word of mouth and participating in live deliveries, Madame du Coudray developed a series of 38 lectures and a training mannequin. Rather than being able to train one student in the course of a three year time period, she could now train 80 to 100 students in three months. Madame du Coudray’s manual, *Abrégé de l’Art des Accouchements* (Guide to the Art of Delivery), went through six editions (Gelbart, 1995). Each student was required to purchase a copy of her text which contained the lectures she taught in her course.
Comparison of Seventeenth- and Eighteenth-Century Midwifery Manuals

A comparison of the midwifery manuals of Louise Bourgeois and Madame du Coudray shows a marked increase in scientific language in the latter. Both manuals contain diagrams and discussion about complications that arise when an infant presents itself for birth with feet first and hands above the head. Louise Bourgeois’ diagram contains no caption but the text warns of the gravity of the situation:

It happens sometimes that the Child comes forward with its feet, with the Arms not close to its sides, but extended above its head; which when it comes to pass, the Midwife is by no means to receive this birth, unless the child be very small…(Boursier & Mayerne, 1663)

Madame du Coudray further explains the gravity of the situation in a caption to a diagram using scientific terms -

This figure shows the pelvis from the front and a little to the side in order to show a structural defect stemming from the overly large bulge of the upper part of the sacrum bone into the pelvis, as well as the turning of the pelvic bone also inward which cannot permit [passage of] the head which is pressing on it. And the face turned to the side of the loin vertebras to find its passage.

(Le Boursier du Coudray, 1769)

Madame du Coudray’s description uses anatomical terms such as “sacrum,” “pelvic bone” and “vertebras.” In addition, she is very concise and tells the exact complication which results when a baby is delivered in this position. The influence of the Scientific Revolution is apparent.

There were other changes in the practice of medicine that affected the training of midwives. Before the Enlightenment views of the human body were very holistic and faith based. Cultural and religious beliefs interfered with the dissection of cadavers. The human body was considered a sacred temple by the Roman Catholic Church and thus dissections were considered desecrating a temple. Dissections had been banned in Rome in A.D. 150. Thus, the
anatomy texts used prior to the Enlightenment had been passed down from Greek times. They had been written by Galen of Pergamum who had been the surgeon of gladiators in the second-century A.D. and, as a consequence, learned a lot about anatomy which he published. ("Medicine," 2003)

As the attitudes about dissection started to change during the Enlightenment, other books on the subject were published. In 1641 Descartes published *Meditations on First Philosophy* in which he introduced the idea of dualism, that the mind and the body are separate and that the body is merely a machine (Weissman, 1996). This mechanistic view of the body greatly influenced Enlightenment ideas about medicine. Descartes published *Discourse on Method* in 1641 and the *Description of the Human Body* posthumously in 1641. The idea that the body was a machine was developed further by Hermann Boerhaave and his student Julien Offran de La Mettrie who published *L’homme Machine* (Man a Machine) ("Medicine," 2003). As a result attitudes shifted about the human body and the dissection of cadavers was legalized in England. This greatly improved the training of surgeons and increased the available knowledge about human anatomy.

In the 1769 edition of *Abrégé de l’Art des Accouchements* Madame du Coudray included 27 diagrams. It is instructive to compare the diagrams mentioned previously showing the child in feet first position for delivery. Historically diagrams in midwifery manuals contained very little anatomy as illustrated by those used by Louise Bourgeois (see Figure 7). During the Enlightenment, more anatomy began to appear. The inclusion of the human pelvis in Madame du Coudray’s diagrams is one example demonstrating this trend (see Figure 8).

The “Man a Machine” philosophy is apparent in another development in midwifery education, the teaching mannequin. The use of mannequins was a new invention in the teaching
of midwifery between the time of Louise Bourgeois (1563-1636) and Madame du Coudray (1715-1794). The first record of a mannequin being used for training of midwives is the Grégoires’s simulator. It was developed in Paris, by the Drs. Grégoire. Although there is no existent mannequin or illustrations of this simulator, a number of descriptions have survived. It consisted of a human pelvis in a basket like frame and was covered with oil-skin and coarse cloth. The baby consisted of a preserved real human fetus (Buck, 1991).

Madame du Coudray’s Training Mannequin

Madame du Coudray also used a training mannequin to teach students. She actually called it *la machine*, reminiscent of Decartes and de La Mettrie. Hers was a significant improvement over the Grégoires’ simulator. It was a device made of cloth, leather, and bone which resembled a pregnant woman from the waist to the knees. It included a small doll which served as the baby which could be manipulated through the birth canal of the mannequin to simulate birth. Madame du Coudray described her mannequin, stating that-

I took the tack of making my lessons palpable by having them maneuver in front of me on a machine I constructed for this purpose, and which represented the pelvis of a woman, the womb, its opening, its ligaments, the conduit called the vagina, the bladder and rectum intestine. I added a model of a child of natural size, whose joints I made flexible enough to be able to put it in different positions: a placenta with its membranes and the demonstration of waters that they contain; the umbilical cord composed of its two arteries and of the vein, leaving one half withered up, the other inflated, to imitate somewhat the cord of the dead child and that of a live child in which one feels the beating of the vessels that compose it. (Gelbart, 1998a)

Later developments also included a bladder of liquid which simulated amniotic fluid. One of her mannequins is preserved in Musée Flaubert et d’Histoire de la Médicin - Rouen and is described in detail in *La “Machine” de Madame du Coudray ou l’Art des Accouchements au*
Figure 7. Illustration from Louise Bourgeois midwifery manual showing child in position feet first for delivery.
Figure 8. Illustration from Madame du Coudray’s midwifery manual showing delivery of child in position feet first for delivery. Copyright BIU Santé Paris (France). Permanent link http://www.bium.univ-paris5.fr/histmed/medica/cote?190618
Summary

The Enlightenment ideas of education and medicine were very influential in the career of Madame du Coudray, the royal midwife of France. Pedagogic ideas which promoted practical education for the common citizen provided opportunities for her to train the peasant women of France in the art of midwifery. The changing attitudes about apprenticeships allowed her to teach many more students than had been previously possible. The Scientific Revolution with its emphasis on mechanistic views of the body opened opportunities for dissections and the study of anatomy as well as a mechanistic mannequin, which allowed her students to learn in a simulated situation rather than waiting for actual opportunities to arise. All of these factors combined to create a cultural and social situation wherein a midwifery educator, Madame du Coudray, could rise to a position to receive a royal appointment and pension.

A Brief History of Midwifery Illustrations

The earliest known manuscript on midwifery was written by Soranus of Ephesus in the second-century A.D. entitled *De morbis mulierum* or *Gynecology*. Although Soranus’ original manuscript has been lost, its contents were preserved through a Latin translation of the work made by Muscio in the sixth-century. Soranus’ work included ten or more descriptions of the orientation of the fetus in the uterus (Radcliffe, 1967). Through the ages as the manuscript was transcribed by scribes, one of them added illustrations of these descriptions. They were very simple illustrations in which the uterus appears as a round bottomed flask and the fetus appears as a miniature adult in various acrobatic positions in the uterus. These simple illustrations would be used again and again in midwifery manuals.
Although the church did not officially ban dissections, the attitude toward the human body was that it was a temple not to be desecrated and that the understanding obtained by the Greeks was sufficient for medical practice. Therefore, dissections were rare in medieval times. In the early fourteenth-century, Mondino dei Luzzi conducted public dissections; however he did not actually participate in the dissection but remained aloof and supervised a lowly barber-surgeon to do the actual dissection. Despite his experience with dissections, his book *Anatomia Corporis Humani*, was based on the learning of the Greeks and did not contribute significantly to the understanding of anatomy (Caldwell, 2006).

It was not until the early sixteenth-century that a much more realistic illustration of the fetus *in utero* appeared. However, it did not come from the anatomists, but an artist, Leonardo da Vinci (Newman). Because artists beautified the Churches and a realistic representation of the human body was dependent on their understanding of anatomy, they observed and participated in dissections (Nuland, 1988). Thus Leonardo da Vinci is attributed with the first realistic illustration of the fetus *in utero* (Newman) which appear in the third volume of his private notebooks (Gilson, 2008).

Throughout the middle Ages the Soranus/Muscio manuscripts were the primary source of information on midwifery. However, access to the Soranus/Muscio manuscripts was severely limited. Not until after the invention of the printing press in 1450 did midwifery manuals actually become available to midwives. The first printed midwifery manual was published in 1513 in Worms by Eucharius Rösslin, the city physician at Frankfurt-am-Main responsible for supervising the city’s midwives (Radcliffe, 1967). His book, *Der Swangeren Frawen und Hebammen Rosengarten* (The Rose-Garden of the Pregnant Woman’s Nurse (Byers, 1912)), relied heavily on the Soranus/Muscio manuscripts. *Rosengarten* was widely distributed and
translated into Latin, French (*Des Divers Travaux et Enfantemens des Femmes*), Dutch, Spanish, Italian, Polish, Czech and English (*The Byrth of Mankynde*) (Newman). It contained over 20 illustrations by Martin Caldenbach, including 17 showing the orientation of the fetus in the uterus (Radcliffe, 1967). However, despite the more realistic illustration of the fetus *in utero* by Leonardo da Vinci, the illustrations in *Rosengarten* are strikingly similar to those in the Soranus/Muscio manuscripts.

In 1543, Andrea Vesalius published his landmark book of anatomical illustrations, *De Humani Corporis Fabrica*. This great work is considered by many to contain some of the first realistic anatomical illustrations of the human body (Nuland, 1988). Vesalius was a young professor at the University of Padua and an expert at dissection. In comparing his observations of dissection with those of the Greeks he realized that the learning of the Greeks was incomplete. Using artists from the workshop of Titian to capture his dissections in illustrations, he wrote and published *De Humani Corporis Fabrica*. The illustrations in *Fabrica* go beyond the realistic representation of the human body, each of them actual tells a story. Caldwell describes them thus-

…the dominant tradition of anatomical illustration is strangely dynamic and expressive, often implying or following an unfolding story: skeletons who stride through pastoral landscapes; deeply dissected corpses who nonetheless smirk seductively; cadavers who assist in their own dissection, gazing raptly into their abdominal cavities (Caldwell, 2006).

These animated cadavers often mimicked the poses of classical sculpture. The frontispiece of Vesalius’ work shows the dissection of a pregnant woman in a great hall, surrounded by a multitude of observers. However, despite a better understanding of the anatomy of pregnancy provided by Vesalius, midwifery illustrations continued to be quite simplistic.
In the early sixteenth-century a school for midwifery was established at the Hôtel-Dieu, a hospital in Paris. During the next 200 years it became a center for midwifery education, not only for France but for Europe (Radcliffe, 1967). One of the first pioneers of midwifery at Hôtel-Dieu was Ambroise Paré, a barber-surgeon, who became the resident surgeon at Hôtel-Dieu in 1533. During his time at Hôtel-Dieu he wrote a number of books about surgery, including some on midwifery. In a short work he wrote in 1549, he included a chapter about podalic version, a method for delivering an infant when it presents transversally. Using podalic version the fetus is turned in utero so that it can be delivered feet first. Podalic version had been practiced by Soranus, but had fallen into disuse (Thoms, 1935). Paré is credited with encouraging its use. He also wrote a book on midwifery. The English version was entitled, Concerning the Generation of Man. Paré had several important students at Hôtel-Dieu including Jacques Guillemeau and Louise Bourgeois.

Jacques Guillemeau followed in Paré’s footsteps and became a surgeon at Hôtel-Dieu. His book about midwifery, L'Heureux Accouchement des Femmes (the English translation was entitled The Happy Deliverie of Women) was published in 1609. He worked hard to dispel superstitions about pregnancy and childbirth and replace them with sound reasoning. Like Paré, he was an advocate of podalic version.

Another of Paré’s students, Louise Bourgeois, became the Royal Midwife. Bourgeois was midwife to the Queen of France, Maria of Medici, from 1601-1609 (Perkins, 1996) and delivered six of her children including Louis XIII. She was also the first woman to write and publish a midwifery manual, Observations Diverses, in 1609. Her manual was very popular and was translated into English as The Compleat Midwives’ Practice Enlarged.
Probably the best known student of midwifery to come out of the Hotel-Dieu was François Mauriceau, whose name is still used today to refer to the Mauriceau maneuver, a way to deliver an infant who presents feet first and face down. His manual, *The Diseases of Women in Pregnancy and Childbirth*, corrected a misunderstanding that was prevalent at the time that the pubic bones separated during delivery. He described the difference between real and false labor and consistently worked to correct superstitions. He was well known, not only in France, but England where Hugh Chamberlain, whose family invented the forceps for delivering babies, translated his manual into English.

In England, the first original work on midwifery was written by William Harvey who previously had discovered the circulation of blood. His work on midwifery was entitled *de Generatione Animalium* which included original work on labor (Thoms, 1935).

Meanwhile in Holland, Hendrik van Deventer was realizing the important role the anatomy of the pelvis played in childbirth. His work *New Light for Midwives* described not only the anatomy of the pelvis, but the deformities of it that resulted in complications during delivery. His 1725 manual included a very realistic illustration of the pelvis. His work was translated into Latin and then into English.

Early in the eighteenth-century William Smellie came from England to study midwifery at the Hôtel-Dieu. He would return to England and publish his classic work, *A Sett of Anatomical Tables, with Explanations, and an Abridgment, of the Practice of Midwifery*, which contained very realistic illustrations by the Dutch artist Jan van Rymsdyk. Another English male-midwife William Hunter also hired Rymsdyk to illustrate his *Anatomia Uteri humani gravidi*. Hunter makes an interesting observation about two types of anatomical illustrations of the time in the preface to his work. “One is the simple portrait, in which the object is represented exactly as it is
seen; the other is a representation of the object under such circumstances as were not actually seen, but conceived in the imagination” (Massey, 2005). The illustrations in Hunter’s book were obviously the former type. They were gross dissections in which the body appears like a piece of meat, flies and all. The later type of illustration refers to the simplistic illustrations passed down from the Soranus and Muscio manuscripts.

A contemporary of Smellie and Hunter who actually became the head midwife at the Hôtel-Dieu, Madame du Coudray opted for yet a different approach to midwifery illustrations. In her approach the anatomical structures were accurate, yet the mother and infant are not portrayed as cadavers, but living beings. She chose a realistic yet respective representation of the human body.

A Brief History of Midwifery Simulators

Madame du Coudray, in describing her mannequin to his lordship, Bernard de Ballainviliers, takes full credit for inventing the obstetric simulator. She claims, “I have perfected an invention that pity made me imagine” and describes “the advantages bestowed by the Machine that I invented to facilitate the Art which I practice” (Le Boursier du Coudray, 1769). And in fact, her manual contains an endorsement from the Surgical Academy for her machine:

From 13 May 1756. Monsieurs Verdier and Levret, have been appointed by the Academy to examine a machine, invented by the Lady du Coudray, Royal Mid-Wife, received in Paris, established at Clermont in Auvergne, to demonstrate the practice of delivery, and having had a very favorable report, the Academy has deemed this Machine worthy of its approval. In faith of which I have given the present Excerpt to our Registers, the first of December 1758. MORAND, Permanent Secretary (Le Boursier du Coudray, 1769).

However, as with most scientific inventions, Madame du Coudray did not invent the machine without considerable influence from previous obstetric training devices.
Anatomical models made of wax which showed the various difficult presentations were an important method of training midwives in the eighteenth-century. Mary Catherine Biheron² became well known in France for her life-like anatomical sculptures. Similar sculptures were created in Italy and used for training midwives. A number of them have survived to modern times and can be viewed in Bologna’s Obstetrical Museum (Newman) and the Museo Galileo in Florence ("Room XVIII. Surgery and obstetrics."). An online catalog and virtual tour of the collection is available on-line for the later.

However, as life-like as these sculptures were, they could not be manipulated to learn the manual skills of midwifery. This required a simulator. A simulator is “a physical object, device, situation, or environment where a task or series of tasks can be realistically and dynamically represented” (Ennen & Satin, 2008, pg. 97). The more realistic a simulator is, the higher the fidelity.

Jacques Gélis, in “The Demonstration Mannequin: A History of Phantoms” claims that the first description of an obstetric simulator appears in a manual published by Johann Van Hoorn in Sweden in 1715. It consisted simply of a women’s pelvis, with no lower limbs and a doll of stuffed leather for the infant. However, no known example has survived to the modern day.

The earliest known obstetric simulator in France was developed by a father and son team of male midwives, Gregoire, who taught at the Hôtel-Dieu in the 1730s (Buck, 1991). We have no illustrations of it, but we do have a description of the Gregoire simulator:

In a pamphlet of 1750, entitled “A Comparative View of the Practice of Surgery in the French Hospitals” the writer gives a full description of the phantoms of Gregoire … “It was made of

² Boulinier claims her name was Marie Marguerite Biheron in an article, [A Female Anatomist of the Enlightenment: Marie Marguerite Behiron (1719-1795)], published in Histoire des sciences médicales 2001 Oct-Dec 35(4):411-23.
basket-work covered with course cloth; the pelvis was human, covered with oil-skin; and a real foetus was used…” (Smellie, 1876).

It had a very low fidelity as one observer noted, “‘tis so rude a work that a common pelvis stuck into a whale without any embellishment would be as like nature as this machine which has been so much admired” (Smellie, 1876). Although we know of no Gregoire simulator that has survived to modern times, a simulator which is very similar in description is in the Bolognese Obstetrical Museum. A picture of it appears in Newman’s Fetal Positions (Newman). It has a wire basket for the uterus, the neck of which goes through a human pelvis.

As mentioned previously, Smellie received his midwifery training at the Hôtel-Dieu. There he was trained by the younger Gregoire, so he was aware of the Gregoire simulator. When he returned to England he constructed three simulators with dolls for infants (Gélis, 2004a). His machines were described as “composed of real human bones armed with fine smooth leather and stuffed with an agreeable soft substance” and Smellie himself describes them as “machines which I have contrived to resemble and represent real women and children; and on which all the kinds of different labours are demonstrated, and even performed, by every individual student” (Smellie, 1876). It is difficult to judge the fidelity of the Smellie simulator as none survive to modern times. However, it was considered a significant improvement over the Gregoire simulator.

Gélis also mentions a couple other simulators about which little are known. Richard Manningham, another Englishmen, is known to have used simulators to train students in his birthing house which was founded in 1739. Also in 1752 a German, G.F. Mohr, left an illustration of one (Gélis, 2004a). However, very little is known about either simulator.
Mini Case Study of Modern Midwifery Education

In order to learn about modern midwifery, I conducted a small case study. In particular, I wanted to learn how a modern midwife is trained and modern midwifery is different than obstetrics. I proposed that modern midwives receive more training in modern medicine than their predecessors, and that they choose to become midwives because they feel that midwives have something to offer that is not found in the practice of modern obstetrics.

Review of Literature

For centuries maternity and childbirth were the domain of women, and midwives delivered most babies. However, training for midwives has changed significantly over the last century and a half. At the turn of the twentieth-century 50% of all births in the United States employed a midwife (Buchanan, Parker, & Zajdel, 2000). The typical midwife was a lay midwife, often called “granny midwives,” with no formal training. One author describes them thus-

Until fairly recently, most babies were delivered by midwives who had been self-taught or who had served a kind of apprenticeship with an older midwife. The knowledge had been handed down through generations and often within the same family from mother to daughter or aunt to niece. These were the picturesque “granny women” who rode mules into the hollows, often behind the expectant father who had come to “fetch Granny.” They would sometimes leave their own homes and families for days and stay with the expectant family until the baby was born and maybe a few days afterward to be sure mother and child were doing all right. (Buchanan, et al., 2000)

With the development of medical schools the wealthy had begun using physicians for the delivery of their children while midwives continued to care for those who could not afford a physician.
It wasn’t until 1923 that the first school for training nurse midwives was established in Hyden, Kentucky, the Frontier Nursing Service. Mary Breckinridge, a graduate nurse from Kentucky, became concerned about the maternal and natal care of women in rural Kentucky. She had traveled to Europe with the Visiting Nurse Services of the American Committee for Devastated France and was very impressed with the training received by the French and English midwives. When she returned to the United States she attended a graduate program in public health at Columbia University and she became interested in the obstetric care in rural Kentucky. Seeing a need for better training for midwives, she returned to England where she earned a certificate as a nurse-midwife. Then she returned to Kentucky and established the Kentucky Committee for Mothers and Babies which immediately began training nurse-midwives (Litoff, 1978). The Frontier Nursing Service started the Frontier Graduate School of Midwifery. From these humble beginning developed the modern profession of nurse midwifery.

Since that time a number of nurse midwifery programs have sprung up in the United States. To become a nurse midwife today you must earn a Baccalaureate degree in nursing and a Master’s in midwifery. Midwifery is one of the three Advanced Practices of Nursing along with Nurse Practitioner and Nurse Anesthetist.

Sampling and Data Collection

I selected a Certified Nurse Midwife (CNM) who practices in Baton Rouge. I obtained her name from a professor of Nursing whom I interviewed. As the CNM says, “There is not a lot of us” (Mary, 13 November 2008), so I took the opportunity to visit with the only one I knew of locally. Although a formal list of questions was submitted and approved with the IRB (see Appendix A and B), the interview was conducted as a guided interview. In addition, I used the
interview I had done previously with the professor of Nursing at OLOL College (Connie, 13 October 2008). It provided information about undergraduate nurse training in obstetrics.

To support the interviews and establish trustworthiness, I consulted two documents from the American College of Nurse-Midwifery, Core Competencies for Basic Midwifery Practice ("Core Competencies for Basic Midwifery Practice," 2004), and the Criteria for Programmatic Accreditation ("Criteria for Programmatic Accreditation," November 2006), and information about the curriculum in Midwifery from the Stony Brook website ("Master of Science Program: Nurse Midwifery.").

Data Reduction

The two interviews and the Core Competencies were imported into Atlas.ti. Open coding was used to analyze the documents (see Appendices C, D, and E). I was able to code the interview with the CNM quite thoroughly. However, I reached the limit of the demonstration version of Atlas.ti which was 50 codes and 100 quotes shortly thereafter, so I was only able to do limited coding of the interview with the nursing professor and the Core Competencies. A list of codes is found in Appendix F.

A theme started to emerge from the coding, because there was one code which resulting in 10 quotes, namely “midwife vs. obstetrician.” This code was used to indicate quotes which compared and contrasted the philosophy of midwives with those of obstetricians. The CNM was making a point to describe to me the difference between the two.

The codes fell into several families (see Appendix G). “Midwifery work” which was used to describe the types of work that midwives do appeared as a theme with the families. Another prominent code was “Graduate teaching methods” which was used to describe how CNMs are trained in graduate school.
Interpretation

I am a biomedical engineer and, I must admit, I love modern medicine! I constantly marvel at the miracles that occur daily as a result of modern medicine. So, you can imagine my surprise when my niece, who is a graduate student in the health sciences herself, opted to use a midwife when she was expecting her first baby! My imagination conjured up images of the Old West with a young father running for the doctor to deliver his first born. Then, finding the only doctor in town drunk or otherwise ill-disposed, he resorted to going for the midwife. I imagined the midwife to be a kind, compassionate, grandmotherly woman. However, she had no formal training in medicine. The only training she had received was the folk medicine which had been passed down to her through the generations of midwives who had preceded her. Was my niece turning her back on all the medical knowledge in obstetrics that has been obtained through sound scientific research? Or has the training of midwives changed and am I the one that is not up to date?

I decided to visit with a midwife to find out for myself. In a recent interview with a nursing professor, she mentioned that there was a certified nurse midwife in Baton Rouge. I was anxious to meet her. I called her office and left a message. She returned my call within a few hours and was very happy to meet with me in a few days. We met at a local coffee shop. She was young (probably mid-thirties), petite and attractive. She wore a black skirt and white blouse. She mentioned that she was the mother of two small children. This was not the “granny” I expected!

She enthusiastically told me all about being a modern midwife. She is a Certified Nurse Midwife which means that she has a Baccalaureate Degree in Nursing, a Master’s Degree in Midwifery and is board certified by the American College of Nurse-Midwives. In addition, she
has a nursing license and an Advanced Practice certification from the Louisiana State Board of Nursing. I was impressed!

She described her graduate training to me. She received her Master’s degree from Stony Brook University School of Nursing, which is part of the Medical Center there. It was a two and a half year program. She participated in a distance learning program and so most of her coursework was done on-line. A summary of the curriculum is shown in Appendix H.

Each semester she spent one week on-campus doing laboratories and hands on training. She described it thus-

But we would go to Stony Brook to have some “hands on training.” We learned to do intrauterine device insertion. You have to be checked out on that at school, so we had…to use models…to learn how to do a proper pelvic exam, we did them on each other. It is called a peer pelvic exam. So you met all these strangers from around the country and you had to get intimate really quick. And that was part of the training process. We did microscope slides. We did all that there at Stony Brook. They would have these big model…dummies, and it would have an empty belly and they would stick a dummy baby in there and you had to try and figure out what position the baby was in. That is the kind of testing they did. “Hands on” stuff they did while we were there you know. (Mary, 13 November 2008)

In addition to the coursework and laboratories, she spent a significant amount of time in “clinicals,” being trained locally by another certified nurse midwife. A total of 855 clock hours of clinical experience are required by the Stony Brook Midwifery Program ("Master of Science Program: Nurse Midwifery"). According to the “Criteria for Programmatic Accreditation” from the American College of Nurse-Midwives, certification requires extensive clinical training which is summarized in Appendix I. ("Criteria for Programmatic Accreditation,” November 2006)
Of course the specialty of midwifery has always been labor and delivery. The word midwife means “with woman” and they take the responsibility seriously. In fact, they often “labor sit” –

We tend to labor sit too. You know, when a women is in labor an obstetrician typically will pop in at lunch time, say hello, come back when it is time for the birth. We want to be there with the patient during the course of her labor. Once we hit that active labor phase we want to be at the bedside with mom (especially those that desire a natural birth) and be with her and help her throughout her labor. We do take patients…our patients are allowed to get up epidurals, if they choose…but a lot of women choose midwifery care because they desire that natural birth. They know we have experience there. And we are going to be at their bedside a little more than an obstetrician would be. (Mary, 13 November 2008)

In addition to labor and delivery, midwifery work includes a number of other responsibilities. They conduct prenatal care, including primary care for pregnant women. They do “well woman exams” for women of all ages including pap smears, STDs, and menopause. They even have prescriptive authority.

One of the real themes that emerged from the interview was the difference between midwives and obstetricians. As described in the Core Competencies, one of the Hallmarks of Midwifery is “Advocacy of non-intervention in the absence of complications”("Core Competencies for Basic Midwifery Practice" 2004). The CNM I interviewed described it thus-

I think just the philosophy for…the difference between an obstetrician [and midwife is] an obstetrician is trained to look for the pathology. That is what they do. Is that they study what is wrong. A nurse midwife is going to study what is right and remember that it is normal until the pathology is there, but we don’t look for it, if there is none there in the first place. And I think that is the difference. And just trust it. We trust birth a lot more. We trust a woman’s body to be able
to birth a baby. You know, even if it takes a little longer. We just trust it. (Mary, 13 November 2008).

Another significant difference between midwifery and obstetrics is that midwifery is a lot more family centered-

   It is a family process and a lot of obstetricians don’t let small children in the door. However, with midwifery care we want it to be family centered. Bring your two year old in with you to your visit. We will let that two year old try to listen to the baby’s heart beat as well. So it is a little bit different how we take care of things. (Mary, 13 November 2008)

This is also one of the Hallmarks of Midwifery, “Promotion of family-centered care” (“Core Competencies for Basic Midwifery Practice” 2004).

   I thoroughly enjoyed my visit with a modern midwife and I was able to answer my questions, “Yes, modern midwives are thoroughly trained in modern obstetric methods” and the difference between a midwife and an obstetrician is mostly a philosophical difference. Midwives believe in family-centered births and non-intervention when there are no complications.

**Reflection**

   I learned a lot from this experience. I discovered that doing a case study is very time consuming. I spent many hours but finished this project feeling like I could have spent even more time. Collecting all the data takes time, but the data analysis also takes time.

   I could improve my interviewing skills by stating my questions more succinctly. I found myself starting to ask a question, then realizing that it was not very open ended and so I changed the question mid-stream. This probably came across as being timid and unclear.
If I had unlimited time, I would interview the other two CNMs which my interviewee mentioned. In addition, I could have had a whole section in my narrative about teaching methods used in midwifery school including case studies, clinicals, models, etc.

I really enjoyed learning how to use Atlas.ti and think that it will be very useful in my graduate studies. However, I also learned the limits, 50 codes and 100 quotes. If I had it to do again and had unlimited time and money, I would buy the commercial version of Atlas.ti and do a more thorough job of coding the other two documents.

**Teaching-Illustration Theory**

**Tufte’s Theory of Graphic Design**

Edward Tufte, a Yale statistics professor, has greatly influenced scientific graphics with his landmark four volume work on information design. In it he emphasizes that data is the most important feature and thus should be the most prominent part of any scientific graphic. The four volume work includes *Visual Display of Quantitative Data* (1983), *Envisioning Data* (1990), *Visual Explanations* (1997), and *Beautiful Evidence* (2006). In his books Tufte uses a variety of examples to illustrate his major principles of graphic design. Although his major principles are found in all of the books, each book has a particular focus. *Display of Quantitative Data*, his premier work, was written to show “pictures of numbers,” an obvious interest for a statistician. In *Envisioning Data* he broadens his scope to discuss how his Tuftian principles apply to “pictures of nouns.” *Visual Explanations* shows how to effectively communicate processes or in other words, it is about “pictures of verbs.” His final work *Beautiful Evidence* discusses “pictures of adverbs and adjectives.”

In his books Tufte uses a variety of graphics, both good and bad, to illustrate his principles (see Figure 9). Of the principles shown in Figure 9, I will only discuss those that have
Figure 9. Concept map showing major information design principles of E.R. Tufte
particular relevance to the 26 teaching graphics that Madame du Coudray, an eighteenth-century French midwife, used in her teaching manual.

Madame du Coudray was a Paris-educated midwife who was commissioned by King Louis XV to teach midwifery in rural France during the eighteenth-century. In the 20 years she taught midwifery, she traveled throughout France and trained thousands of midwives. Early in her career, she compiled her 38 teaching lectures into a manual, *Abrege de l'Art de Accouchement*, and published it in 1759. This manual would go through six editions (including a Flemish edition) with no significant changes, except for one - the addition of 26 color illustrations in the *nouveaux* edition of 1769 (see Figure 10). These illustrations were included in every edition thereafter. Interestingly, Madame du Coudray’s illustrations demonstrated many of Tufte’s major principles.

**Graphics Should Be Multivariate**

Perhaps Tufte’s favorite graphic is a map by Menard of the ill-fated march of Napoleon’s army into Russia. Tufte likes this graphic for a variety of reasons, one of which is that the graphic is multivariate, several variables are plotted on the same graphic. Menard’s map shows the size of the army, the distance traveled, the temperature, the mortality rate, and even the terrain that they covered. Another graphical method he likes for demonstrating the multivariate nature of data is the small multiple. A small multiple is a series of pictures that are graphically similar but that show variables through time or under different circumstances. For example in *Visual Explanations* he shows the step by step illustrations used by magicians to show how they perform a magic act. These are small multiples. Small multiples have several attributes that make them useful for communicating processes. One of the attributes of small multiples is that the
Figure 10. Concept Map Summarizing Madame du Coudray’s Teaching Graphics
graphics are very similar and so once the viewer understands the first graphic, it is very easy to visually compare and contrast the remaining graphics to discern differences between them.

Although Madame du Coudray’s illustrations are not small (each covers a single page) they have many of the important attributes of small multiples. They are multivariate. They show the orientation of the mother, the orientation of the baby, the relationship between the two, and there are even some time series. As one looks at the illustrations in Madame du Coudray’s midwifery manual you immediately notice that all the illustrations (except for the title page picture of the author herself) include the bony pelvic girdle of the mother. Because the pelvic girdle appears in every picture, one can easily visually compare between any two pictures in the book. The girdle acts almost like an x- and y- axis for a scatter plot. Once you see the pelvic girdle you know exactly what you are looking at. Its presence in all the illustrations serves to make them a set of multiples. This allows her to show time series (such as the dilation series) and various deformities (such as the orientation of the uterus, or the misshaped sacrum). One of the best examples of the benefit afforded the viewer to compare things visually is the illustrations of the four stages of dilation. (In the 1769 edition of the manual, the diagrams of the first two stages are actually bound facing one another to facilitate visual comparison.) The four diagrams are essentially the same: the uterus sitting in the bony pelvic girdle. However one immediately notices that the opening of the cervix is larger in each successive dilation picture. The comparison is obvious because of the similarities between the series.

**Maximize Data Ink and Eliminate Chartjunk**

One of Tufte’s core values is to maximize data ink and eliminate chartjunk. By maximizing data ink he means that as much of the ink of the graphic as possible should be ink representing
data. He despises decorative ink which has no relation to the data or is redundant. Some of his graphics are almost minimalist because he has stripped away all unnecessary ink to showcase the data.

Madame du Coudray’s illustrations also maximize data ink and eliminate chartjunk. As mentioned previously all the diagrams include the pelvic girdle. The first three diagrams are a series about the pelvis [(1) the pelvic girdle, (2) the pelvic girdle and the feminine reproductive organs (uterus, ovaries, fallopian tubes, vagina, ligaments, etc.) and then (3) the pelvic girdle, female reproductive organs, and infant]. However, after that, she does not continue to include all the organs and accessory structures. In each diagram, the only structures that are included are those that are relevant to the topic being discussed. For example, when showing the effect on delivery of a misshaped sacrum, the illustration only shows the pelvic girdle and the infant’s head which is misaligned with the birth canal. It does not include the fallopian tubes, ovaries, ligaments, etc. which are irrelevant to the problem being discussed.

**Show Causal Relationships**

When possible Tufte encourages that graphics be designed to show causal relationships. What is the cause of a peak or valley in a scatter plot? He even encourages information designs to label the causes directly on the plot.

A number of illustrations in Madame du Coudray’s manual show causal relationships, particularly the illustrations of the stuck child. After showing the difficult child position when an infant must be delivered feet first, she shows the importance of the Mariceau maneuver in which the midwife turns the infant so that it is face down. Then the midwife presses on the occipital bone with one hand while putting her finger in the baby’s mouth with the other hand. Thus the
baby’s head can be flexed for a safe deliver. Then Madame shows the consequences of not using the Mauriceau maneuver. She actually has an illustration that shows a decapitated infant in the pelvic girdle of the mother. Through these three pictures she shows the problem (the cause), the solution and the wrong solution (effect).

**Appropriate Use of Color**

The use of color is discussed extensively in Tufte’s work. Tufte points out that the human eye can discern infinitesimally small differences in color, thus it is not necessary to use extreme differences in color in scientific illustrations. The least discernible difference is best and one should use natural colors. He used a topographical map to illustrate this principle by contrasting the map done first in bright colors with the map done in natural colors with barely discernible differences. It was obvious to the viewer that the natural colors were the better choice. He also discourages the use of color unless it improves the understanding of the data.

Color printing was a new development in the 1760’s. It was expensive and few printers could do it. However, Madame du Coudray felt it was worth the cost to commission an artist and to print her illustrations in color. Her explanation was that the color illustrations would help her students discern the subjects better. It would clarify the data. Although she had at her disposal red, blue, yellow, and black ink, when one looks at the illustrations you are struck with how natural the colors are. She used pink for soft tissue like the infant and the hands of the midwife. She used pale yellow for the hard tissue of the bony pelvis. There is little use of the color blue except in illustrations of the uterus that show the veins (red) and arteries (blue).

**Close Proximity of Graphics to Descriptive Text**

Last but not least, Tufte promotes the integration of graphics into the text close to the text
describing it. He uses Galileo’s data books as good examples of integrating graphics into the text. He disapproves of putting all the graphics together in a separate part of the book.

An analysis of Madame du Coudray’s illustrations and text shows that her illustrations were normally bound in the text within a page or two of the descriptive text. Although printing methods of the time probably did not make it possible to entirely integrate the illustrations and text, she did the very best she could under the circumstances to make sure that her students could view the illustrations and text nearly simultaneously.

**Content Analysis Theory**

**Krippendorff’s Content Analysis**

Content analysis is a method of text which has been used for over 100 years. The first content analysis studies were done on newspapers in the late nineteenth-century. These were very simple quantitative studies in which the frequency of specific words and phrases was counted. Totals were considered indicative of the importance of the concepts represented by the words and phrases. Early in the twentieth-century the application of content analysis expanded to other texts and media and was used by social scientists to study trends in society. During World War II content analysis was used to analyze Nazi propaganda and assisted in predicting the war activities of the Nazis. After the war, the use of content analysis spread to numerous disciplines and it is used today in many of the social sciences (Krippendorff, 2004).

Klaus Krippendorff is a professor of communications at the Annenberg School of Communication at the University of Pennsylvania. He is the author of *Content Analysis: An Introduction to Its Methodology* which has gone through two editions. The first was published in
Figure 11 Components of Content Analyses from (Krippendorff, 2004), pg. 86
1980 and, more recently, the second edition in 2004. He is known for developing Krippendorff’s Alpha, a method of calculating interrater reliability which takes into account the fact that raters may agree merely by chance.

Krippendorff’s method of content analysis is summarized in Figure 11. The first step is to determine what units will be analyzed. Then a method of sampling is defined. Once the sampling method has been defined, the samples are recorded, or coded, according to specific coding instructions. When the data has been collected it is analyzed and summarized using established statistical methods. From the analysis of the data, the researcher can infer contextual phenomena. Finally the researcher narrates the answer to the research question (Krippendorff, 2004).

This is the first time a study of Madame du Coudray’s teaching methods has been undertaken. Content analysis is particularly suitable for exploratory research, such as the analysis of Madame du Coudray’s manual. Krippendorff’s method of content analysis was selected.

Summary

A thorough review of education, graphic design and content analysis theory, as well as, midwifery education (both eighteenth-century and modern), indicated that this research as diagrammed in the Gowin’s Vee Diagram (see Figure 2) should be very revealing. Ausubel-Novak human constructivist theory provides a theoretical framework for the study. The historical study identified the cultural conditions in which Madame du Coudray taught. The mini case study of modern midwifery education provided a comparison for her teaching methods. The review yielded the necessary information to select detailed research methods.
CHAPTER 3: METHODS

The educational researcher needs to consider a number of factors when undertaking an historical research study. Education cannot be understood without taking into account the cultural context of the times. It is not independent of the culture in which it evolves but is a product of the culture of the times.

In particular one needs to be careful of Whig history. Whig history is the natural tendency of human beings to impose their current culture and values on historical situations. However, this does not do justice to the historical figures. To be fair to the subject one must consider the cultural setting in which the historical figure lived.

The cultural context includes the worldview, the epistemology, and the role of the individual in society (see Table 1). In addition, one must consider in detail the cultural circumstances in the country.

Madame du Coudray lived in the Modern Age. The Age of Reason had been ushered in by Descartes and Bacon. It was the beginning of the scientific revolution. The individual was becoming more autonomous. It was still assumed that truth was absolute, but instead of depending on the Church to elucidate it, individuals were expected to use rationality and reason to discover knowledge. This brought about changes in the educational system and the medical profession.

Research Design

An historical case study limits the type of methods that can be used. Of course, there are many methods available to the researcher including qualitative, quantitative, and mixed methods.
<table>
<thead>
<tr>
<th>Time period</th>
<th>Worldview</th>
<th>View of individual</th>
<th>Ideas of Knowledge</th>
<th>Pedagogy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ancient Times (100,000 B.C.E. to 500 B.C.E.)</td>
<td>The world was not viewed as an object. It was dynamic and unpredictable.</td>
<td>A very holistic view. The individual was not separate from the world but an integral part of it.</td>
<td>Knowledge came from mystery and myths.</td>
<td>The primary methods of education were myths and narratives.</td>
</tr>
<tr>
<td>Monotheistic</td>
<td>The individual was separate from God.</td>
<td>Knowledge was gained through intuition, revelation and inspiration.</td>
<td>Education was through religious texts and ritual.</td>
<td></td>
</tr>
<tr>
<td>Greeks (500 B.C.E. to 500 A.D.)</td>
<td>The worldview was very vertical.</td>
<td>The individual was a separate entity.</td>
<td>Knowledge was gained through logic and reason.</td>
<td>Socratic method was the primary form of education</td>
</tr>
<tr>
<td>Medieval (500 A.D. to 1500 A.D.)</td>
<td>The worldview was multidimensional, both vertical and horizontal.</td>
<td>The individual had rights and responsibilities.</td>
<td>Knowledge was gained by from the Church.</td>
<td>Education was very communal. Values and morals were emphasized.</td>
</tr>
<tr>
<td>Modern (1500 A.D. to 2000 A.D.)</td>
<td>The worldview was based on the scientific method.</td>
<td>The individual was autonomous.</td>
<td>Knowledge is gained by rationality and reason. Truth is absolute and can be discovered.</td>
<td>Education incorporated the Scientific Method. It became teacher centered.</td>
</tr>
<tr>
<td>PostModern (2000 A.D. - ?)</td>
<td>The world view is cyclic and holistic</td>
<td>The individual is decentered.</td>
<td>Knowledge is intersubjective.</td>
<td>Education is holistic.</td>
</tr>
</tbody>
</table>
However, this research was particularly suited for a qualitative case study. In Yin’s *Case Study Research* (Yin, 2009) he discusses several reasons for doing a case study including (1) it is a typical case (2) it is a unique case or (3) it is revelatory. This case was not a typical case at all, but instead quite the opposite and it is unique. It is an eighteenth-century midwife who was commissioned by the King Louis XV, King of France to travel throughout rural France and train peasants as midwives. For 20 years she traversed France from north to south and east to west educating thousands of midwives in the best midwifery practices of the times. I know of no other midwife who was given such a daunting educational responsibility.

In addition to being unique, the case of Madame du Coudray is revelatory. One of the challenges facing science educators in the twenty-first-century is science illiteracy. Science illiteracy is one of the results of science curriculum decisions that were made in the United States as a consequence of the perceived threats to our national security during the Cold War. When *Sputnik* was launched there was an urgent need for a new generation of highly trained scientists. At that time the science curriculum was entirely revamped to emphasize math and theoretical science. The result was the successful production of a scientific workforce on par, if not superior, to the Russians. However, in the process the scientific education of the average American was left behind. Whereas the previous curriculum taught practical skills, the new curriculum was so theoretical it left many students with misconceptions about science and a distrust of scientists. However, science illiteracy is not a problem unique to the twenty-first-century. Madame du Coudray also faced this problem. She had been trained in Paris where she had access to some of the best medical training of her time. Unlike herself, her students were common peasants with no training in science. In fact, most of them could not even read and write.
Case studies can include a single case or multiple cases. As I know of no other case of an eighteenth-century midwife who undertook such a monumental educational task, I only considered a single case study. As mentioned in the “Research Questions” section, I discovered what contemporary biology instructors can learn about teaching science-illiterate students from Madame du Coudray. However, rather than doing an holistic case study, an embedded case study was conducted. Because several of her teaching tools are available, three embedded cases were selected. The first focused on the teaching illustrations she used in her manuals. The second focused on her teaching mannequin. The final study focused on her teaching manual which contains the 38 lectures she taught. A general overview of the research is illustrated in the Gowin’s Vee Diagram (Figure 2) in the “Introduction.”

**Data Collection Procedures**

Another challenge for the historical researcher is the availability of sources. Where contemporary researchers have many possible data collection tools as described in Stake’s *The Art of Case Study Research* (Stake, 1995), the historical researcher’s tools are limited. Such useful tools as surveys, observations, interviews and photographs are unavailable for someone studying an eighteenth-century midwife. With so many resources unavailable, were there sufficient resources available for triangulation? Could one find enough information from different sources to be able to get a complete picture and eliminate the bias found in data collected from a single source? In this particular case, I think it was indeed possible. Documents created by Madame du Coudray were available for research including all six editions of her midwifery manuals which include the 38 lectures which she used to teach midwifery, as well as her teaching illustrations. A digital copy of her 1869 edition, the *nouveaux* edition, which was
the first edition to contain her illustrations, was available on-line from the Bibliothèque interuniversitaire de medicine in Paris. Archival copies of the other five French editions were available in Paris either from the same source or from the Bibliothèque nationale de France. As her manuals have not been previously translated and published in English, I commissioned an expert on eighteenth-century French, Kate Healy, to make an English translation of the 1869 edition of Madame du Coudray’s.

A very important artifact also remains for study, the amazing obstetrical mannequin Madame du Coudray built and used to train midwives. The only existent mannequin is preserved in the musée Flaubert et d’histoire de la médecine at Rouen, France The museum has painstakingly restored the mannequin and photographically documented the details in a book, La “machine” de Madame Du Coudray (musée Flaubert et d'histoire de la médecine - Rouen, 2004). I obtained this book and used the photographs for my research.

Data Analysis Procedures

Once I obtained copies of the illustrations, I analyzed them based on characteristics identified in Tufte’s theory of scientific illustrations. Tufte’s theory of scientific illustration is based on many historical illustrations including a number from the eighteenth-century, so it was entirely appropriate to apply it to the illustrations used by Madame du Coudray. In fact, a similar historical study has been done by Clary in analyzing the graphics of geologist Henry T. de La Beche (Clary, 2003). Whereas Clary’s study was a quantitative study that classified the graphics by type, this study was a qualitative study and content analysis of the illustrations for characteristics discussed by Tufte. This study uses similar data analysis methods to those described by Kenney in Visual Communication Research Methods (Kenney, 2009). I developed
the characteristics for analysis from the Tufte books, then analyzed Madame du Coudray’s
displays using these categories. This was done manually.

I analyzed the photographs of Madame du Coudray’s mannequin. However, I used a
different approach on these. I analyzed the photographs to understand the characteristics of the
mannequin itself. Using the active learning theory and the brain-based learning theory I
categorized the features of the mannequin that demonstrate the use of teaching with the senses
and by interaction with the environment.

Finally the text of the 1869 edition of Madame du Coudray’s midwifery manual was
content analyzed using a method similar to that used on the interviews in the “Modern
Midwifery Education” section. As mentioned previously, the text was in French. However, I
commissioned a complete English translation of Madame du Coudray’s manual for use in
collecting this research. As to the method of analysis, I used Krippendorff’s *Content Analysis*
(*Krippendorff, 1980*). Chiappetta has developed a quantitative method of content analyzing
science textbooks for major themes in scientific literacy (Chiappetta, Fillman, & Sethna, 1991).
However, I was concerned that using it would result in Whig historical research as it is based on
cultural ideas of the twentieth-century about scientific literacy. Rather than impose modern ideas
about what constitutes appropriate teaching for science illiterate students, I used open coding and
let the methods Madame du Coudray used emerge independent of twentieth-century ideas about
teaching science illiterate students. I used Atlas.ti computer software for the text analysis.

As all three cases involved content analysis, I had a Ph.D. student in science education
sort a representative sample of my data independently, using my code so that I could calculate
inter-rater reliability.
Summary

In summary, this is a qualitative historical case study on the teaching methods of Madame du Coudray. Care was taken to avoid Whig history, by taking into considerations the cultural context in which Madame du Coudray taught. This is an exploratory study designed to determine if contemporary biology instructors can benefit from her teaching methods. It is a single case study with three embedded studies. The three embedded studies are about her teaching illustrations, teaching mannequin, and teaching manual. The teaching illustrations were categorized using Tufte’s graphic design theory. Photos of the mannequin were used to characterize the mannequin features. Her manual was content analyzed using Krippendorf’s theory. These methods provided a better understand of Madame du Coudray’s teaching methods and how they might be used by modern biologists to improve scientific literacy.
CHAPTER 4: RESULTS AND DISCUSSION

Translation of Madame du Coudray’s Midwifery Manual

Electronic versions of the 1759 and 1769 French editions of Madame du Coudray’s *Abrege de l’art des Accouchements* are available from *Bibliothèque Interuniversitaire de Medicine*. However, as my French is very limited I realized I needed an English translation to do the research I proposed. An initial search for a published English translation yielded no results. I even contacted Gelbart, the author of Madame du Coudray’s biography, to see if she was aware of an English translation of Madame du Coudray’s manual, and she knew of none. In a chance encounter with a friend, I mentioned that I was looking for someone to translate an eighteenth-century French text into English. She recommended Dr. Kate Healy, a linguist who is an expert on eighteenth-century French (see *curriculum vitae* Appendix J). I contacted Dr. Healy, who was living in France at the time, and inquired about her interest in translating the manual. She was very interested in the project, not only from a professional point of view, but also a personal one as she was expecting a child and using a French midwife. We selected the 1769 edition as it was the first edition to contain the teaching illustrations. Furthermore, the text appeared to be identical in all five editions of the manual. Over the course of several months Dr. Healy translated the 188 pages of the 1769 edition of the manual. We hope to publish the translation as a companion volume to Gelbart’s biography.

The Teaching Illustrations of Madame du Coudray

Although the first edition of Madame du Coudray’s manual in 1759 included no illustrations, her nouveaux edition in 1769 included 26 color teaching illustrations and a frontispiece of herself. Gelbart claims that these plates cost her at least 3,000 livres and quotes
Freré Côme, her advocate with the king, as saying, “This expenditure has already very much inconvenienced and starved her in her finances; more than half of the King’s pension since August is already gone.” (Gelbart, 1998, pg. 129) She used the new three color system of printing developed by Le Blon. Why was she willing to invest so much? In the introduction to her new edition she explains-

The only obstacle that I found for my project was the difficulty of making myself understood to minds little accustomed to grasp anything except through their senses…I added to my second Edition, the etchings that could remind my Pupils of the … demonstrations, & be able to render them even more tactile, I had them illuminated, so that the different colors give greater clarity to the subjects. (translation by Kate Healy) (Le Boursier du Coudray, 1769)

I travelled to Paris to view the different editions of the manual at the Bibliothèque nationale de France (BnF) and the Bibliothèque Interuniversitaire de Médecine (BIUM). I was able to locate copies of all five French editions. I was curious as to whether the illustrations were in the same order in each edition and if they appeared in approximately the same place in the text. The first edition in 1759 did not have any illustrations. The second edition in 1769 was the “Nouveaux” edition and it was the first to include the illustrations. The same illustrations that appeared in the 1769 edition appear in the fourth (1777) and fifth (1785) editions. The third edition published in 1773 was interesting. I found two versions, a microfilm copy at the BnF and a hard copy at the BIUM. In the microfilm copy the illustrations were in the same order as all the other editions, but they were inserted every eight pages with no regard for the associated text; it was as if an editor had inserted them. The hard copy of this edition had no illustrations at all, and there were no illustrations at all in the book, not even the frontispiece of Madame du Coudray.
was never able to determine which copy was correct. Either there were no illustrations in the
1773 edition and they were added when microfilming, or there were illustrations that had been
removed from the copy at the BIUM. However, in each of the other three editions of the manual
(1769, 1777, and 1785) the illustrations always appear in the same order and close to the
associated text. The illustrations in these three editions appeared to be identical with the
exception of the plate numbers (see Table 2). It appears that the plate numbers in the first edition
may have been the order in which the artist created the plates. However, after the first edition the
plates were renumbered in the order that they appear in the text to prevent them from accidentally
getting out of order when printing. The order of the text, and thus associated illustrations was
very important to Madame du Coudray as stated in the Foreword of the 1769 edition:

I admit that in composing the Lessons that I gave them to read, I had only country Mid-Wives in
mind; but having reflected that these Lessons could pass through the hands of more intelligent
persons, and consequently susceptible to a broader instruction, I believed that without at all
changing the order that I gave to these precepts, I should add to them some particular remarks, so
that they would be read with greater satisfaction and at the same time, more profit. (Le Boursier
du Coudray, 1769) (translated by Kate Healy) [emphasis added].

Tuftian Analysis

Tuftian key concepts cover both data and presentation as shown in the concept map
illustrated in Figure 9. The data in Madame du Coudray’s illustrations are the individuals
(mother, infant and midwife) and anatomical information which they convey. Table 3
summarizes the data found in each illustration. Although many of the examples Tufte uses in his
books are of quantitative data, he does have a number of examples of qualitative data that
Table 2. Comparison of Illustrations in 1769, 1777, and 1785 editions

<table>
<thead>
<tr>
<th>Description</th>
<th>1769 Plate #</th>
<th>1769 Pg.</th>
<th>1777 Plate</th>
<th>1777 Page</th>
<th>1785 Plate</th>
<th>1785 Pg.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pelvis</td>
<td>I\textsuperscript{ere}</td>
<td>14</td>
<td>I</td>
<td>15</td>
<td>I</td>
<td>15</td>
</tr>
<tr>
<td>Pelvis w/ Uterus</td>
<td>I\textsuperscript{ere}</td>
<td>16</td>
<td>II</td>
<td>17</td>
<td>II</td>
<td>17</td>
</tr>
<tr>
<td>Pelvis w/ Uterus and Baby</td>
<td>II</td>
<td>47</td>
<td>III</td>
<td>51</td>
<td>III</td>
<td>51</td>
</tr>
<tr>
<td>First Dilation</td>
<td>III</td>
<td>50</td>
<td>IV</td>
<td>55</td>
<td>IV</td>
<td>55</td>
</tr>
<tr>
<td>Second Dilation</td>
<td>IV</td>
<td>51</td>
<td>V</td>
<td>55</td>
<td>V</td>
<td>55</td>
</tr>
<tr>
<td>Third Dilation</td>
<td>V</td>
<td>52</td>
<td>VI</td>
<td>57</td>
<td>VI</td>
<td>57</td>
</tr>
<tr>
<td>Stuck Baby</td>
<td>XIV</td>
<td>62</td>
<td>VII</td>
<td>69</td>
<td>VII</td>
<td>69</td>
</tr>
<tr>
<td>Proper Hand Placement</td>
<td>XV</td>
<td>63</td>
<td>VIII</td>
<td>69</td>
<td>VIII</td>
<td>69</td>
</tr>
<tr>
<td>Pelvic Defects 1</td>
<td>XI</td>
<td>86</td>
<td>IX</td>
<td>95</td>
<td>IX</td>
<td>95</td>
</tr>
<tr>
<td>Pelvic Defects 2</td>
<td>XII</td>
<td>87</td>
<td>X</td>
<td>95</td>
<td>X</td>
<td>95</td>
</tr>
<tr>
<td>Pelvic Defects 3</td>
<td>XIII</td>
<td>87</td>
<td>XI</td>
<td>95</td>
<td>XI</td>
<td>95</td>
</tr>
<tr>
<td>Fourth Dilation</td>
<td>VI</td>
<td>92</td>
<td>XII</td>
<td>101</td>
<td>XII</td>
<td>101</td>
</tr>
<tr>
<td>Uterine Problem 1</td>
<td>IX</td>
<td>98</td>
<td>XIII</td>
<td>109</td>
<td>XIII</td>
<td>109</td>
</tr>
<tr>
<td>Uterine Problem 2</td>
<td>X</td>
<td>99</td>
<td>XIV</td>
<td>109</td>
<td>XIV</td>
<td>109</td>
</tr>
<tr>
<td>Uterine Problem 3</td>
<td>VII</td>
<td>100</td>
<td>XV</td>
<td>109</td>
<td>XV</td>
<td>109</td>
</tr>
<tr>
<td>Uterine Problem 4</td>
<td>VIII</td>
<td>101</td>
<td>XVI</td>
<td>111</td>
<td>XVI</td>
<td>111</td>
</tr>
<tr>
<td>Problematic Child Position 1</td>
<td>XVIII</td>
<td>104</td>
<td>XVII</td>
<td>113</td>
<td>XVII</td>
<td>113</td>
</tr>
<tr>
<td>Problematic Child Position 2</td>
<td>XVI</td>
<td>105</td>
<td>XVIII</td>
<td>115</td>
<td>XVIII</td>
<td>115</td>
</tr>
<tr>
<td>Extracting a Stuck Child 1</td>
<td>XIX</td>
<td>106</td>
<td>XIX</td>
<td>115</td>
<td>XIX</td>
<td>115</td>
</tr>
<tr>
<td>Extracting a Stuck Child 2</td>
<td>XX</td>
<td>111</td>
<td>XX</td>
<td>121</td>
<td>XX</td>
<td>121</td>
</tr>
<tr>
<td>How NOT to Extract a Stuck Child 1</td>
<td>XXI</td>
<td>112</td>
<td>XXI</td>
<td>123</td>
<td>XXI</td>
<td>123</td>
</tr>
<tr>
<td>How NOT to Extract a Stuck Child 2</td>
<td>XVII</td>
<td>116</td>
<td>XXII</td>
<td>125</td>
<td>XXII</td>
<td>125</td>
</tr>
<tr>
<td>How NOT to Extract a Stuck Child 3</td>
<td>XXII</td>
<td>117</td>
<td>XXIII</td>
<td>129</td>
<td>XXIII</td>
<td>129</td>
</tr>
<tr>
<td>How NOT to Extract a Stuck Child</td>
<td>XXIV</td>
<td>124</td>
<td>XXIV</td>
<td>137</td>
<td>XXIV</td>
<td>137</td>
</tr>
<tr>
<td>Extracting the Placenta</td>
<td>XXIII</td>
<td>128</td>
<td>XXV</td>
<td>139</td>
<td>XXV</td>
<td>139</td>
</tr>
<tr>
<td>Pessary</td>
<td>XXV</td>
<td>138</td>
<td>XXVI</td>
<td>151</td>
<td>XXVI</td>
<td>151</td>
</tr>
</tbody>
</table>
demonstrate that his principles can also be applied to qualitative data. In this study I will apply them to anatomical illustrations.

A thorough search of the literature showed that Tufte is mentioned often, but I found no instrument based on his principles that could be used to qualitatively analyze illustrations. As mentioned previously, Clary in her dissertation, *Uncovering Strata: A Investigation into the Graphic Innovations of Geologist Henry T. De La Beche*, used a quantitative method to classify the graphics by type; however, she did not develop an instrument. Therefore I determined to use the characteristics shown in the concept map (see Figure 9) to design such an instrument.

**Development of Instrument**

To develop the instrument, I reviewed a study entitled “Sex on TV: A Content Interpretive Analysis” in Kenney’s *Visual Communication Research Designs* (Kenney, 2009). In this study, different scenes in television programs were rated for sexual content. This article gave general information about how to do an effective content analysis study on visual material. I also reviewed the “Reformed Teaching Observation Protocol” (RTOP) (Pibum & Sawada, 2000) which is an instrument that I have used previously. This instrument is used widely to evaluate video recordings of science teachers teaching. It described a number of characteristics of good teaching and asked the rater to evaluate the teacher on a scale from 0 to 4.

Based on the information from these two content analysis studies of visual information, and the concept map of Tufte’s key principles, I developed the instrument used in this study to analyze Madame du Coudray’s anatomical illustrations. Initially, I wrote one question for each characteristic in the concept map. However, I realized that some characteristics were actually
<table>
<thead>
<tr>
<th>Description</th>
<th>Mother</th>
<th>Infant</th>
<th>Midwife</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pelvis</strong></td>
<td>pelvis, sacrum, coccyx</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Pelvis and Uterus</strong></td>
<td>pelvis, coccyx</td>
<td>uterus, cervix, vagina</td>
<td>bladder, urethra, colon, anus</td>
</tr>
<tr>
<td><strong>Pelvis and Uterus and Baby</strong></td>
<td>pelvis</td>
<td>uterus, cervix, vagina</td>
<td>bladder, colon, anus, head, body, cord, placenta</td>
</tr>
<tr>
<td>1st Dilation</td>
<td>pelvis</td>
<td>uterus, cervix</td>
<td></td>
</tr>
<tr>
<td>2nd Dilation</td>
<td>pelvis</td>
<td>uterus, cervix</td>
<td></td>
</tr>
<tr>
<td>3rd Dilation</td>
<td>pelvis</td>
<td>uterus, cervix</td>
<td>head</td>
</tr>
<tr>
<td><strong>Stuck Baby</strong></td>
<td>pelvis</td>
<td></td>
<td>head, body</td>
</tr>
<tr>
<td><strong>Proper Hand Placement</strong></td>
<td>pelvis</td>
<td></td>
<td>head, body</td>
</tr>
<tr>
<td>Pelvic Defects 1</td>
<td>pelvis, spine, sacrum</td>
<td>head</td>
<td></td>
</tr>
<tr>
<td>Pelvic Defects 2</td>
<td>pelvis, sacrum, coccyx</td>
<td>head</td>
<td></td>
</tr>
<tr>
<td>Pelvic Defects 3</td>
<td>pelvis, sacrum</td>
<td>head</td>
<td></td>
</tr>
<tr>
<td>4th Dilation</td>
<td>pelvis</td>
<td>uterus, cervix</td>
<td>head</td>
</tr>
<tr>
<td><strong>Uterine Problem 1</strong></td>
<td>pelvis</td>
<td>uterus, cervix</td>
<td></td>
</tr>
<tr>
<td><strong>Uterine Problem 2</strong></td>
<td>pelvis</td>
<td>uterus, cervix</td>
<td></td>
</tr>
<tr>
<td><strong>Uterine Problem 3</strong></td>
<td>pelvis</td>
<td>uterus, cervix</td>
<td></td>
</tr>
<tr>
<td><strong>Uterine Problem 4</strong></td>
<td>pelvis, sacrum, coccyx</td>
<td>uterus, cervix</td>
<td></td>
</tr>
<tr>
<td><strong>Problematic Child Position 1</strong></td>
<td>pelvis</td>
<td></td>
<td>head, body, cord, hands</td>
</tr>
<tr>
<td><strong>Problematic Child Position 2</strong></td>
<td>pelvis</td>
<td></td>
<td>head, body</td>
</tr>
<tr>
<td><strong>Extracting a Stuck Child 1</strong></td>
<td>pelvis, sacrum</td>
<td>head, body</td>
<td>hands</td>
</tr>
<tr>
<td><strong>Extracting a Stuck Child 2</strong></td>
<td>pelvis, sacrum</td>
<td>head, body</td>
<td>hands</td>
</tr>
<tr>
<td><strong>Extracting a Stuck Child 3</strong></td>
<td>pelvis, sacrum</td>
<td>head, body</td>
<td>hands</td>
</tr>
<tr>
<td><strong>Extracting a Stuck Child 4</strong></td>
<td>pelvis, sacrum</td>
<td>head</td>
<td></td>
</tr>
<tr>
<td><strong>Extracting the Placenta</strong></td>
<td>pelvis</td>
<td>uterus, cervix</td>
<td>hands</td>
</tr>
<tr>
<td><strong>Pessary</strong></td>
<td>pelvis</td>
<td>uterus, cervix, vagina</td>
<td>hands</td>
</tr>
</tbody>
</table>
describing the same features but from different perspectives (chartjunk and data ink; truthful and complete) so I combined these characteristics into one question. The final instrument asked the rater to evaluate each illustration on nine characteristics: “chartjunk and data ink”, “truthful and complete”, “multivariate”, “causal relationships”, “font”, “colors”, “landscape”, “reduced-but-appropriate size” and “close proximity to the associated descriptive text.” A copy of the instrument and the instructions for its use can be found in Appendix K and L, respectively.

**Coders and Training**

In addition to myself, another PhD. student, Marene Shepherd, in Dr. Wandersee’s lab rated the illustrations. We have both taken Dr. Wandersee’s course on Tufte in which we studied all four of his books. We have also both taken a course on Qualitative Methods. Each of us has a graduate degree in a medical profession (biomedical engineer, nurse anesthetist).

**Coding of Illustrations**

Each coder was provided with color copies of the illustrations from the electronic versions of the 1769 edition of Madame du Coudray’s *Abrege de l’art des Accouchements* which are available from *Bibliothéque Interuniversitaire de Medicine*. In addition they received color photographs of the illustrations and an English translation of the entire manual including the illustration captions. Each coder rated the illustrations independently.

**Data Analysis**

An overall rating for each illustration was calculated by taking the average of all characteristic ratings for that illustration (see Table 4). An overall rating for the set of illustrations was calculated for each characteristic (see Table 5).
Table 4. Summary of Overall Tuftian Ratings for Each Illustration

<table>
<thead>
<tr>
<th>Description</th>
<th>Overall Rating</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pelvis</td>
<td>3.06</td>
<td>1.59</td>
</tr>
<tr>
<td>Pelvis and Uterus</td>
<td>3.33</td>
<td>1.24</td>
</tr>
<tr>
<td>Pelvis and Uterus and Baby</td>
<td>3.5</td>
<td>1.04</td>
</tr>
<tr>
<td>First Dilation</td>
<td>3.5</td>
<td>1.15</td>
</tr>
<tr>
<td>Second Dilation</td>
<td>3.33</td>
<td>0.91</td>
</tr>
<tr>
<td>Third Dilation</td>
<td>3.56</td>
<td>0.86</td>
</tr>
<tr>
<td>Stuck Baby</td>
<td>3.67</td>
<td>0.69</td>
</tr>
<tr>
<td>Proper Hand Placement</td>
<td>3.06</td>
<td>1.21</td>
</tr>
<tr>
<td>Pelvic Defects 1</td>
<td>3.56</td>
<td>0.86</td>
</tr>
<tr>
<td>Pelvic Defects 2</td>
<td>3.61</td>
<td>0.70</td>
</tr>
<tr>
<td>Pelvic Defects 3</td>
<td>3.67</td>
<td>0.69</td>
</tr>
<tr>
<td>Fourth Dilation</td>
<td>3.56</td>
<td>0.86</td>
</tr>
<tr>
<td>Uterine Problem 1</td>
<td>3.61</td>
<td>0.61</td>
</tr>
<tr>
<td>Uterine Problem 2</td>
<td>3.67</td>
<td>0.59</td>
</tr>
<tr>
<td>Uterine Problem 3</td>
<td>3.56</td>
<td>0.98</td>
</tr>
<tr>
<td>Uterine Problem 4</td>
<td>3.56</td>
<td>1.04</td>
</tr>
<tr>
<td>Problematic Child Position 1</td>
<td>3.50</td>
<td>1.29</td>
</tr>
<tr>
<td>Problematic Child Position 2</td>
<td>3.72</td>
<td>0.57</td>
</tr>
<tr>
<td>Extracting a Stuck Child 1</td>
<td>3.50</td>
<td>1.29</td>
</tr>
<tr>
<td>Extracting a Stuck Child 2</td>
<td>3.39</td>
<td>1.14</td>
</tr>
<tr>
<td>How NOT to Extract a Stuck Child 1</td>
<td>3.67</td>
<td>0.59</td>
</tr>
<tr>
<td>How NOT to Extract a Stuck Child 2</td>
<td>3.67</td>
<td>0.69</td>
</tr>
<tr>
<td>How NOT to Extract a Stuck Child 3- twins</td>
<td>3.11</td>
<td>1.41</td>
</tr>
<tr>
<td>How NOT to Extract a Stuck Child 4</td>
<td>3.56</td>
<td>0.92</td>
</tr>
<tr>
<td>Extracting the Placenta</td>
<td>3.56</td>
<td>1.15</td>
</tr>
<tr>
<td>Pessary</td>
<td>3.39</td>
<td>1.04</td>
</tr>
</tbody>
</table>
Table 5. Summary of Average Ratings for Tuftian Characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Average</th>
<th>Standard Deviation</th>
<th>Percent Agreement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chartjunk and Data Ink</td>
<td>3.92</td>
<td>0.33</td>
<td>100</td>
</tr>
<tr>
<td>Truthful and Complete</td>
<td>2.71</td>
<td>1.04</td>
<td>73</td>
</tr>
<tr>
<td>Multivariate</td>
<td>3.56</td>
<td>0.80</td>
<td>96</td>
</tr>
<tr>
<td>Causal Relationships</td>
<td>2.90</td>
<td>1.38</td>
<td>81</td>
</tr>
<tr>
<td>Font</td>
<td>4.00</td>
<td>0.00</td>
<td>100</td>
</tr>
<tr>
<td>Colors</td>
<td>4.00</td>
<td>0.00</td>
<td>100</td>
</tr>
<tr>
<td>Landscape</td>
<td>2.83</td>
<td>1.54</td>
<td>92</td>
</tr>
<tr>
<td>Reduced –but-Appropriate Size</td>
<td>3.69</td>
<td>0.67</td>
<td>96</td>
</tr>
<tr>
<td>Close Proximity to Text</td>
<td>3.83</td>
<td>0.43</td>
<td>100</td>
</tr>
</tbody>
</table>
Initially I calculated interrater reliability using Krippendorff's alpha for "Nominal data, two observers, no missing data" (Krippendorff, 2007). However the results were extremely low. For example, on two characteristics, font and color, the two raters agreed 100%; however, the calculated alpha was zero, indicating that the results were no better than chance. I contacted Dr. Krippendorff about my data. He confirmed that I was calculating the alpha correctly; however he indicated that the problem was a lack of variability in my ratings (personal communication, March 15, 2011).

I decided to try another method of calculating interrater reliability. As the instrument was based on the RTOP instrument, I analyzed my data by the same method used by the RTOP developers, i.e., plot the data on a scatterplot and calculate the correlation coefficient. Again, I encountered low correlation coefficients and in some cases a correlation coefficient could not be calculated because of the lack of variability between the ratings. In reviewing the data, there was indeed a lack of variability. The root cause of the lack of variability was Madame du Coudray’s illustrations themselves. They are all very similar; in fact they are so similar that they could be considered a set of small multiples. Another cause of the lack of variability was that some of the characteristics which the instrument asked to be rated did not require a nominal scale for rating. For example, “The font used has a serif”, could have been rated with a simple binary rating of “descriptive” and “not descriptive.”

Based on this information I reviewed my instrument. As the instrument did not describe in detail how each nominal rating should be given, I decided to collapse the categories into binary ratings of “low” and “high.” This was done by assigning ratings of 0 and 1 as “low” and
ratings of 2, 3 and 4 as “high.” After collapsing the ratings I again calculated Krippendorf's alpha, this time for "binary or dichotomous data, two observers, no missing data.” Again the result was very low because of a lack of variability caused by the similarity of the illustrations themselves.

Finally I determined to calculate the interrater reliability based on percent agreement using the collapsed categories. These calculations resulted in credible numbers for the interrater reliability. For example on font and color the interrater reliability was 100% as one would expect when both raters agree 100% of the time. So I determined to use percent agreement for interrater reliability.

**Chartjunk and Data Ink**

Minimizing chartjunk and maximizing data ink are two characteristic which Tufte deems essential for good scientific graphics. Chartjunk is “interior decoration of graphics that does not tell the viewer anything new” (Tufte, 2001). Data Ink is the “non-erasable core of a graphic” (Tufte, 2001). In order to maximize data ink, one must minimize chartjunk and so I combined these two characteristics into one category on the instrument, i.e., “The data are shown. Chartjunk has been minimized and data ink has been maximized.”

Both coders rated the illustrations as low in chartjunk and high in data ink. Madame du Coudray did an excellent job of reducing each illustration to the very core of critical details. For example, the third illustrations shows the “pelvis and the womb, with all its subsidiaries” (see Figure 12). This graphic shows not only the pelvic girdle (ilium, ischium, pubis, and acetabulum) and uterus with its associated structures (cervix, ovaries, fallopian tubes, broad ligaments, and round ligaments) but the structures of the urinary system (bladder, urethra, and urinary meatus)
Figure 12. Pelvis and the womb with all its subsidiaries. Copyright BIU Santé Paris (France). Permanent link http://www.bium.univ-paris5.fr/histmed/medica/cote?190618
and the digestive system (colon and anus). It would have been very easy to put all of the structures shown in this illustration in all of the following ones as they all illustrate things that occur in the women’s pelvis. However, as shown in Table 3, Madame du Coudray resisted the temptation. Once this anatomical information is illustrated the later illustrations focus only on those anatomical parts that are relevant to the subject of each individual illustration. Thus she minimizes chartjunk and maximizes data ink.

The only structure that is repeated in all diagrams is the pelvic girdle. This structure functions as an x-y axis for orienting the reader and makes comparisons between the diagrams easy. The inclusion of the pelvic girdle in each diagram makes all diagrams comparable with one another and makes the whole series of illustrations a set of small multiples. Small multiples are a very useful tool for illustrating processes. Tufte thinks it is such a valuable tool that he spends three chapters on it, one in each of three out of his four books. He claims that well-designed small multiples are “efficient in interpretation” and “inevitably comparable” (Tufte, 2001). In addition they “represent the narrative sequence of motion”, and they “amplify, intensify, and reinforce the meaning of the images” (Tufte, 1997). In short, small multiples are synergistic and provide the reader with more information than the sum of the individual illustrations.

There is also some interesting evidence in the midwifery manual itself which shows that Madame du Coudray intended for these diagrams to be visually compared. This evidence is found in the way the illustrations about the dilation of the cervix are bound in the book. In particular, the first two illustrations are bound next to each other (see Table 2). In the 1777
edition and the 1785 edition they are even given the same page number\(^3\). As with most color copper engravings of the time, the illustrations are printed on one side of the paper and the back of the page is blank. Typically when binding such illustrations the plate is bound with the illustration facing the front of the book so the reader encounters it before the blank page. However, in the case of the illustrations of the first and second stage of dilation the first plate is bound with the illustration on the back of the page, so that you encounter the blank page first and then you open up the next page and the first and second dilation illustrations are facing each other so that you can easily compare them (see Figure 13a and b). The visual comparison emphasizes the only difference between the first dilation and the second dilation is a small increase in the dilation of the cervix. This small difference would be lost if the two illustrations were not face to face and thus could not be visually compared.

Madame du Coudray used a series of small multiples to illustrate the process of birth and emphasize the important role that the pelvic girdle plays in the process as had been illustrated by Hendrik van Deventer in 1725. As mentioned previously, the illustrations in her manual appear in a specific order intended by the author. This order is chronological and shows the process of childbirth through the passage of time. In addition it shows how the different anatomical parts change in space over time. Tufte would call them a “visual explanation” of childbirth (Tufte, 1997).

Not only is the whole series of illustrations a set of small multiples, but within the set there are series of illustrations that constitute smaller sets of small multiples. These include a

\(^3\) Madame du Coudray often numbers different pages with the same number. Many of the illustrations have the same page number as the previous page of text so one often finds two consecutive pages with the same page number.
Figure 13. Stages of Dilation

a) First stage

b) Second stage.

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Permanent link http://www.bium.univ-paris5.fr/histmed/medica/cote?190618
series about the anatomy of the pelvic girdle and its abnormalities, a series showing the dilation of the cervix, a series showing various positions of the uterus in the pelvic girdle, a series about difficult deliveries and a series about how to handle a stuck child. In short, Madame du Coudray made good use of small multiples.

**Truthful and Complete**

The first principle of graphic excellence put forth by Tufte in his first book is that graphics should reveal the data by being truthful and complete. Tufte does not agree with the proverbial use of statistics to lie. He claims that data should be truthful and presented in such a manner that the reader is not deceived.

As medical science is an area of continuing research, there is no gold standard of truth to use as a control for comparison of Madame du Coudray’s illustrations. However, as most of my readers are more likely to be familiar with modern medical standards than any other, I chose current medical standards as a basis for comparison. Therefore, the instrument asks the rater to evaluate whether the “illustration is truthful and complete, by current medical standards.” As “current medical standards” was not explicitly defined, each coder used their own definition. I used obstetric manuals (Beckmann et al., 2010; Callahan & Caughey, 2009), an anatomy and physiology textbook (Shier, Butler, & Lewis, 1999), and Netter’s *Atlas of Human Anatomy* (Netter, 1997). The other rater, Ms. Shepherd, is a nurse anesthetist and works with nurse midwives and nursing educators. Therefore she consulted these professionals. The instrument also did not clearly define the opposite criteria, i.e., what is not descriptive of current medical standards. I have been studying midwifery history and thus considered the Louise Bourgeois example from the seventeenth-century (Figure 7) the standard for not descriptive of current
medical standards. However, it was not provided to the other coder as an example. I recommend that future users of this instrument provide graphic examples of illustrations that are descriptive of current medical standards and NOT descriptive of current medical standards, so the raters are in agreement on the standard for current medical standards.

However, despite the difference in definition used by the coders, the percent agreement between the raters was still 73%. The average score for all illustrations on this characteristic was 2.71. Considering that these illustrations were drawn in the eighteenth-century, only about 100 years after those of Louise Bourgeois, they are much closer to modern standards than one would expect.

Also, although the sources consulted by the coders were different, both coders noted a number of the same differences between Madame du Coudray’s illustrations and modern medical standards. In particular, the diagram of the Pelvis has a couple of structures mislabeled. But surprisingly the illustration of the Pelvis and Uterus is labeled correctly, although it is a much more complex and detailed diagram. The size of the infant in the Pelvis and Uterus and Baby was disproportionately small and the size of the pelvis in a number of diagrams was abnormally large.

**Multivariate**

Throughout his works, Tufte emphasizes that a good scientific graphic is multivariate, namely, it provides data on more than one variable. For example, in a section entitled, “Narrative Graphics in Space and Time”, he analyzes Minard’s graphic which illustrates the ill-fated march of Napoleon’s army on Moscow. In this graphic Tufte identifies six different variables, “the size of the army, its location on a two-dimensional surface, direction of the army’s movement, and
temperature on various dates during the retreat from Moscow” (Tufte, 2001, pg. 40). Although some of these variables are quantitative, they have qualitative characteristics, such as location, size, shape, and direction. These variables could be considered when analyzing an anatomical illustration such as those in Madame du Coudray’s manual.

Therefore, the instrument included an assessment as to whether or not the illustrations were multivariate. Ms. Shepherd used the baby, the mother, and the midwife as variables. There are 24 illustrations in Madame du Coudray’s manual that show two or more of these variables, and a total of eight illustrations that show all three (see Table 3). My list of variables included not only the individuals represented, but also the shape, size and location of the anatomical parts shown and their orientation in space. For example, one of the illustrations shows an infant lying in a pelvis, and physiologically that is impossible because there is not enough room in the pelvis for a child to lie that way, so the orientation of the child relative to the mother’s pelvis is one of the things that needs to be considered. However, despite the differing perspectives as to what constituted a variable, both of us concluded that nearly all of the illustrations in Madame du Coudray’s manual qualify as multivariate.

Causal Relationships

In several of his works, Tufte addresses the idea of cause and effect. In particular in “Links and Causal Arrows: Ambiguity in Action” he talks about artwork that illustrates cause and effect (Tufte, 2006). His definition of cause and effect is when “X acts on Y”, i.e., when it is shown that one variable influences another.

Madame du Coudray’s illustrations include a number of illustrations in which the influence of one variable is seen on the other. For example, in her series of three illustrations
about pelvic defects she graphically shows how it is impossible for the infant to be delivered if there are certain structural defects of the pelvis such as a bulge of the sacrum bone into the pelvis (see Figure 14). In another series about uterine problems, she illustrates how it is impossible for an infant to be delivered when the cervix is not lined up correctly. Both of these series are excellent examples of the use of cause and effect in illustrations.

**Font Style**

Tufte is particularly fond of fonts that have serifs. A serif is a fine line used to finish off the main strokes of the letter, such as found in Times New Roman font. His support for using fonts with serifs is the following quote from Josef Albers-

“Ophthalmology has disclosed that the more the letters are differentiated from each other, the easier is the reading. Without going into comparisons and details, it should be realized that words consisting of only capital letters present the most difficult reading—because of their equal height, equal volume and with most, their equal width. When comparing serif letters with sans-serif, the latter provide an uneasy reading. The fashionable preference for sans-serif in text shows neither historical nor practical competence (Tufte, 2001).”

In keeping with Tufte’s recommendation the instrument simply asks if “The font used has a serif.” This was perhaps the easiest characteristic to judge and could have been assessed simply with a binary choice. Both coders agreed 100% of the time, Madame du Coudray used a font with a serif.

**Use of Color**

The appropriate use of color in illustrations is another common theme in Tufte’s books. Unlike many novices at PowerPoint, Tufte is opposed to striking differences in color. He
Figure 14. Pelvic Defects I. Copyright BIU Santé Paris (France). Permanent link http://www.bium.univ-paris5.fr/histmed/medica/cote?190618
recommends that natural colors be used. In addition, “just noticeable differences” in color reduce visually clutter and promote readability (Tufte, 1997).

The appropriate use of color was another area in which there was high interrater agreement. Madame du Coudray had at her disposal three colors: yellow, red and blue. However, she used them in very natural ways. A faint yellow was used to depict bony structures such as the pelvic girdle. A faint pink was used to depict the healthy tissues, such as the uterus, baby and hands of the midwife. The blue, which may have been used to illustrate the blood vessels in the uterus, is not easily discernible from the black ink. Overall the colors do not detract from the data, but as Madame du Coudray said, “the different colors give greater clarity to the subjects” (Le Boursier du Coudray, 1769).

**Landscape**

Tufte recommends that the shape of graphics should “tend toward the horizontal, greater in length than height” because this format is analogous to the horizon and our “eye is naturally practiced in detecting deviation from the horizon, and graphic design should take advantage of this fact.” In addition, horizontal labeling which is written from left to right is easier to read when the graphic is horizontal (Tufte, 2001).

To assess whether Madame du Coudray’s illustrations were horizontal or not, each coder was asked to rate whether the illustrations were in landscape format or not. In hindsight, this could have been easily rated on a binary scale. However, despite the ambiguity introduced by the 0-4 scale, the coders agreed that most of the illustrations were horizontal, i.e., landscape. The few exceptions to this were those illustrations which included the midwife’s hands. These of necessity were portrait format in order to maintain the correct ratio of size between the different
structures. However, the change from landscape to portrait format only emphasizes the presence of the midwife in these illustrations and the important role she plays in delivering the baby.

**Reduced but Appropriate Size**

In “Data Density and Small Multiples” Tufte promotes reducing the size of a graphic to increase the data density, i.e., the amount of data ink in a given area. Of course, size reduction is only appropriate if there is no loss in readability. Therefore, the coders were asked to rate if the illustration was in reduced-but-appropriate size.

Of course, Madame du Coudray did not have at her disposal modern computers and printing capabilities which allow for amazing reductions in size of graphics. However, there had been recent improvements in printing capabilities. Prior to this time, most illustrations were printed using woodcuts but prior to her publication of her illustrations in 1769 a new method had been developed to print using copper engraving and color. Copper engravings allowed for much more detail in print and thus a higher data density than with wood block printing. However, some of the illustrations have so many anatomical structures in them (see Table 3) that it would be difficult to reduce them in size without losing some of the information. Within the limitations of the technology available and the quantity of data to convey, both raters felt that the illustrations were in reduced-but-appropriate size.

**Close Proximity to the Descriptive Text**

Tufte is not in favor of separating the illustrations from the text, a practice that is common with publishers. He uses illustrations from Leonardo da Vinci and Galileo to demonstrate that words and drawings can be integrated together to improve communication of important ideas (Tufte, 2001, 2006).
Madame du Coudray’s teaching illustrations have a caption located at the bottom of each illustration page which explains the illustrations. In addition, each illustration is described in the associated text; most descriptions appear within one page of the illustration itself. In fact, the illustrations are almost all within one page of the descriptive text and could have served as a type of finding aid for illiterate midwives to locate the material they needed to have read to them.

The Teaching Mannequin of Madame du Coudray

Fortunately, an example of Madame du Coudray’s simulator, which she called *la machine*, can be viewed in France at *musée Flaubert et d’histoire de la médecine – Rouen*. Madame du Coudray produced hundreds of these mannequins, but this is the only one to survive to modern times. Each community where she taught was obligated to purchase the machines which cost 300 *livres* each. These machines could then be used by the local surgeons to train more midwives after Madame du Coudray left the community. In addition, the community was required to buy a model machine, which was kept to be used as an example for repairing the other machines if necessary (Gelbart, 1996). The mannequin in Rouen is a model machine and thus did not receive the wear and tear of the demonstration machines.

In the Foreword to her manual, Madame du Coudray describes her machine-

I took the approach of making my lessons for them palpable, having them manipulate a machine for me that I constructed for this purpose, & which represents the woman’s pelvis, womb, its opening, its ligaments, its conduit called *vagina*, the bladder & the intestine *rectum*. I added the model of an infant in actual size on which I made the joints sufficiently flexible, to be able to put it in different positions, a placenta with the membranes, & the demonstration of the waters around it, the umbilical cord composed of its two arteries, & the vein, leaving the one half limp and the
other swelled, to imitate in some way the cord of the dead infant & that of a living infant in which we feel the beating of the vessels that make it up.

I added to the model the head of an infant separated from the torso, in which the bones of the skull overlap each other… (Le Boursier du Coudray, 1769) (translation by Kate Healy).

And indeed, the mannequin in Rouen has all of these features. In addition to the mannequin of the mother and infant, there are a number of accessories that were used for training. These include a separate model of the anatomy of the organs in the female pelvis with all organs labeled, a model of a seven month infant in utero, a model of twins sharing a common placenta, and several heads of deceased infants in various states of decomposition. Thus Madame du Coudray’s mannequin and accessories are a significant improvement in fidelity over their predecessors.

**Development of Analysis for Mannequin**

The objective of this study is to determine if the mannequin used in Madame du Coudray’s course provided active brain-based learning. Unfortunately, typical methods for studying active learning, such as interviews and video recordings, are not available for an historic study such as this. I was unable even to locate any contemporary descriptions of the mannequin training. However, Gélis, gives a brief description of the method of instruction on the mannequin in *Une Pédagogie Pratique* (Gélis, 2004b) (translated by Kate Healy) but does not cite his sources.

At the beginning of the practical session, each student received a number corresponding to the order of her turn at the mannequin. In the first part, the demonstrator, who was none other than the royal midwife’s own nephew, the doctor Coutanceau, stressed the particular position of the
child in the womb and explained the manner to proceed for delivery. From this point of view, the mannequin and its annexes made it possible to truly “speak to the eyes” of the students, as Madame du Coudray states. Then the “apprentices” performed the maneuver in turn while stating in an intelligible manner what she was doing: thanks to a simple manipulation, she learned to recognize the position of the fetus, in order to overcome the difficulties “mechanically” [i.e., without thinking or automatically]. Above all, the student was expected to be careful, to know how to evaluate the risks in order to call for help when the situation required…

The fundamentals of the lesson are learned by heart so that they are better imprinted in the memory. After the class, the acquisition is tested by questioning the students, and Madame Coutanceau, Madame du Coudray’s niece, willingly became tutor.

Given the limited availability of contemporary sources, I decided to evaluate the characteristics of the mannequin to determine if it was designed so that it could be used for active learning.

Madame du Coudray’s manual and mannequin were used together to teach midwifery. An initial reading of Madame du Coudray’s midwifery manual revealed that a significant part of the text actually describes the activities, or manipulations to be conducted by the midwife in delivering a baby. Madame du Coudray said, “Using the machine is definitely within people’s abilities because it is labeled, and my book, which I send with it, contains the steps to demonstrate and the course content” (musée Flaubert et d’histoire de la médecine - Rouen, 2004) (translated by Kate Healy).

In reviewing her description of the manipulations I noticed that she consistently used the same words to describe these maneuvers. Using atlas.ti, qualitative data analysis software, I coded the manual using these words. A list of codes with their frequencies is found in Table 6.
This resulted in 152 quotes. Of these quotes I selected those quotes which had a code density of three or more codes. This resulted in 35 quotes (see Appendix M).

The only existent mannequin is in musée Flaubert et d'histoire de la medicine in Rouen, France. It is not available for use to test the manipulations described in Madame du Coudray’s manual. However, a complete description of the mannequin, including many photographs, is contained in a beautiful book, La “Machine” de Madame Du Coudray ou l’Art des Accouchements au XVIIIe Siècle, which has been published by the museum. As the museum has not published an English translation of this book, I invited Dr. Healy to translate the portions of the book which describe the mannequin, along with the captions of the accompanying photographs.

Using the 35 quotes from Madame du Coudray’s manual as well as the pictures and description from La “Machine” each coder was asked to read the quote, review the features of the mannequin as photographed and described in La Machine, and then rate whether it appears that the manipulation described in the manual could feasibly be performed on the mannequin or not. Manipulation was explicitly defined as “to examine or treat by skillful use of the hands.” A copy of the instrument can be found in Appendix N.

Data Analysis

An average rating for each illustration was calculated (see Table 7). All ratings were greater than or equal to 2. The interrater reliability was 94%. It was calculated as a percent agreement after the categories were collapsed into binary categories of “low” and “high.” This was done by assigning 0 and 1 ratings as “low” and 2, 3 and 4 as “high.”
Table 6. List of Codes and Frequencies

<table>
<thead>
<tr>
<th>Code</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hand</td>
<td>48</td>
</tr>
<tr>
<td>Finger</td>
<td>45</td>
</tr>
<tr>
<td>Pull</td>
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</tr>
<tr>
<td>Feel</td>
<td>37</td>
</tr>
<tr>
<td>Examine</td>
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</tr>
<tr>
<td>Touch</td>
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<td>Push</td>
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</tr>
<tr>
<td>Press</td>
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</tr>
<tr>
<td>Manipulate</td>
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</tr>
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</table>
Table 7. Average Rating of Feasibility of Manipulation on Mannequin

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<th>Standard Deviation</th>
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<td>2</td>
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<td>3</td>
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</tr>
<tr>
<td>5</td>
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<td>3</td>
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</tr>
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</table>
The Teaching Manual of Madame du Coudray

The teaching manual of Madame du Coudray has several sections. It starts with a letter to Bernard de Ballainviliers, intendant of Auvergne. This is followed by a Foreword in which Madame du Coudray explains her goal to teach country midwives and extols the virtues of her machine and teaching illustrations. Next are the 38 teaching lessons which she developed. This is followed by 12 observations added by the editor of unique obstetric cases. The book ends with a table of contents, an endorsement of “la machine” by the Surgical Academy, an endorsement by the Master Surgeon of the manual, and the King’s license to Madame du Coudray to teach midwifery in all the land. This study will only analyze the 38 teaching lessons.

Content Analysis of Midwifery Manual

Madame du Coudray’s 38 lessons were studies using Krippendorff’s method of content analysis. The translation of the 1769 edition of Madame du Coudray’s manual was read to see if there were any educational themes that appeared which were relevant to the research questions. Two important themes emerged, namely, the role of application as well as social and cultural responsibilities.

Application is a theme that runs through all the lessons. It is demonstrated by the extensive explanations of the manipulations that a midwife does to deliver a baby which are discussed in the previous section. Each manipulation described by Madame du Coudray had a very practical application that could be used in the everyday activities of a midwife.

More evidence that Madame du Coudray used applications to the real world as a way to teach can be found in the use of narratives which point out how she, or another medical professional, applied the concepts of midwifery being taught. I identified 24 such narratives
which can be found in Appendix O. Often these narratives are just short statements which start with “I have found…”, or “I have seen…” However, on several occasions, she tells a vivid tale, sure to be remembered by her students. Here is her warning about assuming too hastily that an infant is dead.

When the infant comes into the world too weak & without any movement, these women hurry to wrap it in a rag, exposing it on the ground in one of the remotest corners of the room, to avoid the sad sight for the mother: one cannot doubt that they bury them all alive, & and always unfortunately still without Baptism, witness the four that had been sacrificed, & to whom I had the happiness to return life, & to have them baptized at the Church. I found one of these children on whom a dog had already eaten a toe, without anyone noticing: we feel how much this negligence is painful to humanity; we will find in the fourteenth Chapter the manner in which one should help the infant, & we will see that we should never abandon him unless we are totally convinced of his death.

These short narratives emphasize the concepts that she is teaching and show how they can be successfully applied.

Another common theme is the social and cultural responsibilities of the midwives. In fact, the first chapter in her book is devoted almost entirely to the social responsibilities of midwives. Madame du Coudray was loyal to the King of France who paid her pension; what did she teach her midwives about their responsibilities to the King? The Catholic Church was another powerful influence in society in eighteenth-century France; what did she teach them about their responsibilities to the Church? The medical professions were changing during
eighteenth-century France; what did she teach them about their responsibilities to the other medical professions, particularly male-midwives, surgeons and physicians?

Quotes that had to do with the government were identified by coding the manual in atlas.ti using the codes king and state. There are several references in the frontispiece caption, the title page, the foreword and the license (mostly emphasizing Madame du Coudray’s endorsement by the king). However the lessons themselves do not contain any direct reference to the responsibilities of the midwives to the state.

But the important responsibilities of the midwife to the Church are given immediate attention as the first chapter begins, “Devout of our Religion…” (Le Boursier du Coudray, 1769). In addition, the majority of quotations found with the Church family of codes (see Table 8) are in the first chapter before any discussion of anatomy, physiology or how to deliver a baby. In this chapter Madame du Coudray impressed upon her students the importance of seeing that the child is baptized. She gives detailed instructions about contacting the Priest, contacting the parish clerk to warm the water, and even how to hold the child for baptism. Later in the manual she even describes how to baptize a fetus in utero in the event that it does not appear that the child will survive the birth.

In the hierarchy of the medical professions, it was important that midwives be competent in their realm of expertise but they also needed to know when an emergency existed that required the expertise of a physician or surgeon. Madame du Coudray promotes competency, but warns against overconfidence:

[If] the woman be in danger…it is our duty to give our report on the state of the woman to the Doctor or the Surgeon who will be called. All pride should give way when it comes to the
Table 8. List of Families, Codes and Frequencies to Identify Social Responsibilities in “Lessons”

<table>
<thead>
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<tr>
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<tr>
<td></td>
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<td>Medical Professions</td>
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<tr>
<td></td>
<td>Surgeon</td>
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</tr>
</tbody>
</table>
preservation of an infant. How can we console ourselves for a premature death, that we have cause to reproach ourselves, when it was caused by overconfidence in ourselves, & that in this mindset we have neglected to instruct ourselves in the depths of the matter, where knowledge would prevent us from committing such errors?

From her text, it is obvious that Madame du Coudray wants her midwives to be confident; however, she realizes that they have responsibilities to the mother and infant to get assistance when needed.

In summary, Madame du Coudray’s manual exhibits two themes that are relevant to the research questions, namely, the use of application as well as the social and cultural responsibilities. She used descriptions of manipulations and short narratives to show the real world applications of the concepts she was teaching. She taught her students their social and cultural responsibilities, particularly to the Church and the other medical professions.
CHAPTER 5. SUMMARY AND CONCLUSIONS

The objective of this study is to determine what contemporary biology instructors can learn about teaching science-illiterate students from Madame du Coudray, an eighteenth-century royal midwifery educator. The study was focused by studying three of her teaching tools: her illustrations, her mannequin, and her manual.

**Background Research**

In order to conduct this research a sound understanding of the concept of scientific literacy was required. A review of the evolution of the concept of scientific literacy from the launching of *Sputnik* through the twenty-first-century was conducted. This review revealed that there is continuing debate as to what constitutes scientific literacy and how to address it. The societies of professional scientists promote a theoretical approach to science. However, a theoretical approach increases science illiteracy among those who do not aspire to be a professional scientist.

To avoid Whig history, a study of the social and cultural context in which Madame du Coudray lived and practiced midwifery was conducted. This included reading Madame du Coudray’s biography and period histories which described the state of midwifery during the Enlightenment in France. This study revealed that the medical professions of the eighteenth-century were quite different than today. Physicians did not participate in hands on care of patients, but were educated gentlemen who oversaw medical care in their communities. Surgeons were the hands on medical professionals and were responsible for primary care of patients; with the exception of childbirth which was the domain of midwives. Midwifery had been the domain
of women throughout history. However, in the eighteenth-century, the traditional female role of midwives was being threatened by the male-midwives.

To understand the role of midwifery in modern society both a nursing professor and a certified nurse midwife were interviewed. This revealed that modern midwives are well educated in modern medicine; a certified nurse midwife must have an undergraduate degree in nursing and a Master’s degree in midwifery. They typically handle low risk pregnancies and work under the supervision of an obstetrician.

A review of modern educational theory included Ausubel-Novak Human Constructivist Theory and Brain-Based Learning. Both of these theories support the concept that the student is primarily responsible for their own learning and the instructor only acts as a facilitator for learning. Both theories also emphasis the importance of active learning, the student must be involved in the learning process.

A review of the Tufte theory of graphic illustration as described in his four books was also conducted. This revealed a number of basic principles which could be used to evaluate the teaching illustrations. These are summarized in Figure 9.

**Research**

This study is a qualitative case study with three embedded cases, i.e., the case of the teaching illustrations, the case of the teaching mannequin and the case of the teaching manual. In order to conduct this research Madame du Coudray’s manual, *Abrége de l'art des accouchemens* was translated into English by Kate Healy, a linguist who is an expert in eighteenth-century French. The biography of Madame du Coudray was reviewed. The primary sources were collected in France. All six French editions of Madame du Coudray’s manual were viewed and
photographed. The 26 illustrations were also photographed. Photographs of the mannequin at *Musée Flaubert et d’Histoire de la Médecine – Rouen* were obtained.

The 26 teaching illustrations were analyzed using Tufte’s theory of graphic design. As no instrument was available for this analysis, one was developed. The illustrations were rated by two doctoral students in the Curriculum and Instruction department. Both students had professional training in medicine and had completed a one semester graduate course in Tufte’s theory of graphic design. On the nine Tuftian characteristics rated the average ratings ranged from 2.83 to 4 (on a scale from 0 to 4) and the percent agreement ranged from 73% to 100%.

The teaching mannequin was not available for use in the study and so photographs of the mannequin were used instead. These photos were compared with the 35 quotes from the manual describing the manipulations to be performed by the midwife during delivery of a baby. The same raters were used as for the illustrations. The raters were asked to rate how feasible, on a scale from 0 to 4, it would be to conduct the manipulations described in the manual on the mannequin. The average rating ranged from 2.5 to 4 and the interrater reliability was 94%.

The 38 lessons in Madame du Coudray’s teaching manual were content analyzed to see if any teaching themes emerged that were relevant to the research questions. Two important themes emerged, teaching by application and teaching social and cultural responsibilities. Application was not only taught in the many descriptions of the manipulations a midwife must conduct to deliver a baby, but also by narratives that illustrate how the concepts being taught were applied by Madame du Coudray and others. Social and cultural responsibilities were taught by emphasizing the important responsibilities that the midwife has to the Church and the medical profession.
Contributions of This Study to Biology Education Research

This study makes significant contributions to Biology education research. The translation of Madame du Coudray’s manual into English makes the teaching tool of this outstanding teacher of anatomy and physiology available to the English-speaking world. The development of a qualitative instrument for analyzing graphic illustrations according to Tufte standards provides a tool which could be used in countless other studies to evaluate scientific illustrations. The study of Madame du Coudray’s mannequin provides insights into the very beginnings of the use of simulators in biology and medical education. Each embedded case contributes to our understanding of the history of biology education.

Translation of Madame du Coudray’s Teaching Manual

The commissioning of an English translation of Madame du Coudray’s manual by an expert in eighteenth-century French is a significant contribution to biology education research in the English-speaking world. This manual has never before been published in English and is the foundation of Madame du Coudray’s teaching methods. She used these methods to teach over 4,000 students the art of midwifery and saved the lives of countless women and children. The manual is the cornerstone of her teaching method and includes her lectures, illustrations and the instructions for the use of the mannequin. The lack of an English translation prevented her methods from being studied by biology educators in the English-speaking world. Because of this, Madame du Coudray has been underrecognized as a biology educator. With the translation of

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4 It should be noted that during this study an obscure typescript copy of an English translation of Madame du Coudray’s manual was located in the Thomas Fisher Rare Book Library at the University of Toronto. It was a private translation by D.A.H. Moses. Very little is known about the translator except that he was awarded the British Military Cross in 1918 and died early in World War II. No information is available about his credentials as a translator. As this study is a scholarly work and dependent on a professional, reliable translation; the typescript was disregarded and this study was conducted based on the professional translation by Kate Healy.
this manual, her methods can now be studied by other biology educators and she can become recognized as the outstanding educator and early pioneer in biology education that she truly was.

**Development of Instrument for Analyzing Graphic Illustrations**

The development of an instrument for the analysis of graphic illustrations according to Tufte’s theory of graphic design is also a significant contribution, not only to the study of educational illustrations, but of any type of scientific illustration. Prior to this time there was no qualitative tool that could be used to study scientific illustrations. With the development of this tool, countless studies could be undertaken to study the use of graphic illustrations in science textbooks and identify ways to improve them.

**Contributions to the History of the Use of Medical Simulators in Biology Education**

The use of medical simulators in many facets of medical education is common today. Resusci Anne has been used by millions to learn the basics of cardiopulmonary resuscitation (CPR). Noelle is an obstetrics simulator used to teach doctors, midwives and nurses. The use of simulators for medical education dates back to the use of “phantoms” in the 1700s for educating midwives. Madame du Coudray’s mannequin is the earliest known example of these simulators which has survived to the present day. The study of her mannequin provides insights into the very beginnings of the use of simulators in biology education.

**Limitations of the Study**

This study has limitations, as with all studies. The fact that this is an historical case study imposed limitations on the sources of information available. For example, surveys, observations, interviews and video recordings (which are often used in case studies) do not exist. However, in this particular case, there are excellent resources which do exist, including: copies of all the
editions of the manual with the original illustrations, a restored mannequin which has been photographed extensively, and Gelbart’s excellent biography which is based on extensive archival research throughout France.

Another limitation imposed by the fact that it is an historical case study is that it is not 100% transferrable to modern biologists. For example, Madame du Coudray discussed treatment of patients with herbs and home remedies. It would be inappropriate for a modern medical professional to treat patients with medicines that had not gone through clinic trials. However, despite the obvious differences between eighteenth-century and twenty-first-century medicine, valuable lessons about teaching methods can still be gleaned from the teaching tools of Madame du Coudray.

Other limitations include the financial and time constraints on this study. Because of this only two coders, one of which was the author, were used for rating of the illustrations and the mannequin. However, both coders were trained in medical science, qualitative research, and Tufte theory of graphic design. In addition, both coded the illustrations and mannequin quotes independently.

Publications

This study has produced three products which could be published. Because of the original nature of this study, a journal article is planned about the teaching methods of Madame du Coudray to be submitted to Science & Education, which emphasizes the use of historical approaches to improve teaching. Plans also include publication of an annotated English translation of the 1769 edition of Madame du Coudray’s manual, which will include an introduction and annotations about her teaching methods. This could serve as a companion
publication to Gelbart’s excellent biography. The third possible publication is an English translation of *La "machine" de Madame Du Coudray ou l'art des accouchements au XVIIIe siècle*, the book published by the *Musée Flaubert et d'Histoire de la Médecine* in Rouen, France.

**Future Research**

A direct comparison of the midwifery illustrations of Madame du Coudray’s manual with those of Smellie’s manual would be very interesting. Madame du Coudray and Smellie were contemporaries and both studied at the Hôtel Dieu, but the style of the illustrations in their books are very different. The Tufte instrument could be used for this study.

I would also like to conduct an in-depth study of the early history of “phantoms”, the early obstetric mannequin simulators. There are a number of different simulators which are mentioned in the literature, but very little is known about them. I think an exhaustive study might yet reveal important information about these early predecessors of the modern medical simulators.

Another study that would be revealing is to compare the features of Madame du Coudray’s mannequin with a modern obstetric simulator to see if her mannequin includes features which might be implemented to improve modern simulators. Many of the tactile features of Madame du Coudray’s mannequin were used to teach palpation, the art of feeling a patient to determine the size, shape, condition, and location of different organs and tissues. Modern medicine is becoming more dependent on technology. Are we losing palpation skills? Could modern simulators be improved to be more realistic and increase their fidelity by implementing some of the tactile features of Madame du Coudray’s mannequin?
Conclusion

Contemporary biology instructors can learn much about teaching science-illiterate students from Madame du Coudray, an eighteenth-century royal midwife. Her methods also address the major concerns about science education that were initially voiced by Hurd in 1969 and have continued to be voiced to the current day, namely, a “lack of apparent relevance to the real world…the separation of science from human and humanistic contexts” and “the personal, social and the practical applications are missing” (Hurd, 1969). Madame du Coudray’s teaching methods teach the applicability of science to the real world and the relationship of science to human and social endeavors. She used three important teaching tools to accomplish this, namely: illustrations, a simulator (the mannequin), and her textbook (manual).

Her illustrations exemplify Tufte’s theory of graphic design. In particular, they implemented the use of small multiples to teach students the process of delivering a baby. In addition she has eliminated chartjunk and focused the illustrations on the data that is relevant to the subject at hand. She did not let anything, including the availability of color, detach from the data. Although many science textbooks have illustrations they are not used to their full extent by instructors and could be used more extensively in assessment as described by Wandersee in Designing an Image-Based Biology Test (Mintzes, Wandersee, & Novak, 2005a).

Her mannequin provided the opportunity to simulate the process of childbirth through active learning. Her method of teaching as described by Gélis in Une Pédagogie Pratique (Gélis, 2004b) is strikingly similar to the model of active learning described by Michael and Model (see Figure 4). The “input state” of the process was provided by the demonstrator who taught the position of the infant in the uterus and how to deliver it. The “learning experience” was the
actual practice delivering the infant on the mannequin. The “output state” was the questioning of
the students after the lesson. Her teaching methods also fit the model of Kolb’s learning cycle
(see Figure 6) and thus brain-based learning could have occurred. Attempting delivery on the
mannequin could provide the “concrete experience”. If the delivery was not successful, the
student would have the opportunity for “reflective observation” to determine the problem. This
could provide them with the opportunity to develop an “abstract hypothesis” and finally
“actively testing” it on the mannequin.

Her manual showed applications to the everyday life of a midwife. In addition to the
direct application of the manipulations on the mannequin to real life, Madame du Coudray also
used narratives to teach application principles. By showing how she and others used the concepts
being taught in their practice, the students could see the immediate application of what they were
learning. The use of narratives also demonstrates that science is a human endeavor. The use of
narratives in the form of Interactive Historical Vignettes as described by Wandersee and Roach
in Teaching Science for Understanding (Mintzes, Wandersee, & Novak, 2005b) would be an
excellent method of implementing short narratives in a contemporary science course showing the
applicability of science to real life and that science is a human endeavor.

Madame du Coudray’s manual also emphasized the important social and cultural
responsibilities associated with the use of science. By emphasizing the duties of the midwife in
the society she lived in, she facilitated the successful practice of the midwives in their
community. Modern biology teachers could learn a valuable lesson from her. By teaching the
social and ethical responsibilities of the scientist, they can minimize hostility towards science
and improve relationships with the communities in which we live.
In July of 2009 a conference of science educators convened in Washington D.C. Organized by the AAAS with support from the National Science Foundation the conference was entitled, *Vision and Change: A Call to Action* (American Association for the Advancement of Science, 2010). From this conference emerged a set of recommendations for improving science literacy in the biological sciences for the twenty-first century. These recommendations included: students should have experience with simulation and “systems-level approaches” to biology, they should have an understanding of the “core concepts that form the very basis of life on earth”, and they should understand how science is “closely integrated within society.” Madame du Coudray’s teaching methods are outstanding examples of all of these recommendations. The study of her methods could greatly assist modern biology instructors in implementing the changes recommended by *Vision and Change*. 
REFERENCES


APPENDIX A:

INTERVIEW INSTRUMENT FOR MIDWIFE SUBMITTED TO

INSTITUTION REVIEW BOARD
Interview Instrument for Midwife Submitted to Institution Review Board

Introduction

1. Tell me a little about yourself.
2. How did you get interested in becoming a midwife?
3. How long have you been a midwife?
4. What credentials or certificates do you have?

General Questions About Midwifery

5. What do modern midwives do?
6. What is the difference between a certified nurse midwife and an obstetrician?
7. What type of personality traits do you have to have to be a midwife?
8. What type of skills do you have to have to be a midwife?
9. How do modern midwives differ from midwives a couple hundred years ago?

Training in Midwifery

10. What training is required to become a midwife?
11. What work experience have you had as a midwife?
12. What type of “on the job training” do midwives receive?
13. Are there professional development programs for practicing midwives?
14. What professional organizations control midwife training?
15. Tell me about the education program you completed.
16. Where are midwifery schools located?
18. What training did you receive that you thought was most useful?

19. What training did you receive that you thought was least useful?

20. Are there different types of midwives? If so, what are they and how are they trained?

Midwife Work

21. What type facilities do certified nurse midwives work at?

22. What is your position at the facility?

13. What other health care professionals do you work with in your job? What do they do?

14. Where can midwives deliver babies?

15. What parts of your job do you enjoy?

16. What parts of your job do you not enjoy?

17. Are midwives regulated by any agency?
APPENDIX B:

CONSENT FORM FOR A NON-CLINICAL STUDY
Consent Form for a Non-Clinical Study

1. Study Title: A Modern Midwife
2. Performance Site: Louisiana State University and Agricultural and Mechanical College
3. Investigators: The following investigators are available for questions about this study, M-F, 8:00 a.m.-4:30 p.m.
   Trudy Witt, M.S.Eng. 388-9460 (h), 937-2361 (c)
   Dr. S. Kim MacGregor 578-2150
4. Purpose of the Study: The purpose of this research project is to obtain information about the training, qualifications and work of Certified Nurse Midwives. The information will be used to compare and contrast with midwifery training in France in the 1700’s for purposes of a dissertation in Education (ETPP)
5. Subject Inclusion: Certified Nurse Midwives
6. Number of subjects: 10
7. Study Procedures: The study will consist of interviewing Certified Nurse Midwives about their work and training in midwifery.
8. Benefits: The subjects will have the opportunity to share information about midwifery as a career choice.
9. Risks: There is a very small risk that personal information might be inadvertently released. However, every effort will be made to maintain the confidentiality of your study records.
10. Right to Refuse: Subjects may choose not to participate or to withdraw from the study at any time without penalty or loss of any benefit to which they might otherwise be entitled.
11. Privacy: Results of the study may be published, but no names or identifying information will be included in the publication. Subject identity will remain confidential unless disclosure is required by law.
12. Signatures:
   The study has been discussed with me and all my questions have been answered. I may direct additional questions regarding study specifics to the investigators. If I have questions about subjects’ rights or other concerns, I can contact Robert C. Mathews, Institutional Review Board,(225) 578-8692, irb@lsu.edu, www.lsu.edu/irb. I agree to participate in the study described above and acknowledge the investigator’s obligation to provide me with a signed copy of this consent form.

Subject Signature: ____________________________

Date: ____________________________

Institutional Review Board
Dr. Robert Mathews, Chair
203 B-1 David Boyd Hall
Baton Rouge, LA 70803
P: 225.578.8692
F: 225.578.6792
irb@lsu.edu | lsu.edu/irb
APPENDIX C:

CODED INTERVIEW OF CERTIFIED NURSE MIDWIFE
Coded Interview of Certified Nurse Midwife

Interview with Certified Nurse Midwife
11/13/2008

TLW: Well, I really... like I said... appreciate you taking the time.

CNM: It's no problem.

TLW: So what are the names of the other two midwives over there?

CNM: Linda -------

TLW: OK

CNM: And Tammy -------.

TLW: OK, great, I'll keep that in mind if I need some more. Well, I thought we would just talk... start by you telling me a little bit about yourself; like how you got interested in midwifery.

CNM: OK. I was a labor and delivery nurse. You know, I got out of nursing school with a bachelors degree from USL, ULL now, in Lafayette. Worked in labor and delivery for several years and caught a few babies by accident, you know, the doctor doesn't make it in time. And I always had an interest in pregnancy, childbirth and labor and delivery process. And it was after getting into it, working for a while that said the fun part is delivering the babies. It was always very interesting to follow a woman for twelve hours during the labor and then accidentally get to catch a baby once in a while. How fun would it be to follow her for the course of her prenatal care and still get to deliver the baby? So I went back to school. I graduated from Stony Brook University in 2006 with a Master's degree and then you get a certification in midwifery and passed boards. A lot of people kind of group us with Nurse Practitioners. We are an Advance Practice for Nursing; but we are not really a Nurse Practitioner we are a Certified Nurse Midwife.

TLW: OK

CNM: But that is just how I got started.

129
TLW: That's how you got into it, huh? Well, that's awesome. So how long have you been doing it, since 2006?

CNM: 2006

TLW: Well, great. Let's see, like, what do modern midwives do and how is that different than, like an obstetrician?

CNM: We follow the course of a woman through her whole prenatal care. We take care of low risk pregnant women. So, if an insulin dependent diabetic came to me, she would not really meet the qualifications that I look for. Some midwives do take a little more high risk population, but really our scope is low risk pregnant women. We also do "well woman" gynecology. You know, "well woman" exams...all the fun: pap smears and birth control, STD. We do a little bit of primary care. A pregnant woman comes in with a sinus infection during her pregnancy it is perfectly within my scope to treat that. I do have prescriptive authority so I do write prescriptions. But that is pretty much what we do.

The difference between us and an obstetrician...midwife means "with woman" so we tend to spend a little more time with our patients, a lot of education involved with midwifery care. We want women to... It is a family process and a lot of obstetricians don't let small children in the door. However, with midwifery care we want it to be family centered. Bring your two year old in with you to your visit. We will let that two year old try to listen to the baby's heart beat as well. So it is a little bit different how we take care of things.

TLW: Just kind of a different philosophy

CNM: It is. It is. We tend to labor sit too. You know, when a women is in labor an obstetrician typically will pop in at lunch time, say hello, come back when it is time for the birth. We want to be there with the patient during the course of her labor. Once we hit that active labor phase we want to be at the bedside with mom (especially those that desire a nature birth) and be with her and help her throughout her labor. We do take patients...our patients are allowed to get up epidurals, if they choose...but a lot of women choose midwifery care because they desire that nature birth. They know we have experience there. And we are going to be at their bedside a little more than an obstetrician would be.
TLW: And so do you...um...where do you practice, like hospital?

CNM: Yes. Yes, most Certified Nurse Midwives practice at a hospital. There are different levels of midwifery, however, Certified Nurse Midwives tend to do hospital births only.

TLW: OK so you do hospital birth only.

CNM: Yes, like I have privileges at the Baton Rouge General. So I see my patients at Oschner Clinic, but my privileges to deliver babies, is at Baton Rouge General.

TLW: Yeah, I talked to Connie --------. And she said that, “There is one here in town”.

CNM: There is not a lot of us.

TLW: She said, “I don’t know if I have ever been in there when she delivered a baby but some of my students may have been in there.”

So what kind of personality traits to do you have to have to be a midwife.

CNM: Patience.

TLW: I’ll bet.

CNM: That is the main thing. Midwives tend to not intervene as much in the birthing process. You know, a lot of obstetricians put women on what they call a curve, a labor curve, and they have to have done THIS by THIS time. And they have so many hours to get to this point. They are kind of on a time line. Midwives, the best thing a midwife can do is sit on her hands. We don’t intervene. We don’t automatically start pitocin if they are not progressing fast enough. That’s the difference. Patience is probably the one thing. We don’t electively induce labor for convenience. So we will get called out more at two and three a.m. versus an obstetrician that puts her woman in so she will be delivered by the afternoon. So that is one less patient he has to worry about being called out for. We don’t do that.
TLW: So you have to be willing to go at a moments notice for a long time.

CNM: You do. My bag stays packed in my car because you never know.

TLW: Wow that is pretty interesting.

So what type of skills would you say someone would have to have to be a midwife?

CNM: You have to understand the labor and birth process. You know, know what...you know, be able to put your hands on a belly and know what you are feeling. A little bit different about midwifery care we rely a lot on our hands versus technology to realize if something is going on. But it is the same thing as an obstetrician is what we learn in school. You’ve got your medical technology there is you need it. But, the main thing with midwifery is to be patient and trust the birthing process to happen.

TLW: Yeah, I read an interesting book about a young boy...like around World War II that went with his dad to make rounds. His dad was a doctor and they talked about how his Dad could...I don’t know what you call it...but could like tap on a person’s organs and stuff and know what they were doing. And that is something the modern doctors don’t usually do.

CNM: We rely on tests for everything. Yeah, sometimes you have got to get back down to basics.

TLW: Alright. So how would you say modern midwives differ from midwives say, a couple of hundred years ago?

CNM: Well, we let them get epidurals for one thing. We are doing hospital births. I don’t know, the same philosophy is there to be with women. Obstetricial care has went backwards. You have probably done your research and know we have some of the worst statistics in the world where maternal and infant mortality are concerned. You look at every other nation. They have excellent rates. Midwives take care of all their patients.

TLW: That’s amazing.
CNM: We have a little too much intervention here. We can’t leave birth alone. If you just trust and leave it alone, most of the time it will work. It is good to be able to recognize when it is not and we are trained for that. But most of the time is to recognize it is a process. Some women labor longer than other women. It doesn’t mean something is wrong. It is just different. That is all.

TLW: So...um...so what does the training involve? You said you went to Certified Nurse Midwifery School, and like what kind of program is it, or whatever, or training is it?

CNM: It is a two and a half year Master’s degree. So you take the...your standard, you know, statistics course, you know all those basic master course. And then it gets a little more into...towards the end...true midwifery courses. And then you do training with a midwife. You do a certain amount, like 180 hours clinical the first semester, 240 the next three or four semesters; you train “hands on” with that midwife. “Hands on” training, you do births with her and see how it works.

TLW: So you were actually on campus there at Stony Brook?

CNM: I went through a distance program.

TLW: I noticed they had one on line.

CNM: I did all my textbook training on the computer at home I would have to go up there once a semester to do a little bit of hands on training, some check offs on procedures. But then after that I trained with Linda --- a midwife in town; did clinic with her, saw patients during the day in clinic, run back and forth doing delivers at the hospital, spent many a night at Baton Rouge General Labor and Delivery.

TLW: So you were able to do a lot of your clinical hours here with her

CNM: Yes... Yes.

TLW: Oh that is great. That worked out great.

CNM: Yeah.

TLW: I think you have already told me about your work
experience. You said you were a nurse in labor and delivery.

104  CNM: Yeah, for about 8 years I did that. Yeah, it was great. Stressful sometimes, but I think something that was very, for me, was to watch birth with some obstetrician and I would be thinking in the back of my mind, “I wouldn’t do it that way.” And I kept thinking I could do it better. And that is part of the reason I went back I. I can give better women better care than this.

105  TLW: That is very interesting. So...are there like professional development programs for practicing midwives?

106  CNM: What do you mean by that?

107  TLW: I mean do you have continuing education hours and stuff like that, and how does that program work?

108  CNM: Oh yeah, well we are governed by the American College of Nurse Midwives. We have to belong to the ACNM to get in practice as a Certified Nurse Midwife. We have to do six pharmacy hours a year, which keeps us up to date on the latest and greatest meds. So we have to do that. We also have to do a certain amount of continuing education hours to keep our nursing license because we are nurses first. So you have to follow Louisiana State Board of Nursing laws which says, I have to have five continuing education hours. And then we have to recertify every seven years where we are sent modules from the ACNM that we have to retake the tests and submit back in. Or you can choose to retake your board certification. Nobody wants to do that again. Most of us choose to pay the money and do the modules.

109  TLW: Sounds great. So...so there...I think you already told me about what professional organizations control midwife training

110  CNM: So, It is the ACNM and your Louisiana State Board of Nursing

111  TLW: OK, So you have to have a license in the state of Louisiana. You have to hold a nursing license in the state of Louisiana and then you have the certification?

112  CNM: Yes, and the Advanced Practice Certification through
the State Board as well. And then your midwifery certification is going to come from ACNM. They are the ones that test us, we take boards with them.

TLW: That's a pretty long process.

CNM: It is. It is. I mean we are governed very closely. We are governed very closely.

TLW: Um.....let's see. You told me about the education program that you completed. So is the one in Stony Brook is that the closest one to here. I mean how many midwifery schools are there?

CNM: There are a lot of midwifery schools. However, for me distance learning was the only option because I have two small children. There is another one, it's called Frontier Nursing, and that is in Kentucky and that is another midwifery... that was the first midwifery school.

TLW: Yeah, I think I have read a little bit about that one that was one of the first ones.

CNM: It is but also lots of other schools University of Cincinnati, Vanderbilt...there is lots of midwifery schools but it is not a distance learning program, you have to be there.

TLW: Yeah, well, this program that you were in, I looked at it. It looks like it is associated with the medical school there.

CNM: Yeah.

TLW: So the training materials were there a lot of similar to the medical schools, were there a lot of similar or were they separate.

CNM: No, I think the nursing school the medical school they probably all use the same labs so to speak.

TLW: What teaching methods did they use, like, you have told me a little bit about like the on line stuff, but like did you use like models?

CNM: We did. We did. I mean of course most of it is book instruction. But we would go to Stony Brook to have some
hands on training. We learned to do intrauterine device insertion. You have to be checked out on that at school, so we had they had to use models. We did...to learn how to do a proper pelvic exam, we did them on each other. It is called a peer pelvic exam. So you met all these strangers from around the country and you had to get intimate really quick. And that was part of the training process. We did microscope slides. We did all that there at Stony Brook. They would have these big model...dummies, and it would have an empty belly and they would stick a dummy baby in there and you had to try and figure out what position the baby was in. That is the kind of testing they did. "Hands on" stuff they did while we were there you know.

TLW: So was it like Noelle? I saw that model up over here at Our Lady of the Lake. Noelle or do you know the name of the model? Interestingly enough this lady in the 1700’s had built one of her own that she used to train. It was made out of cloth, and like bone, and structured, and had a baby.

CNM: Yeah, we all had our little pelvises with little babies that you try and figure out the mechanisms of labor. I mean that is the kind of stuff we went to New York we would have to do some classwork, but a lot of it was the “hands on” stuff that you learn .... while you were there.

TLW: Yeah, well that must have been pretty intense if you did all your laboratories and stuff at the same time. So how long would you have to go?

CNM: Usually about a week at a time.

TLW: A week at a time? Like once a semester? It was probably pretty intense?

CNM: And expensive...you paid for your own flight to get over there. It was quite pricey, but worth it. I got to see parts of New York.

TLW: So the whole program itself was rather expensive?

CNM: Yes, extremely. Yeah, I think...my husband was in a Master’s program at the same time and he was paying about $1200 a semester and I was paying over $6000 a semester.
TLW: Wow, that is quite expensive. Lets see did you do thing... well, you told me about clinicals... did you do things like case studies?

CNM: Sure, yeah, I mean that was a large part of school, is your clinical instructor would send you a case study and have you review it and, “What do you do?” So yeah, we did that. And then we would do case studies on actual clients when I was in school doing clinicals. Linda gave me ...told you to pick a case study and you would have to do some research about this certain thing, whatever your instructor was asking.

TLW: And the apprenticeship, I guess that is kind of like your clinicals?

CNM: It is. It is. You find a midwife that you can train with and I just was lucky that I knew Linda already, we use to work together. And she became a midwife. And I needed someone to train with and there was nobody else. There was one other midwife she was at Earl K. Long but she was about to move so I ended up, you know, training with Linda. And now we work together!

TLW: Alright, when I was talking to Connie, she was talking about proctors...what is the title for someone that trains a nurse?

CNM: Sometimes they use “proctor”.

TLW: Oh do they.

CNM: Yeah.

TLW: She talked a lot about that. So it would be a similar kind of thing.

CNM: Yeah.

TLW: OK, so what training did you think was the most useful?

CNM: “Hands on”, doing the clinicals with Linda, going and doing the births. “I mean, some of the bookwork, school assignments. You know, you don’t know until you do it.

TLW: Yeah I am sure that is true.
CNM: Yeah, and that is something that Linda had always taught me, "You see one, you do one, you teach one". That was her philosophy. It was like, "I am not going to show you this a bunch of times, you are going to see it, and then you are going to do it, then you are going to teach it." Yeah, that is where you learn the most when you are actually doing it.

TLW: So have you had the opportunity to train any other midwives?

CNM: No, but I do do a lot of teaching with students like when we have undergrads students that are in nursing school. They come and they do their clinicals at the Baton Rouge General where I do my births and sometimes in labor, and the patient is OK with it, I'll bring the students in and I will teach. I love it. I have always taught childbirth classes, that is just something I enjoy.

TLW: You just enjoy teaching. Well that is great. So what did you think was the least effective...the textbooks...err?

CNM: Some of the classes that we had to take, again we talked about what a midwife should and should not take care of. So sometimes in your primary care course you would learn about things that you know you are never going to deal with as a midwife. So, I mean, I guess some of it is good to be able to recognize and then pass it off. But you know...but yeah, so that's probably the most...just, "Why am I doing this? I am never going to use this. I am never going to see this."

TLW: Yeah. So are there different types of midwives?

CNM: There are. Lay midwives they are the... they call them "granny midwives", they were trained by an older midwife. They have no professional training so that is, from what I understand, I think that is illegal. At least in many states it is illegal to do that. They have Certified Professional Midwives. They go through probably about 18 month training at a school and they do home births. And then sometimes they will open birth centers like they have one birth center in Lafayette. And that is run by a Certified Professional Midwife. So but, that's pretty much it that is practicing nowadays. You've got Certified Nurse Midwife that got a Bachelor's degree, got a Master's degree got a certification, and then you have the granny midwife.
midwives and you have the professional midwives.

TLW: Let's see...you already answered this one about what type of facilities do Certified Nurse Midwives work at.

CNM: And probably in other states they may have some Certified Nurse Midwives that do home births but not around here. I don't know what they do...just from going to meetings and stuff I have met other midwives that there are some Certified Nurse Midwives that do home birth. However, insurance is a major issue. Many midwives can't get insurance company to cover that, if they are doing birth outside of the hospital.

TLW: Yeah, I would imagine. OK, so it is more like an insurance issue than it is a philosophical issue.

CNM: Probably so. Probably so.

TLW: So, what is your position at the facility that you work at? I am like how do you relate to the other health care professionals?

CNM: You know its kind of different for me because I...at the Baton Rouge General that is where I worked. I was a nurse. I was a peer with all those girls up on labor and delivery and they were very supportive of me when I was in school. And then I just took a step up and now I am just there doing the deliveries...But it...They have been incredible supportive. I don't think they look at me much different. You know, we still are very honest with each other. You know...yeah I don't know that I am perceived much different than I ever was.

TLW: You just have more opportunity to do more.

CNM: Yeah.

TLW: Let's see, you already answered this part about where can midwives deliver midwives. OK, what parts of the job do you enjoy the most?

CNM: I think for me it is a natural birth, unmedicated natural birth, being there laboring with the mom and getting to do the deliver. That is probably the best. And then I think my least favorite is, you know, we do "well woman" care too. I am not
a big fan of menopause. And I think it is ‘cause my training...I did not have a lot of training with it. Of course we studied it, we took tests about it, but I still just don’t get it sometimes. And try to figure out, OK can she have this medication...can she not. You know, she’s got a uterus, but doesn’t have this or she’s got her ovaries and uterus do you do ...menopause is very confusing and that makes me a little....but I am learning.

221 TLW: Yeah, I am sure.

224 CNM: But that is probably my least favorite part of my job.

226 TLW: It is probably one of those things you understand better when you get there. Kind of like having kids you really don’t get it until you do it

227

228 CNM: Exactly

229 TLW: And you already told me about the regulations from the Board. Well, I appreciate it. So, is there anything else you would like to add that we didn’t cover.

232 CNM: I don’t think so. I think just the philosophy for...the difference between an obstetrician an obstetrician is trained to look for the pathology. That is what they do. Is that they study what is wrong. A nurse midwife is going to study what is right and remember that it is normal until the pathology is there, but we don’t look for it, if there is none there in the first place.

And I think that is the difference. And just trust it. We trust birth a lot more. We trust a woman’s body to be able to birth a baby. You know, even if it takes a little longer. We just trust it

233 TLW: Well, that is really interesting. That was really

interesting because when my niece was talking about this, and I have heard a lot of others, I thought Wow, in my mind, midwifery means a “granny midwife” (CNM: Exactly) and they have changed a lot; (CNM: Right,) a lot of education, a lot of training, a lot of stuff like that.

235 CNM: Yeah, but if you need to contact Linda or Tammy at any time. Tammy actually lives right down the street and I am sure she would be happy to meet with her if you wanted to ask her. She has got a lot more info than me probably, because she has been doing it a lot longer and she has worked in a lot of states
TLW: She has worked at a lot of different places. Well, I really do appreciate it. Thanks so much.

APPENDIX D:

CODED INTERVIEW OF NURSING PROFESSOR
Coded Interview of Nursing Professor

Interview with Nursing Professor
10/13/2008

TLW: Well, I really appreciate you taking the time to visit with me today. I am excited I think this will really be interesting. But, I thought we could just start by you maybe explaining like your background and training and how you got in this area.

Prof.: OK, well I started my Bachelor’s degree in Nursing is from LSU Health Sciences Center and I was in the days that they still had diploma programs. They did...there were no Associate degree programs yet but there were...I think LSU at that time had the only Baccalaureate program in the area and possibly in the state. But one of my best friends in high school had four sisters that had been...that were nurses and they had all been through diploma programs and gone back to get their degrees. So, whenever, you know, I was in contact with them they would say just get your degree to begin with, so that was very good advice and so I did that. And, then I expected, I knew I wanted to do Masters and, I was ... my interest at that time was Public Health. I’ve always had kind of that dual interest ... that love OB but I also really liked Public Health. And I got a....I applied to the Tulane School of Public Health and Tropical Medicine. Now at that time there were also no Masters in Nursing programs in the state. A Masters in Public Health or a Masters in Science in Hygiene from the Tulane School of Public Health were probably the closest to a real health related Masters degree that you could get. Other nurses at that time, uh, got Masters in Education or Masters in Psychology. And then several years, 10, 15 years after that there was that big pressure that, no, you have to have a Masters in Nursing. So I even had to go through a process with the State Board of Nursing, submitted my transcripts, that what I had, has been accepted by the Board of Nursing as the equivalent to a Masters in Nursing. I was fortunate that in the time at the Tulane School of Public Health there was actually a Department of Nursing. And I also had wonderful advising that I had at least 12 hours of Education courses, including a course on teaching Nursing in a Baccalaureate program. It included a kind of like a student teaching or, you know, a teaching role with actual students for a semester. It was a very small limited role, but still it was, you know, it was, it was a very good experience. So, and then years later, I went back to school for my doctorate and applied at LSU. I was actually applying so I could get the alphabet letter “N” in a Masters, but when I
applied they looked at my credentials and transcripts they said, “Oh you really just need to go doctorate”. So, that worked out and I completed my Doctorate in Nursing Science last year and graduated in May.

007 TLW: Wow, congratulations! So is that program in New Orleans too?

009 Professor: Oh yes, yes.

011 TLW: That nursing program?

013 Professor: Yes.

015 TLW: At the medical school?

017 Professor: Yeah, the LSU Health Science Center which has Medical School, Nursing School. It used to be Medical Center or Medical School with departments. But now so many of these different disciplines have schools within themselves that several years ago they changed it to the big long humongous LSU...LSU Universe...Louisiana State University Health Sciences Center that encompasses all of that. And I think Shreveport...LSU Shreveport. I think also at one time you were able to get a doctorate in Nursing there also. But it is just not that many places that you can just pick up and go and get a doctorate in Nursing.

019 TLW: Yeah, I hadn’t heard of it before.

021 Professor: Yeah, which like some of the people that you have probably been in class with that are nurses, they’re going the Education route and probably that will be just fine for like quite a few years to come. But at some point in time, I would imagine that there may be pressure, just like with the Masters in alternate disciplines, that, you know, there may come a time where the Nur...you know the discipline of Nursing itself as an alphabet letter in the degree, or that is the basis of the degree, that may be something that comes to be. One of the things that as far as that goes, its has kind of always a background possible issue, not that it is always an issue. I have DNS, its like, what is that? Doctorate of Nursing Science. Why didn’t they just give us PhD. in Nursing, you know, and solve that because people in the world understand PhD? Whereas DNS, you know, sometimes they don’t quite understand that. So, but
anyway, that’s just one of the little background things. It doesn’t really have that much to do with the ordinary day to day teaching.

023 TLW: So when you were an undergraduate student what kind of methods did they use to teach Nursing?

026 Professor: We had overhead projectors with transparencies, as far as like, that was the main technology. Mostly classroom, you know, and our...Nursing has always been pretty good about course syllabi, probably much more so than many disciplines. Right from the beginning you get your course syllabi with your objectives and your reading assignments, you know and keeping up with that, so pretty much it was textbook. We were required to do “bib” cards, you know, go to the library, get a relevant article and do a “bib” card. Oh, I think just about every week we had that type of thing to do.

027 TLW: Wow.

030 Professor: And that is something that...that is not done that much anymore. Now with Internet there is so many things to do that you can just even get, you know articles...full text articles online. But I find that most students these days, you know are, they...most... a few, a handful will go the extra if they are interested in something or assigned, and go that extra distance, you know, to maybe unrequired supplemental readings. But most are... most are focused on what do they have to do to pass the course.

031 TLW: I agree, that has been my experience.

034 Professor: So pretty much plain lecture, clinicals, you know, clinical assignments, very similar to as what is done today. Now in the clinical setting, again, the technology with computerized charting and scanning of medications and that type of thing, that was not in existence at the time. So...there was a lot of handwriting and hand transcribing of anything that you either...either in your planning of care, in your official required documents for the care of the patient (like the patient charting itself...that had to be done at the hospital) and then for any assignments that had to be done. That was a lot of busywork with just sheer transcribing of that information. Another big difference is that patients usually stayed longer. So if we had to do a case study, which we did, we probably...
had a major case study in each course, which would end up being maybe like a 20 or 30 page typed paper. And, but we had access to the patients for a longer period of time. Even if we were no longer assigned to the patient we could go back and look at the patient record on floor or to Medical Records if the patient had left the hospital. And in the recent years with the HIPA Act, you know, the laws that protect health information that is much more difficult for a student to be able to do that. You know, or especially after the fact to go back in and to study the patients records really tease out, you know, the relevance of the labs, to the patient's condition, to the surgeries, to the surgical reports. Unless that is on the chart while they are actually in the hospital, it is very unlikely that we would be sending students back to go get that information and we would probably have to have specially, special documents, and consent forms that the patient authorizes that this relation...information to be released to the student. Whereas it use to be, you know, the instructor could just send a note and that was enough.

TLW: So...and so you felt like, well, like...What is your feeling about that? I mean do you think that the students are missing out because they can't do the case studies?

Professor: Well, yes and no,... you know...the student can’t go back and doesn’t have the opportunity to dig that information out so much themselves. But pretty much, I will spend at least with each student, with every student probably about a twenty or thirty minute session, now not with each student every day, but with the clinical group, you know. At some point that I have that group of students with me, I will do what I call an instant case study. And I will go through it with them, cause like I’ve done so much of that and from that is really one of the basic things that was ingrained in me from in my very early years in nursing. So, you know, I will do that with them, and some really do appreciate it and some...some, you know, they start getting glassy eyed...too much information, or, you know, it’s a challenge sometimes for them to see the relevance. And even when I know for a fact, now I won’t sometimes say, “Now you know I have an exam question related to this material”. I mean, sometimes I will say that, but I won’t say exactly what the item is. But sometimes I will outright say you know...”You could see this on an exam, you know this …you might want to pay attention to this”. Or just through sheer nonverbal communication the..., you know, tone of voice or
something, you know. And really kind of draw them back into
eye contact and say now, “Look at this”, and, you know,
sometimes that’s all it takes and that’s very effective. And then
there are always a few, there are always a few either way that
just, you know, they, you know just really appreciate it, and
really get it, and a few that are highly resistant. (TLW laugh)
And sometimes don’t pass the course because they were failing
to latch on to that aspect that, you know, I know what they
need to know. And I see that they’re not getting it and I am
trying to MAKE them get it. But some of that has to come
from within them also.

TLW: Yeah, now the clinical experience, since my background
is in science, I have done a lot of laboratories so...so what is
entailed in a clinical experience for a nursing student?

Professor: Well, in the early....early courses, which I am not
teaching right now, they’ll usually go a day ahead and get
some information on their patients. Now that is one of the
things with current technology, sometimes they are able to
print out, instead of having to sit and hand transcribe. They are
able to print out the basic jest of information and to cut off any
identifying information. So that basically they are left with
things like doctors orders, the plan of care, what the
medications will be for that patient the next day, and other
types of procedures or dressing changes or things like that.
And then they spend that evening preparing for that patient
care the next day. The down side of that is that sometimes the
patients are no longer there so they kind of have to (TLW:
Wow) be reassigned to a new patient. Now in the OB course
which is one of the ...either the last or the second to last
course of the Associate... of the Associates degree program.
They don’t go ahead of time. Which is, you know, I think is
also very good, because once they get out into the real world it
is just not realistic to expect that the nurse is going to have,
you know, that spend all evening the night before she goes to
work planning her day the next day, and still have a life too.
That, you know, that’s just way too much to expect. And that
was one of my biggest adjustments when I got out of school. I
felt like I wanted to know everything about every patient I took
care of, to the extent that I would be able to write a 30 page
paper on it. And that was a big shock not to be able, you know,
just to have to go and deal with patients and not to be able to
create, you know, spend hours, and hours getting all this
background information. No, you have to, you know, get up
and go running shoes on and be able to take care of 2, 3, 4
maybe 8 patients or more. And...so I think it is good that they
are able just to go that morning, get their assignment and then
of course, especially early in the course before they have had
the course material, then I have to be much more available.
You know, to...to...to assist them to understand what they are
seeing and assist in...to be available for them in giving that
care. In the OB setting, in labor and delivery, that is...people
don’t usually think of that as a critical care unit, but it really is.
It is a restricted area, you know, they usually have double
doors that, you know, limited access through the double doors,
not everybody can just come and go in there. And not
everybody should be coming and going in there. It should be
more restricted. In that setting, where people are actually in
labor or actually giving birth, or that several, maybe one or two
hours after birth, or else maybe they are in preterm labor and
trying to stop preterm labor, or some other high risk conditions
for which the ratio with a nurse would be like one to one or
maybe...maybe one to two or three depending upon how
critical, you know, what’s going on with the patient. The
student role there is more observation and buddy with a
nurse. Now, in the subsequent course or possibly the previous
course, depending upon the sequence that a student has in their
last semester, they do precept with a nurse where they are
actually very much hands on and much more like what it will
really be like when they finish school. Now I am not teaching
in that course. I do find a difference if I have students who
have already had the preceptor course. Then they are already
use to functioning more independently with a nurse that is
assigned to their patient and to being that is their focal point of
interaction as opposed to if they have not had that and still
looking to their clinical group as their main interaction, and
still looking to faculty like their faculty and their clinical group
as kind of like a little social clinic...clinically related social
circle. Or thinking that like, you know, the...every minute
turn to faculty. And usually with the ones that have not had the
preceptor course, you know, I know that and I am kind of
prepared to deal with that. And I will tell them, “I am
going...you will be split up among several areas you will not
all be on a single unit”. Some will be in nursery, which is also
a more observational...a more observational unit, especially
where I am because Baton Rouge General does not have a
normal newborn nursery. It has only NICU, neonatal intensive
care. So if the baby is basically a well baby, that baby will be
on the postpartum unit. It will...we call it mother baby, so its

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rooming in, the baby will be rooming in with the mother if, you know, unless there's a problem that the baby has a need for some type of NICU. Sometimes it might be a few hours. Sometimes, you know, the baby might start out there immediately from birth. So, because it is NICU, which definitely is a critical care unit and the medications and the procedures to done to those... they are so fragile and so highly technical... that also is an observational... mainly an observational role. Now students in that setting sometimes they do have more hands on there are some babies who are, like no longer on ventilators, that they are in an open crib, they don't require any extra warming, they are just about ready to go home, so and they're feed... like the no tube feedings, they can be bottle feed. So students can assist with those babies with the feeding, and the rocking, and the diaper changes, and that type of thing and get hands on well baby kinds of care. But as far as the critical nursing care that is done to the babies the students would be again buddy with a nurse and mainly observation. Contrary to the mother baby unit, where I spend most of my time, I would like to spend more of my time like in the action of labor and delivery. That is what I really like. I really like to be there the best, you know, I can just never get enough of that. But, as far as what students can actually do, I really need to be on the mother baby unit. They do buddy with a nurse, but the nurses are not preceptors there, and the other units that I mentioned the nurses are not preceptors. So I am the main resource for the students on the mother baby unit, who are hands on pretty much the total scope of patient care. And usually I will get to know the nurses and the student... I do allow the students to go with a nurse. They don't have to go with me and so usually who every gets to the initial assessments with the... we do mother and baby assessments that is one of the main things we do right off the bat. So whoever gets... if the nurse is ready to go with the student that's fine with me. The student can go with that nurse to the do that initial mother and baby assessment. If I am ready before the nurse, and especially if the nurses are busy, they usually greatly appreciate it and look to me to go ahead and go with as many students as I can. So I try to, you know, very carefully, that is when I talked to you on the phone the other day talked about putting the heads together and setting the stage. You know that is one of the day to day, before I go to a place, and then once I've been there for a few days, a few semesters, whatever, day to day usually I know most of the nurses. Sometimes there is a new nurse. I can usually tell. This
is what I call the board. It is kind of an erase board like you saw in the classroom and it is where the public can’t see it. But there will be a listing of like, who the patients are, and a brief comment of what their status. So it doesn’t tell me everything, like sometimes like sometime if a patient is particular difficult, or say the patient has been either abusive to the nurses, or there is something in the patient’s background that is just a case that the nurses think will it is not a good case for the student to be involved in. There is just some dynamics going on and that it would really be better to avoid that. I cannot tell that from the board. But I can tell enough to see whose on. I kind of have an idea of what their dispositions is. I can kinda tell at a glance, like if there is no empty slots, in other words there is no room in the Inn. Like, like or there was no …like Christmas day there was no … Jesus, Mary and Joseph, no room at the inn. This is going to be one of those days. There is no room to put anybody else. So therefore if anybody else comes in, you know, or the ones that are delivering now, if there is no room on labor and delivery and all these deliveries are going on. Once they deliver where are they going to put these people? You know, in the rooms where there is no slots to put them in now, and then if anybody comes in from the outside where are they going to put them. So I can tell that right off the bat. This is going to be a very busy day as to juggling this type of situation, usually it all works out but I try to be especially helpful and be on my toes and to do what I can as far as merging what I can do to help the nurses, and also with the students need for their ordinary learning experiences. Now that type of day is usually great for student learning ‘cause there is just so much going on. (TLW: Yeah) And usually most of the time the students, most of the students are very helpful and looking for, you know, things to do to be helpful. So a little bit of extra help to the staff on days like that, that goes a long way to smoothing out my role long term to make things work. You know, in creating relationships and creating good working relationships.

TLW: Right. Now you have mentioned a couple of times this role of preceptors for the nurses, do they have to go through certain type of training or have certain credentials, or whatever, to do that?

Professor: Yes, and that is …the State Board of Nursing has some regulation in that and then the school also has certain protocols. And I’m not in that course, so Kathy could probably
explain more about that to you, since she has been here, you
know, for a good while that she knows all the ins and outs of
that aspect of it. But usually there...even with the preceptor,
there is faculty is responsible, it is just the faculty is not on site
with the students. But faculty do usually make rounds with the
students and faculty are usually available to all the students
that are in clinical at any point in time, as a contact person. But
the main supervising clinical person would be the preceptor
themselves. And I do believe that every so often there is like
an ERA workshop or, you know, a little training session or
something, you know, some type of a little formal type
program that is done. And then there is that ongoing
informal...getting together...either in person either in phone
calls or possibly even by e-mail these days between faculty and
preceptor. So there’s, you know, there is communication that
goes on and preparation for that also. And then the students
also have their orientation as to their expectations in that role.

TLW: Yeah, I am sure that has to be spelled out. Well...now
could you explain to me like what classes are offered in your
program and maybe which classes you teach?

Professor: Yes, we have...there is some preliminary courses
that they have to take. And if you like maybe I could print like
a degree...give you a copy of a degree plan so you would have
that to refer to. I will give you that on your way out.

TLW: Oh, that would be nice.

Professor: So there is like Anatomy and Physiology,
Psychology, an introductory Chemistry, English, College
Algebra; so, some of the usual typical freshman types of
things. Then there’s also Psychology Across the Lifespan,
which is growth and development, and Nutrition. Human
Nutrition, which...those two courses can be taken, they don’t
have to be completed before they start their initial nursing
courses. Some of the more...that whole first semester’s of
courses that have to be completed before they can be accepted
into the program and start their nursing courses. In addition to
nursing courses, there is a Sociology course that can be taken
later on down the line. Just in the process of waiting to get in,
some students will do some of the later courses that can be
taken concurrently with Nursing. Some students get all of that
out of the way first. And there is also either, it can be either a
Theology, Philosophy or Religion, Philosophy one
other...Anthropology, higher level course related to that, that is another background course that can be usually it can be taken concurrently but some have taking it before. Then when they enter Nursing there’s Fundamentals...Fundamentals of Nursing and Pharmacology... that is their first two main nursing courses. Then there is an Adult Health Nursing, Mental Health Nursing, Pediatric Nursing and then the final semester is...oh, did I say a second Adult Health Nursing...so there is...OK Fundamentals, the first Adult Health Nursing, the second Adult Health Nursing and then that Preceptorship, that really is that third more advanced Adult Health Nursing course that includes critical care. And that last semester is that particular course, and the OB course.

TLW: OK so the OB course is the last one.

Professor: Yeah.

TLW: And this is for the...

Professor: Will it can be it is in the last semester, but any given student can take either OB or that Adult Health Preceptor course, that is interchangeable. They can...you know...so the last semester either one can be taken in either sequence.

TLW: And so the degree that they receive is an Associate degree, or a Bachelors degree?

Professor: No, an Associate of Science in Nursing, ASN.

TLW: An associate of Science in Nursing. And then do you offer other...other degrees like a Bachelor’s or graduate degree, and do they take any OB courses in those?

Professor: They do not have to retake the OB course for the Baccalaureate program. That is...it...and we do have that. They do have to take Community Health Nursing they do have to take Research in Nursing and there are probably several other background courses they have to take they have to take some additional English courses, maybe one, maybe more than one. In other words, probably any standard Bachelor’s degree, they have to take supplement whatever they did not get in Associate degree. Like the English composition, English II, General Statistics, and several other courses that are included in addition to nursing courses to complete their BS Degree in
Nursing. And we also offer Masters in Nursing with the focus on Education, Nursing Education, and we also offer a Masters Degree through the Anesthesia program. (TLW: Oh, yeah) That use to be just another certificate diploma type program and that has gone...the Anesthesia programs have gone towards being Masters' programs in their own right. So we also have that. Now also we do have an accelerated program for...in Nursing...that I do not teach in that, that is for people who already have a degree in Nur...a degree not in Nursing and who want to get an Associate degree. So now a person in that type...making that type of decision would have to decide...well, do they want...is an Associate degree sufficient for them, or do they want a BSN. If they already have a Bachelor's degree for some of these people Associate in Nursing is sufficient for them. If they wanted to advance in nursing as a career then they may have to go back and still even though they already have a Bachelor's degree specifically get that Bachelors of Science in Nursing, Masters of Science in Nursing and some type of Doctorate degree depending upon what their career goals are. But simply to work as a nurse the Associate degree in Nursing would be sufficient for them. And that program they usually can not have an outside job. That basically, that program is so demanding, it is ... I think a 10 month program. (TLW: Wow) So it is very demanding and they have...oh, we usually have at least seven weeks in the course. They may have like three to four weeks for each course so it is very intense and very fast pace. Then we have another program LPN, Licensed Practical Nurse, to RN. So THEY do not have to repeat the same of the fundamentals courses, but they do have to take...(that's Kathy passing by back and forth out there)...they do have to take...there is a Transition course that they have to take. I would have to look at the degree plan to see, I am not too sure what they do about the Pharmacology. They would also have to take...any of the...any of the core courses like the English and that type of thing, you know, that would be required for the Associate of Science degree. They would have to take that. But as for actual Nursing course they take ...that Transitions and then they take the OB and the Preceptor course. I don’t think they need to take the Pediatrics and the Mental Health. I think they...you know...as far as the Transition Nursing course, the OB, and the Preceptor Adult III course. And when I say OB, I always call it OB, but sometimes it is Maternal and Newborn Nursing sometimes its Family Nursing. That can have different titles in different schools and the official title is usually never called OB Nursing any more. I
just do that out of habit because that is basically how I grew up in nursing with it. But, if you look in the course catalog it is probably going to say Maternal Newborn or something… or Maternal, Newborn and Women’s Health, something like that.

TLW: So… if someone was going to work in labor delivery. If a nurse wanted to work in labor and delivery, would she need extra qualification or does she get extra training?

Professor: Different hospitals do that different ways. For quite a while it use to be that you had to work maybe a year or two on a regular unit before you would be allowed to work in labor and delivery. And that is more of a hospital type of thing than say a nursing school type of thing. These days…and also the same is true for critical care units and neonatal care units… More recently there are, you know, it depends on the staffing of the units and what their needs are, and there are times where people fresh out of school will be recruited to and allowed to work in specialty units. Especially if the student had worked there before either as a Nurse Tech, many hospitals have nurse tech programs, where the student instead of being saying a Nurse Aide or a Patient Care Attendant (which is the lingo they use these days). That it is a little bit of a higher status. They have a little bit more of a flexible schedule to dovetail with their school work and peak times for exams and that type of thing. So in that sense if the student has already been a tech on the unit and the student…that is really what they want to do and there is a place for them on the unit and the unit personnel have then also developed that knowledge in relationship with the student. That, you know, that does happen that they can go straight into a unit like that and work there if that is their choice. And now in that particular…usually in a hospital orientation the hospital itself would provide a certain amount… a few weeks, or whatever, general orientation just to the hospital itself, then, an even more precise orientation on the unit, whichever unit it is, and then again several weeks of working side by side with a nurse that is a preceptor. And then what usually happens with the preceptors…and now that’s a preceptor…and I am saying preceptor it could be called something else in the hospital, but where they’re under somebody’s wing working and maybe its the same person usually, and it could be a different person from day to day. But what I have seen when I have been there with students and a new nurse is coming on, and sometimes it is even one my own students from the past that is coming on,
they’re usually working side by side with a lot of assistance in the early days. And then the staff nurse that is working with them starts stepping back and is more like hovering as a watchful guardian angel or, you know, that type of thing. Ready to step in if needed but more and more turning loose...turning loose and turning over more complex things, where there is really a lot going on at one time. Like when the baby is born, you need to do the identification, you need to do Apgar score and it is suppose to be exactly at one minute and five minutes and in the mean time you need to be watching the mother and baby being sure everything is really OK with them. And then applying the bands and doing the fingerprints and the footprints and so on and so forth and also assisting the physician. That’s a lot at one time. (TLW: It is.) That is one of the reasons that, if I really loved to do that much at one time, that’s where I would be. But in teaching I can still be around it, but I am not under that same degree of pressure of having that total responsibility of me to achieve all of that at the same time when that is going on. But, that is what those nursing do and in training a new person to work with that. We can introduce that in nursing and we can point that out to students and we can assist them. But I would not turn a student loose to manage the entire nurse’s role in labor and delivery. The student’s role in that particular frame is to observe, take in as much as they can, and then come back, you know, discuss it with me, discuss it with the clinical group in clinical conference, through their written assignments, and them maybe items related...you know, exam related items that maybe include content related to what they have seen. So...but...I guess...getting back to your question. That’s very much...That gets back...that is probably the most...whether it is...they’ve worked fresh out school even if they are an experienced person who has worked labor and delivery in another hospital, a new person coming on. That is where you are going to see the most of probably your work interest has been with that French...was it French midwife, you know, and more that apprenticeship working side by side. I think that is where you are going to see...you would see some of that in what we do day to day as faculty. But to actually be totally capable and functioning working independently, some of that is going to be done with that true apprenticeship type whether you call it an apprenticeship, preceptorship, or whatever, you know, on the units when they actually get in the hospital. I would say, it is probably going to be maybe about four to six months, before, you know, the student really...before somebody really starts feeling more
confident, and really about a year before they really, you know, before like the staff themselves will back off and feel like that nurse can handle anything.

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076 TLW: Yeah, now when we talked on the phone you mentioned some modern day midwives and could you maybe explain a little about what qualifications a person has to have and what they can do?

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078 Professor: They would usually have to have a Bachelor’s degree in Nursing. So if one of my students, that is their long term goal, the advantage to that student would be that they could come on and get a degree in Nursing and start having an RN salary, if they needed a salary, and then they could be possibly working full or part time and go back and get that BSN. And then they would still have that next extra step, and get that Master’s degree in Nursing and certification as a nurse midwife. Now there might be still some lay midwives around that still do home births, whatever, but pretty much as far as acceptable medical standards, you don’t see too much of that any more. And just as far as going to a diploma program to be a nurse midwife, which they used to have, to my knowledge almost everything now has gone to Masters degree to be a Certified Nurse Midwife which is an Advanced Practice role in Nursing, which basically there are four Advanced Practice roles in Nursing- Nurse Practitioner, Clinical Nurse Specialist, Nurse Midwife, and Nurse Anesthesia. (TLW: Oh). And there is currently somewhat of a tide, or a movement to get Education in itself as a role of Advanced Practice. To my knowledge, it is not currently recognized as one of those four Advanced Practice roles. Which in those roles... those roles involve usually extra training and documentation that the nurse has had advanced Pharmacology and also advanced... even more advanced Assessment and Diagnosis so that... like a Nurse Practitioner you are probably familiar with that. (TLW: Right) That ... these specialties were usually in conjunction with a physician but can independently... they can see a patient, diagnosis and prescribe for a patient under a physician’s umbrella. But not necessarily... like the physician ... the physician doesn’t have to be in the room with them and that type of thing. You know, it is not the same like if a doctor tells a working nurse, gives her verbal orders, she can write that in a chart or put it in the computer, that is a different thing, that is an ordinary nurse. These nurses can actually give the orders. There is also another role that is not Nursing but
that Our Lady of the Lake College has and that is Physician’s Assistant. And that is also a Master’s Degree. So some nurses will go into that role instead of the nursing role, because, just because they like the medical model and the medical part of it rather than the “nursecy”, “nursecy” in quotation marks aspect of it. So some nurses will go that route but that is kind of separate role from Nursing.

TLW: And so a modern day midwife...where would they work...like?

Professor: Oh, they would work, they could possibly have a private practice usually they are in collaboration; if they have a private practice they usually have some type of collaborative agreement with a physician. They also have...have to have collaborative agreements like if their patient becomes high risk, that they can turn that patient over. And sometimes that happens during the pregnancy so it can be planned for and that is a very easy transition, but if it is in the middle of a delivery that they have to have, you know, somebody that works with them that is willing to step in for an emergency delivery like on the spot. So that is a little extra level of collaboration and working together that they have. And you would probably also have to verify what’s really...how they do things with somebody that is actually doing that. That’s what I am telling you is my perception of how it works. The one I have worked...have seen two in pretty active practice, one was at...in New Orleans before the storms and I am not sure what she is doing now. I think she worked...I think she had a private practice but she was in collaboration with a group of physicians and she would come to the hospital. I was not actually present when she delivered babies. I may have had students in the room when she delivered babies. And she loved her work. She had gone back to school to get her Master’s degree to function in that role and had also...there is kind of...like physicians take a board exam to become board licensed. It is a licensing certification type of exam that they take. So she had gone through that whole process and then there is also one at Baton Rouge General that’s practicing and she is with the Ochsner’s group of Physicians. And so she does...and she goes...they have multiple offices like one is like right near Baton Rouge General itself. The Ochsner’s doctors’ office is right in proximity to the hospital, but those doctors and that midwife also routinely go to whatever branch offices
they have. Like I believe somewhere in Baker, you know, some of the more outlying areas. Sometimes they have offices there too. So she will see people just like, you know, like a normal... progressing through a normal pregnancy you have certain routine visits that you go to the doctor's office for, well she will see patients there, and at the time of the delivery, or if they are in the hospital, sometimes she will be making rounds if they are hospitalized for something during their pregnancy. Then at the time of birth she will be... kind of function very similar to what an obstetrician does, is as best as I can explain it. So...

TL.W: So, that is very interesting.

Professor: The nurse midwives likewise they are usually very receptive to having students buddy along with them. You know, it is very, very, rare that either a nurse, a midwife or an obstetrician will advice that this is not a good patient. That is just very... that is extremely rare. Now sometimes a patient would prefer not to have a student. And to me that is also totally understandable. Because it is their birth and their time (TL.W: Right) and another thing that I am... I am very particular about it like how many people would you like to be standing in a room and looking at your perineum. You know, it sounds very blunt. But students can get very excited like it is not their assigned patient. But they might have a little lull that they actually have time so they could go in and see that. Its like, “No”. You know, under certain circumstance maybe so. Is it OK with the patient? Is it ok with the others who are managing the care? Sometimes they need extra help and they are glad to have extra students in the room, that happens too. But just this is what I say, “Its not ‘That’s Entertainment’”. (TL.W: Yeah) And the other thing is, once the baby’s out the show is not over. You know, its not... No, you are not going in there to be entertained solely to see what you can see. You are going in there to learn but also to take care of patients and be part of, you know, part of life beginning and there is a continuation of this process. Once the baby is out there is still a lot of critical care that is going on.

TL.W: Uh huh

Professor: So and most students, once I set that as an expectation, I don’t have many problems with that. But I would say of the problems that I have its like, “OK, the baby’s
out, I’m going to lunch”. Or the other thing is that, “OK, I’m going to lunch now”. and then want to just pop in and out of rooms to go see who they can go to lunch with. And at any point, because of what it is, even if it is on the mother baby floor. Its like, “No, you don’t just pop in to socially arrange that type of thing with a classmate”. If you are going in and they need two nurses … two students in there for a reason, that is one thing, but if this other person has your money, or this other person has your watch, “No, that should be planned ahead of time so that you are not just popping in, in moments where there is some private care could be going on that somebody should not be just popping into the room and the patient having to deal with that type of stress”. (TL.W: Yeah) So that’s … and I think the staff, that’s another thing that the staff appreciates, that I kind of have a watchful eye. Sometimes it will still happen but I try and keep a watchful eye out for that and I try to set the tone with my original expectations in the beginning that students are aware of that. And, you know, I usually do not have problems with that.

TL.W: Well, this has been very, very helpful. I’ve really enjoyed it. I don’t want to take much more of your time. I know you are very busy, but if there is a few minutes, I would like to see the model

Professor: Yeah, that is what I want to show you next and pick up the degree plan for you.

TL.W: Great!
APPENDIX E:

CODED “CORE COMPETENCIES FOR BASIC MIDWIFERY PRACTICE”
Coded “Core Competencies for Basic Midwifery Practice”

Core Competencies for Basic Midwifery Practice

The core competencies for basic midwifery practice describe the fundamental knowledge, skills, and behaviors expected of a new practitioner. Accordingly, they serve as guidelines for educators, students, health care professionals, consumers, employers, and policy-makers and constitute the basic requisites for graduates of all nurse-midwifery and midwifery education programs accredited/preaccredited by The American College of Nurse-Midwives (ACNM) Division of Accreditation (DOA)* <http://www.midwife.org/about.cfm?id=54>.

Midwifery practice is based on the Core Competencies for Basic Midwifery Practice, The Standards for the Practice of Midwifery <http://www.midwife.org/display.cfm?id=485> and the Code of Ethics <http://www.midwife.org/siteFiles/education/Code_of_Ethics_June_2005.pdf> promulgated by the American College of Nurse-Midwives. Certified nurse-midwives (CNMs) and certified midwives (CMs) who have been certified by ACNM or the American Midwifery Certification Board, Inc. (AMCB), formerly the ACNM Certification Council, Inc. (ACC), assume responsibility and accountability for their practice as primary health care providers.

The scope of midwifery practice may be expanded beyond the core competencies to incorporate additional skills and procedures that improve care for women and their families. Following basic midwifery education, midwives may choose to expand their practice following the guidelines outlined in Standard VIII of the Standards for the Practice of Midwifery.

Midwifery education is based on an understanding of health sciences theory and clinical preparation that shapes knowledge, judgment, and skills deemed necessary to provide primary health care management to women and newborns. Midwives provide health care that incorporates appropriate medical consultation, collaborative management, or referral. Each education program is encouraged to develop its own method of addressing health care issues beyond the scope of the current core competencies, and each graduate is responsible for complying with the laws of the jurisdiction where midwifery is practiced and ACNM Standards for the Practice of Midwifery.
ACNM defines the midwife's role in primary health care based on the Institute of Medicine’s report (1996)*, the ACNM philosophy (2004), and ACNM Board of Directors’ Position Statement on Certified Nurse-Midwives and Certified Midwives as Primary Health Care Providers: Case Managers [http://www.midwife.org/siteFiles/position/CNMs_&_CMs_as_PCP_05.pdf] (1997). Primary health care is the provision of integrated, accessible health care services by clinicians who are accountable for addressing the majority of health care needs, developing a sustained partnership with patients, and practicing within the context of family and community. As primary health care providers, CNMs and CMs assume responsibility for the provision of, and referral for, appropriate health care services that are within a defined scope of practice. The concepts, skills, and midwifery management process identified below comprise the foundation upon which practice guidelines and educational curricula are built. The core competencies are reviewed and revised regularly to incorporate changing trends in midwifery practice. This document must be adhered to in its entirety.

I. Hallmarks of Midwifery

The art and science of midwifery are characterized by these hallmarks:

A. Recognition of pregnancy, birth, and menopause as normal physiologic and developmental processes
B. Advocacy of non-intervention in the absence of complications
C. Incorporation of scientific evidence into clinical practice
D. Promotion of family-centered care
E. Empowerment of women as partners in health care
F. Facilitation of healthy family and interpersonal relationships
G. Promotion of continuity of care
H. Health promotion, disease prevention, and health education
I. Promotion of a public health care perspective
J. Care to vulnerable populations
K. Advocacy for informed choice, shared decision-making, and the right to self-determination
L. Cultural competence
M. Familiarity with common complementary and alternative
therapies
N. Skillful communication, guidance, and counseling
O. Therapeutic value of human presence
P. Collaboration with other members of the health care team

II. Components of Midwifery Care: Professional Responsibilities of CNMs and CMs

The professional responsibilities of CNMs and CMs include, but are not limited to, these components:

A. Promotion of the hallmarks of midwifery
B. Knowledge of the history of midwifery
C. Knowledge of the legal basis for practice
D. Knowledge of national and international issues and trends in women's health and maternal/newborn care
E. Support of legislation and initiatives which promote high quality health care services
F. Knowledge of issues and trends in health care policy and systems
G. Commitment to the ACNM's Philosophy, Standards, and Code of Ethics
H. Ability to evaluate, apply, interpret, and collaborate in research
I. Participation in self-evaluation, peer review, continuing education, and other activities that ensure and validate quality practice
J. Development of leadership skills
K. Familiarity with practice management and finances

III. Components of Midwifery Care: Midwifery Management Process

The midwifery management process includes:

A. Systematically compiling and updating a complete and relevant database for the comprehensive assessment of each client's health, including a thorough health history and physical examination
B. Identifying problems and formulating diagnoses based upon interpretation of the database
C. Identifying health care needs/problems in collaboration with the client
D. Providing information and support to enable clients to
make informed decisions and to assume primary responsibility for their own health

E. Developing a comprehensive plan of care with the client

F. Assuming primary responsibility for the implementation of individualized plans

G. Obtaining consultation, planning, and implementing collaborative management; referral or transferring the care of the client as appropriate

H. Initiating management of specific complications, emergencies, and deviations from normal

I. Evaluating, with the client, the effectiveness of care and modifying the plan of care as appropriate.

IV. Components of Midwifery Care: Fundamentals

A. Anatomy and physiology, including fetal anatomy and physiology

B. Normal growth and development

C. Clinical genetics

D. Psychosocial, sexual and behavioral development

E. Basic epidemiology

F. Nutrition

G. Pharmacokinetics and pharmacotherapeutics

H. Principles of individual and group health education

V. Components of Midwifery Care: The Primary Health Care of Women

A. Health Promotion and Disease Prevention

Independently manages primary health screening and health promotion of women from the perimenarcheal through the postmenopausal periods

**MIDWIFERY PRACTICE**

1. Applies knowledge of midwifery practice that includes, but is not limited to, the following:

   a. Nationally defined goals and objectives for health promotion and disease prevention

   b. Parameters for assessment of physical and mental health, including domestic violence, sexually transmitted infections, and substance, alcohol, and tobacco use
c. Nationally defined screening recommendations to promote health and detect/prevent disease

d. Management strategies and therapeutics to facilitate health and promote healthy behaviors

2. Applies knowledge of midwifery practice in the preconception period that includes, but is not limited to, the following:

   a. Assessment of individual and family readiness for pregnancy, including emotional, psychosocial, and sexual factors
   b. Impact of health, family and genetic history on pregnancy outcomes
   c. Influence of environmental and occupational factors, health habits, and behavior on pregnancy planning
   d. Health and laboratory screening to evaluate the potential for a healthy pregnancy

3. Applies knowledge of midwifery practice of gynecologic care that includes, but is not limited to, the following:

   a. Human sexuality
   b. Common screening and diagnostic tests
   c. Parameters for differential diagnosis of common gynecologic problems, including sexually transmitted infections
   d. Essentials of barrier, hormonal, mechanical, chemical, physiologic, and surgical conception control methods
   e. Management strategies and therapeutics for common gynecologic problems and family planning needs
   f. Management strategies and therapeutics for sexually transmitted infections that includes indicated partner evaluation, treatment, or referral
   g. Counseling principles for sexual behaviors that promote health and prevent disease
   h. Counseling, clinical interventions and/or referral for unplanned or undesired pregnancies, sexual concerns, infertility, and common gynecologic problems.

4. Applies knowledge of midwifery practice in the
perimenopausal, postmenopausal and aging periods that includes, but is not limited to, the following:

a. Effects of menopause on physical and mental health  
b. Identification of deviations from normal  
c. Counseling and education for health maintenance and health promotion in the aging woman  
d. Management strategies and therapeutics for alleviating the common discomforts that may accompany the perimenopausal period

B. Management of Common Health Problems

Independently manages, within the CNM's/CM's defined scope of practice, common health problems of women, utilizing consultation, collaboration, and/or referral to appropriate levels of health care services as indicated

1. Applies the knowledge of midwifery practice that includes, but is not limited to, the following:

a. Identification of deviations in the following areas:
   - Cardiovascular/hematologic  
   - Dermatologic  
   - Endocrine  
   - Eye, ear, nose, and throat  
   - Gastrointestinal  
   - Mental health  
   - Musculoskeletal  
   - Neurologic  
   - Respiratory  
   - Renal  

b. Management strategies and therapeutics for the treatment of common health problems/deviations of essentially healthy women

VI Components of Midwifery Care: The Childbearing
Family

A. Care of the Childbearing Woman: Independently manages the care of women during pregnancy, childbirth, and the postpartum period

1. Applies knowledge of midwifery practice in the antepartum period that includes, but is not limited to, the following:
   
a. Diagnosis of pregnancy
b. Genetics, placental physiology, embryology, and fetal development
c. Epidemiology of maternal and perinatal morbidity and mortality
d. Influence of environmental and occupational factors, health habits, and maternal behaviors on pregnancy outcomes
e. Emotional and psychosexual changes during pregnancy
f. Health risks, including but not limited to, domestic violence, sexually transmitted infections, substance, alcohol, and tobacco use
g. Promotion of breastfeeding
h. Indicators of normal pregnancy and deviations from normal
i. Assessment of the progress of pregnancy and fetal well-being
j. Etiology and management of common discomforts of pregnancy
k. Management strategies and therapeutics that facilitate healthy pregnancy and outcome
l. Anticipatory guidance related to birth, breastfeeding, parenthood, and change in the family constellation

2. Applies knowledge of midwifery practice in the intrapartum period that includes, but is not limited to, the following:
   
a. Diagnosis and assessment of labor and its progress
b. Assessment of maternal and fetal status during labor
c. Indicators of deviations from normal, including complications and emergencies
d. Measures to support psychosocial needs during labor and delivery
e. Management strategies and therapeutics to facilitate normal
labor progress

f. Techniques for (i) administration of local anesthesia, (ii) spontaneous vaginal delivery, (iii) third stage management, and (iv) performance and repair of episiotomy and repair of lacerations.

g. Techniques for management of emergency complications and abnormal intrapartum events

3. Applies knowledge of midwifery practice in the postpartum period that includes, but is not limited to, the following:

a. Postpartum self-care, newborn care and feeding, contraception, and family relationships

b. Management strategies and therapeutic to facilitate a healthy puerperium

c. Facilitation of the initiation and establishment of lactation

d. Deviations from normal and appropriate interventions including management of complications and emergencies

e. Management of discomforts of the puerperium

B. Newborn Care: Independently manages the care of the newborn during the first 28 days of life.

1. Applies knowledge of midwifery practice that includes, but is not limited to, the following:

a. Effect of maternal fetal risk factors on the newborn

b. Bonding and attachment theory

c. Evaluation of the newborn: physical and behavioral assessment and gestational age assessment

d. Primary health screening and health promotion up to 28 days of life

e. Methods to facilitate adaptation to extrauterine life: (i) stabilization at birth, (ii) resuscitation, and (iii) emergency management

f. Facilitation of continuation of breastfeeding

g. Indications of deviation from normal and appropriate interventions

h. Management strategies to facilitate integration of the newborn into the family
166
167
169
170 Source: Education Section, Division of Education
171 Approved by the ACNM Board of Directors: May 31, 2002
172 (Supersedes ACNM Core Competencies for Basic Midwifery Practice, May 1997)
173
174 Language in the introduction only was revised and approved by the ACNM Board of Directors in June 2004. This language reflects the retiring of the Guidelines for the Incorporation of New Procedures into Nurse-Midwifery Practice in 2003, concurrent with the revision of the ACNM Standards for Midwifery Practice.
APPENDIX F:

CODES USED FOR ANALYZING MIDWIFE INTERVIEWS AND DOCUMENTS
Codes Used For Analyzing Midwife Interviews and Documents

<table>
<thead>
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<th>Advance Practice</th>
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<tr>
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<td>Associate Degree in Nursing</td>
<td>insurance</td>
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<td>case studies</td>
<td>Interests</td>
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<td>certification and licensing</td>
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<td>Certified Nurse Midwife</td>
<td>lay midwifery</td>
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<td>Certified Professional Midwives</td>
<td>least effective training (graduate)</td>
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<td>Master's Nurse Anesthesia</td>
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<td>menopause</td>
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<td>midwifery schools</td>
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<td>degrees</td>
<td>models</td>
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<td>delivery</td>
<td>modern vs. older midwives</td>
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<td>mother baby assessments</td>
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<td>patient education</td>
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| personality |
| place of practice |
| preceptor |
| prenatal care |
| primary care |
| Professional Societies |
| relationship with other health care providers |
| skills |
| teaching |
| well woman exams |
| work experience |
| work they enjoy least |
| work they enjoy the most |
| write prescriptions |
APPENDIX G:

FAMILIES OF CODES
Families of Codes

Code Families

HU: Midwifery_atlas_t1
File: [C:\Documents and Settings\Administrator\My Documents\Graduate School\Dissert...\Midwifery_atlas_t1.hpr5]
Edited by: Super
Date/Time: 11/20/08 09:27:00 AM

Code Family: Credentials
Created: 11/19/08 06:24:59 PM (Super)
Codes (3): [Advance Practice] [certification and licensing] [degrees]
Quotation(s): 6

Code Family: Graduate Teaching methods
Created: 11/19/08 06:27:53 PM (Super)
Codes (9): [apprenticeship] [case studies] [clinical hours] [coursework] [hands on] [laboratory] [least effective training (graduate)] [models] [teaching]
Quotation(s): 24

Code Family: Midwifery work
Created: 11/19/08 06:30:24 PM (Super)
Codes (12): [delivery] [labor] [menopause] [non-intervention] [personality] [prenatal care] [primary care] [skills] [well woman exams] [work they enjoy least] [work they enjoy the most] [write prescriptions]
Quotation(s): 18

Code Family: Types of midwives
Created: 11/19/08 06:31:41 PM (Super)
Codes (5): [Certified Nurse Midwife] [Certified Professional Midwives] [doulas] [granny midwives] [lay midwifery]
Quotation(s): 14
APPENDIX H:

NURSE MIDWIFERY CURRICULUM FROM STONY BROOK UNIVERSITY
Nurse Midwifery Curriculum from Stony Brook University

<table>
<thead>
<tr>
<th>Graduation Requirements</th>
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<th>Advisement Notes</th>
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<tr>
<td><strong>Nursing Core Courses</strong></td>
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<tr>
<td>HNG 502 Advanced Theory &amp; Role Development: Computer Applications</td>
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<td>HNG 577 Families: Theory &amp; Intervention for Advanced Nursing Practice</td>
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<td>HNG 541 Statistical Methods &amp; Scholarly Inquiry</td>
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<td>HNG 543 Clinical Applications in Nursing Research</td>
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| **Departmental Requirements**                                 |         |                  |
| **Science**                                                   |         |                  |
| HNG 588 Pathobiology                                          | 3       |                  |
| HNG 540 Clinical Pharmacology                                 | 3       |                  |

| **Midwifery Theory Core**                                     |         |                  |
| HNG 555 Conceptual Frameworks in Midwifery I                  | 2       |                  |
| HNG 556 Conceptual Frameworks in Midwifery II                 | 2       |                  |
| HNG 558 Conceptual Frameworks in Midwifery III                | 2       |                  |
| HNG 559 Conceptual Frameworks in Midwifery IV                 | 1       |                  |

| **Advanced Nursing - Theory/Clinical Practice**               |         |                  |
| HNG 501 Primary Care                                         |         |                  |

| HNG 531 Advanced Health Assessment of Women                   | 2       | Must be taken concurrently with HNG 581 |
| HNG 581 Midwifery I                                          | 2       | Must be taken sequentially, I - IV |
| HNG 585 Midwifery II                                         | 5       | Must be taken sequentially, I - IV |
| HNG 586 Midwifery III                                        | 5       | Must be taken sequentially, I - IV |
| HNG 587 Midwifery IV                                         | 5       | Must be taken sequentially, I - IV |
| **Total Credits**                                             | 45      |                  |

**Program of study applies to class 15 and later.**
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<th>Clinical Clock Hours</th>
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<td>HNG 541 Statistical Methods &amp; Scholarly Inquiry</td>
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<td>Midwifery Theory Core</td>
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APPENDIX I:

REQUIRED CLINICAL TRAINING FOR CERTIFICATION OF NURSE MIDWIVES
### Required Clinical Training for Certification of Nurse Midwives

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<th>Experience</th>
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<tr>
<td>New antepartum visits</td>
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<tr>
<td>Return antepartum visits</td>
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<td>Labor management experiences</td>
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<td>Births</td>
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<td>Newborn Assessments</td>
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<td>Primary Care visits–common health problems</td>
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<tr>
<td>Primary Care visits – family planning visits</td>
<td>20</td>
</tr>
<tr>
<td>Primary Care visits – gynecologic visit</td>
<td>40</td>
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</tbody>
</table>
APPENDIX J:

TRANSLATOR’S CURRICULUM VITAE
Translator’s Curriculum Vitae

Katherine Horwinski Healy

CONTACT INFORMATION

Current Address: Ribeiro Meirinho C.P. 125A
8375-071 São Bartolomeu de Messines
PORTUGAL

Permanent Address: 760 Piezzi Rd
Santa Rosa, CA 95401
USA

Phone: (351) 925 080 308
Email: katehorwinski@hotmail.com

PROFESSIONAL EXPERIENCE

2000 – present Freelance translator (USA, France, Poland, Portugal). Translate documents primarily from French to English, and Portuguese to English, but also from English to French or Spanish to English. This has included website translation, business documents, contracts, advertisements, academic articles, and correspondence.

2008 – 2009 CS Fund (Freestone, CA). Translator of official documents and correspondence from French to English and English to French for a non-profit organization.

2004 – 2008 Louisiana State University (Baton Rouge, Louisiana). Economic Development Assistantship. Conduct archival research and compile into a corpus data base, present research at conferences, and make available via internet information on linguistic diversity (particularly dialects) of the state of Louisiana.

2004 – 2008 New Start LLC (Baton Rouge Louisiana). Cofounder/Partner. Perform all administrative duties for a small Real Estate investment business, including managing all legal and financial documents, dealing with renters, buyers, bankers, maintenance personnel, repairmen, etc. Extensive use of MS Office products such as Outlook, Word, Excel, and PowerPoint as well as QuickBooks financial software.

2003 – 2004 Université de Nancy 2 (Nancy, France). Professor’s Assistant/Lecturer in English as a foreign language. Teaching courses at all levels from freshmen to Masters students, and working professionals. Students are primarily majoring in English, Economics, or International Relations, or preparing to take the TOEIC, TOEFL, or Cambridge Exams.

2003 Chamber of Commerce – Training Centre (Lunéville, France). English Professor to working students specializing in sales - BEP and BAC PRO.

2002 – 2003 Collège Alfred Mézières, Collège Frédéric Chopin (Two middle schools in Nancy, France). English Assistant.

2001 – 2002 Collège Alfred Mézières, Ecole Primaire Alfred Mézières, Ecole Primaire Boudonville (A middle school and two elementary schools in Nancy, France). English Assistant. Teaching at all grade levels for 20 to 50 minutes (whole class or small groups), vocabulary, grammar, songs, history, general culture, etc.
Katherine Horwinski Healy

2000 – 2001 Linguissimo Language Center (Strasbourg, France). English Trainer for professionals in international business. Training individuals and small groups. Organization of intensive English immersion courses in the United States for language improvement and introduction to American culture. Responsible for the organization and logistics of these seminars, including budget and all training.

1999 – 2000 MTC (Provo, Utah USA). Teacher – basics in communication, public and human relations, study skills, religious studies and teacher training for future teachers (college age).

TRAINING


2003 – 2004 Université de Nancy 2 (Nancy, France). Diplôme d’Études Approfondies (DEA) in Language Sciences (Linguistics), Foreign Language Teaching - option “Production and reception of oral and written discourse”.


2001 – 2002 Université de Nancy 2 (Nancy, France). Diplôme Approfondi de Langue Française (DALF); Diplôme d’Études Françaises (DEF); Diplôme Supérieur d’Études Françaises (DSEF). (These are the three highest degrees in French as a Foreign Language offered in France.)


VOLUNTEER WORK

1997 – 1998 Charitable Organization (Washington DC and Maryland, USA). Full time service volunteer. Guide, teacher, and information service for individuals and groups (up to 200 people) in English, Spanish French and Russian, sometimes working as an interpreter or presenting in 2 or 3 languages at once to mixed language groups.

ACADEMIC PRESENTATIONS


Katherine Horwinski Healy

gateforeignlan.com


Fifth International Conference on Third Language Acquisition and Multilingualism at the University of Stirling in Scotland, UK. The multilingual mind and perception: Factors and views on self and world. Sep. 2007.

Fourth International Conference on Third Language Acquisition and Multilingualism at the University of Fribourg/Freiburg in Fribourg, Switzerland. Factors affecting cross-linguistic influence in lexical retrieval tasks: Roles of L1 and L2 in L≥3 acquisition. Sep. 2005.

PUBLICATIONS


APPENDIX K:

INSTRUMENT FOR ANALYSIS OF ILLUSTRATIONS
Instrument for Analysis of Illustrations
Using Tufte’s Theory of Graphic Design

Your Name ____________________
Figure Number__________________

1. The data are shown. **Chartjunk** has been minimized and **data ink** has been maximized.
   
<table>
<thead>
<tr>
<th>Not descriptive</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
</table>
   0                | 1 | 2 | 3 | 4 |
   Comments:

2. The illustration is **truthful** and **complete**, by current medical standards.
   
<table>
<thead>
<tr>
<th>Not descriptive</th>
<th>1</th>
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<th>3</th>
<th>4</th>
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</thead>
</table>
   0                | 1 | 2 | 3 | 4 |
   Comments:

3. The illustration is **multivariate**.
   
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</thead>
</table>
   0                | 1 | 2 | 3 | 4 |
   What variables are illustrated?

   Comments:

4. The illustration shows a **causal relationship(s)**.
   
<table>
<thead>
<tr>
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<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
</table>
   0                | 1 | 2 | 3 | 4 |
   Comments:

5. The **font** used has a serif.
   
<table>
<thead>
<tr>
<th>Not descriptive</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
</table>
   0                | 1 | 2 | 3 | 4 |
   Comments:
6. **Colors** are used appropriately, via Tuftian standards.
   
   Not descriptive 1 2 3 4
   Comments:

7. The illustration is **landscape**.
   
   Not descriptive 1 2 3 4
   Comments:

8. The illustration is in **reduced-but-appropriate size**.
   
   Not descriptive 1 2 3 4
   Comments:

9. The illustration is in **close proximity to the associated descriptive text**.
   
   Not descriptive 1 2 3 4
   Comments:
APPENDIX L:

INSTRUCTIONS FOR INSTRUMENT FOR ANALYSIS OF ILLUSTRATIONS
Instructions for Using Instrument for Analysis of Illustrations

Put your name and the figure number in the blanks provided. Each characteristic is to be rated on a scale from 0 to 4. If the illustration matches the description given below for “very descriptive” give it a 4. If it matches the description given for “not descriptive”, give it a 0. Use intermediate ratings to indicate the relative degree to which it falls between the two extremes.

1. The data are shown. Chartjunk has been minimized and data ink has been maximized.

   **Very Descriptive:** The illustration *emphasizes the data*, i.e., the anatomical structures being discussed in the caption. The illustration does *not contain any* graphical decorations, i.e., elements that do not tell the viewer anything about the data. All *the ink is used* to convey information about the data to the viewer.

   **Not Descriptive:** The illustration *emphasizes the decorative elements*. The illustration contains *mostly* graphical decorations that do not tell the viewer anything about the data. Most of the ink is used on the decorative elements and *little is used* to convey information about the data to the viewer.

2. The illustration is truthful and complete, by current medical standards.

   **Very Descriptive:** The illustration *does not distort* what the data has to say. The visual representation is consistent with current medical standards and the relative size of the parts is *consistent*. All of the important, relevant information is *shown clearly*.

   **Not Descriptive:** The illustration *distorts and lies* about what the data has to say. The visual representation is *not* consistent with current medical standards and the relative size of the parts is *inconsistent*. Important, relevant information is *missing* or *disguised*.

3. The illustration is multivariate.

   **Very Descriptive:** The illustration shows multiple variables. Variables would include things such as, but not limited to: shape, size, location, and orientation in space.

   **Not Descriptive:** The illustration only shows one variable.

4. The illustration shows a causal relationship(s).

   **Very Descriptive:** The illustration shows how the different elements influence and affect each other, i.e., it shows a *cause and effect*.

   **Not Descriptive:** The illustration merely shows the different elements, with *no indication* as to how they influence and affect each other.
5. The **font** used has a serif.

   **Very Descriptive:** The font used in the caption and illustration *has* a serif, i.e., a fine line used to finish off the main strokes of the letter.
   **Not Descriptive:** The font used in the caption and illustration *does not have* a serif.

6. **Colors** are used appropriately, via Tuftian standards

   **Very Descriptive:** The illustration uses colors *found in nature*. The *smallest effective difference* in color is used to show different structures.
   **Not Descriptive:** *Unnatural* colors are used. There is a *huge contrast* in color used to show different structures.

7. The illustration is **landscape**.

   **Very Descriptive:** The graphic part of the illustration, is greater in *width* than in *height*.
   **Not Descriptive:** The graphic part of the illustration, is greater in *height* than in *width*.

8. The illustration is in **reduced-but-appropriate size**.

   **Very Descriptive:** This illustration could *not be reduced* in size without a significant loss of legibility and information.
   **Not Descriptive:** This illustration could *be reduced significantly* without a loss of legibility and information.

9. The illustration is in **close proximity to the associated descriptive text**.

   **Very Descriptive:** There *is* a caption for the illustration and it appears on the *same page* as the illustration. The description in the text is *within one page* of the illustration.
   **Not Descriptive:** There *is not* a caption for the illustration. The description in the text *is many pages removed* from the illustration.
APPENDIX M:

QUOTES ABOUT MANIPULATIONS
We can easily tell if the arm presents itself; for in that case the membranes are elongated, & through it we feel the hand that differs greatly from the shape of the foot by its elongated & slender fingers. If the opening is sufficiently dilated, & the membranes not yet broken, pierce them, insert the hand up to the shoulder of the infant, without touching the hand nor the arm, & very gently push upward to reinter them; but often this does not succeed the first time, because the infant, too uncomfortable in his position, cannot yield himself to the movement that we want him to make; in this case, change the maneuver. These attempts being painful for the mother, spare her further discomfort, by directing the hand immediately over the side of the child, over the hip, thigh, knee & the leg, & when we have a foot, the first movement that we make to pull it towards us, will of necessity distance the arm from the canal: having thus found the other foot as well, bring the child out.

After having examined the different symptoms which I have just mentioned, you could be still better assured of the state of the woman by examining her by touch. For this purpose, have her lie on the edge of the bed, the head a little lowered, insert the index finger into the vagina, to touch the opening of the womb, moving it a little while pressing with the left hand on the navel, & you will feel the movement of the child, for it is often that the woman does not feel it move until the fifth to sixth month, & sometimes even later, but if it is in the first part of the pregnancy, & you cannot hope to feel the movements of the child, because of its small size, have the woman stand, & while touching her, you will find the opening of the womb exactly closed, more united, a little more curved towards the back on the side of the sacrum bone,
also feel a weight in the womb, which being lighter in true pregnancy, does not weigh on the orifice as in the case of the false seed, of the mole & of tumors. You must scrupulously examine all these signs, so as to be in a state to make an accurate report, & not make a mistake in the judgment given.

Avoid pressing the belly of the woman, hoping by this means to accelerate the exit of the infant. This practice is very bad: also refrain from putting a finger of each hand in the form of a hook into the woman’s [nether] parts, as many women do. This pulling is of no use to move the child’s head forward. Be content with dilating the opening of the womb, and again this must be done very gently. Do not hope, with one finger to move the head forward, one would risk injuring & scratching it from pulling, which happens only too often. When examining the woman, one should always be careful of the opening of the bladder, for fear that it be too tired; for lack of care, one could cause an inflammation, which would be dangerous. Do not insert the finger into the buttocks, in order to move the child’s head forward, this practice can only be damaging; the irritation of this part is capable of causing some kind of ulceration, which would be difficult to heal, & could cause the destruction of the barrier which separates the two openings, which would render the woman very disgusting. Be content to oil these parts with butter, if they are not too wet, either from mucus, or from the flowing of the waters, & if they have been dry for a long time, take care to moisturize them often, to make them more disposed to yield.

When we notice that the womb advances before the infant’s head, refrain from having the woman push: have her lie down in such a fashion that her head is lower than in an ordinary delivery. Insert the entire hand into her [nether] parts; for just one, & even two fingers will not suffice. Very gently push back the womb, while spreading the fingers; support it, & wait for the head to make itself felt without removing the hand, position which must necessarily be kept, until the child is ready to come: push back then, with the tips of the fingers, the orifice, as the head advances, & the woman will put her pains to work for her. After having birthed the woman with great precaution, which is to say, not having her push, & not pulling too hard on
the cord, for fear that the back of the womb be pulled out by the after-birth, after the exit of the infant, replace the hand in the womb, and push at the back; wait until it begins to tighten, & then remove the hand very gently. Have the woman remain lying with her head lower than usual.

P 1: Guide to the Art of Birthing, du Coudray_12_01_2010.rtf - 1:22 [After having attempted, as I s..] (602:602) (Super)
Codes:   [feel - Family: tactile] [finger - Family: tactile] [hand - Family: tactile] [insert - Family: movement] [pull - Family: movement] [touch - Family: tactile]
pg. 91-93

After having attempted, as I said, to pull the child gently, if there is resistance, insert a finger to find the cause; you will recognize this way that the difficulty comes from the orifice, feeling all around the neck of the infant, which is in the form of a sort of collar: it can easily be dilated, by inserting a finger of each hand, passed between the infant and the opening; run the finger all around to procure dilation, & it is necessary to find the shoulders: prevent the woman from pushing downwards, for fear that the womb close more and more. If the womb remains dry from the flowing of the fluids, grease the hands with unsalted butter, or oil, which will make the opening suppler, always taking care to have the child’s head supported, for fear that he suffocate.

P 1: Guide to the Art of Birthing, du Coudray_12_01_2010.rtf - 1:3 [Yet another difficulty while g..] (620:622) (Super)
Codes:   [examine - Family: movement] [feel - Family: tactile] [finger - Family: tactile] [hand - Family: tactile] [push - Family: movement] [touch - Family: tactile]
pg. 95-96

Yet another difficulty while giving birth, is caused by a slackening of the vagina. We distinguish this slackening from that of the womb, by examining the woman; for that of the vagina does not leave any fluid on the side of the buttocks; it is also smoother than the womb, because having dilated, all the roughness that we feel in its ordinary state, is found to be erased. It is necessary to remedy this, before the woman delivers; for the infant cannot exit except with great difficulty, & its exit together with the efforts of the mother, would cause an even greater slackening. To remedy it, proceed in the following manner. Push the child back a little, by first butting the tips of the fingers of one hand in on the buttocks side, avoiding touching it with the tips of the fingernails, for fear of injury, & continuing to push gently into the [nether] parts, push the vagina back in; continue to advance the hand, until it is under the orifice: leave the hand in this position to hold back the vagina, waiting for the child to advance, & as he approaches, gradually remove the hand.

P 1: Guide to the Art of Birthing, du Coudray_12_01_2010.rtf - 1:84 [When the child appears ready t..] (460:460) (Super)
Codes:   [feel - Family: tactile] [finger - Family: tactile] [hand - Family: tactile] [pull - Family: movement] [push - Family: movement]
When the child appears ready to come out, hold a hand to each side of the [nether] part, so that in flattening them, the thumbs spread as the child advances, & push away the labia majora during his exit. Once the head is out, hold it immediately, by sliding the fingers under the jaw, without taking the head by the ears, for fear of tearing them off, which has happened more than once. Thus holding the head, do not pull the child with too much force, exposing him to danger, if the cord is around the neck, or some other part, as I will observe later on.

If by examining the Woman we find that the child presents badly, respond differently, depending on the part being offered. If it is the belly, or the chest, the membranes will be more flattened, because the child being sideways, presses them on both sides, & does not allow them to stretch out: it is often the case in this position that the umbilical cord is presented first, & when the membranes are not tense, the beatings of its arteries may be felt through the membranes. When the dilation of the opening is sufficient, break the membranes, & identify the part that presents itself. If it is the chest, on sliding the hand over it, we find the belly & the umbilical cord: if we follow that down with a hand to the infant’s [nether] parts, upon finding a thigh, go to the knee, & bring the feet into the canal.

If by examining the woman, the finger cannot find the opening, have her lie down, & place the whole hand into the vagina, after having greased it: raise slightly the head of the child felt in the womb, have the woman lean back as far as she can, & very gently press the orifice, pull gently towards the front, always ensuring that the Woman should not push until the orifice be reduced [replaced], & that the head of the child advances. These reductions should be done with great care, & must take all the time necessary in order to not do violence to the womb.
if, on examining the woman, one does not find the orifice sufficiently dilated, one will lubricate her with unsalted butter, or oil, & leave the process to nature; but if the loss becomes more considerable, the woman must be delivered promptly. Gently insert a finger into the opening of the womb, & then successively introduce the others, having previously greased them well: if the membranes have not been pierced, pierce them with a large grain of salt, a toothpick, or even by scratching them with the fingernail, although one should always have the nails cut fairly close; but these membranes are so tender, that the slightest movement that we give them is sufficient to break them. Pull the child while turning it, if necessary, by the method I will indicate later. It is good to observe that the child, before six months, rarely needs to be turned. When turning the child, one must do it very gently, to not break the cord, which should serve as a guide to detach the afterbirth, although it is rarely adherent in the loss; but supposing that it be attached on some side, & that the infant be small, one can, having the hand in the womb, bring everything out together. It is nevertheless recommended to preserve the cord, to detach the part of the placenta that is adherent; which should be done in the manner which I will indicate hereafter.

It sometimes happens that the shoulders of the child are too large in proportion to the size of the head. We do not expect an obstacle to his exit, once the head is out of the [nether] parts; the aid of a skilled hand is nevertheless very necessary to preserve the life of the child; for often he dies at the fault of those who practice this Art, which I have seen happen more than once. Take good care not to pull with all your strength, the child being weak, the head can come off. Then the head is out, if the torso does not follow, yield immediately, & slip the left hand under the chin to support the head, in order to prevent the nose from being moved towards the buttocks of the mother, & so that in this position the infant not be suffocated. While holding the head in a straight line, insert the index finger of the right hand against his chest, to slide it into the armpit; curve that finger into the shape of a hook, free the shoulder, pulling it out of her parts, & by the effort that the woman will have to make, the child will be alive, without having done him any harm; but supposing that he does not yield to this method, due to unusually wide shoulders, have one of the assistants or the Nurse support the head; an absolutely essential precaution, & free the two shoulders, one after the other, or both at the same time, by inserting the finger of each hand under the armpits, & when they have advanced a little, we will have the infant in an instant. Put the fingers in on the side of the mother’s buttocks, because the vagina, being a fleshy & membranous part, yields well; which is not the case, if the fingers are passed above, the ischion bone not loaning itself well, it would be impossible to get to the end. By this method, the life of several infants will be saved, which
perish by the ignorance of certain village Surgeons, or women without experience, who have no other recourse than that of separating the head, or to use hooks, or a pot spoon, to remove the rest of the body in pieces.

**P 1: Guide to the Art of Birthing, du Coudray_12_01_2010.rtf - 1:105 [When you are sure that the chi..]**

(704:706)  (Super)

Codes:  [finger - Family: tactile] [hand - Family: tactile] [pull - Family: movement] [push - Family: movement]  
pg. 109-110

When you are sure that the child presents the buttocks, do not let the child move too far forward; for it would be very difficult to go in search of the feet, it would be better, if you do not arrive soon enough, & he is too far into the passage, to let him come in this position: you risk less for him & for the mother; but if he only presents one side of the bottom, this traverse position would become very laborious, because the other side of the hip pushes strongly on the woman’s pubic bone, it will not be possible for the child to exit. When he presents just one side of the bottom, gently push it back in, & slide in a finger of the other hand to find the fold of the groin: pull forward the other side, so that the bottom is directly over the opening. If he is allowed to come in this state, free his legs, as soon as the bottom is out.

**P 1: Guide to the Art of Birthing, du Coudray_12_01_2010.rtf - 1:85 [The child’s head is presented..]**  (464:464)

(Super)

Codes:  [feel - Family: tactile] [finger - Family: tactile] [hand - Family: tactile] [pull - Family: movement]  
pg. 61-63

The child’s head is presented, seen, & cannot be free without the help of a skilled Midwife, or an Obstetrician who with both hands, which he slides between the head & the labia majora, forcing them to spread to allow it [the head] to advance: so slipping the fingers up to under the jaws of the infant, he pulls it out; but it is not enough that just the head be out, the shoulders must follow. One must not pull the head with too much force, nor raise it as we see in this figure* one should pull it a little to the right to free one shoulder, & then left to bring out the other, & if one does not succeed by this means, then slide the two fingers the length of the neck as far as one of the armpits, to free one shoulder, & do likewise on the other side to free the other; in this manner the shoulder comes out, the rest of the body follows without trouble.

**P 1: Guide to the Art of Birthing, du Coudray_12_01_2010.rtf - 1:89 [Once the infant has been place..]**  (514:514)

(Super)

Codes:  [finger - Family: tactile] [hand - Family: tactile] [pull - Family: movement] [touch - Family: tactile]  
pg. 73

Once the infant has been placed in a warm cloth, & you have ensured by passing a hand over the belly of the mother, that there is not a second or a third, resolve to deliver the woman. Take the cord, after having wrapped it in a dry cloth, so that it doesn’t slip, if one doesn’t prefer
to wrap it several times around the left hand, whereas the right will follow it by extending the index finger along it, up to the entrance of the woman’s [nether] parts; sway it right & left, pulling very gently at the same time, so that it detaches little by little. Recommend to the woman that she push gently downwards, having her blow in her hand, & lightly rub the belly in the area of the womb; if the after-birth is not too adherent, it will detach as if by itself, using these different methods.

P 1: Guide to the Art of Birthing, du Coudray_12_01_2010.rtf - 1:60 [If the child presents the top ..]  (787:787)  
(Super)  
Codes:  [finger - Family: tactile] [hand - Family: tactile] [insert - Family: movement] [pull - Family: movement]  
p. 123-125

If the child presents the top of the head, & that he is in the passage, put a finger in his mouth, in the form of a hook, & by this means you can easily pull him out; but if the head has not descended far enough, pass an open hand on each side: since it is still somewhat flexible, you can, by flattening it, bring it a little farther into the canal. Try to free a shoulder with one hand, by inserting a finger in the shape of a hook under the armpit.

P 1: Guide to the Art of Birthing, du Coudray_12_01_2010.rtf - 1:111 [We should observe in general, ..]  (762:764)  
(Super)  
Codes:  [finger - Family: tactile] [hand - Family: tactile] [pull - Family: movement] [touch - Family: tactile]  
p. 118-119

We should observe in general, as I have already said, to not attempt in any delivery to deliver the woman, without having first passed a hand over her belly, to be sure that there is nothing more to be found in the womb. By this precaution, we avoid the danger to which we would expose the mother & the second child, if we pull out the after-birth all at once. It can even happen that the first child that we receive, is much stronger that the remaining one, the latter could even have been dead for several days. Once we have recognized that there remains a second child, tie the umbilical cord in the two bindings of which I have spoken, before cutting them: they will be at four finger widths distance from each other, & cut between the two. The first child having exited, make no attempt to pull the afterbirth: take advantage of the first pain to break the membranes of the second. It sometimes happens that each child has his own placenta; but usually the different after-births are united, & by their union makes just one; on which rely the cords of each infant.

P 1: Guide to the Art of Birthing, du Coudray_12_01_2010.rtf - 1:57 [If the orifice of the womb is ..]  (643:645)  
(Super)  
Codes:  [finger - Family: tactile] [hand - Family: tactile] [insert - Family: movement] [push - Family: movement]  
p. 99-100

If the orifice of the womb is turned to the left side, have the woman lie on that same side; for
the weight of the child which is found on the right side, will make it advance to the middle, &
while the woman remains in this position, insert two or three fingers of the right hand into the
vagina, passing between the orifice of the womb and the infant, & with the left hand, pushing
very gently on the belly to make it lean further. We should not make these sorts of reductions
with violence, but on the contrary, do it in several tries. Recommend that the woman not push,
until the orifice be returned to its place; for the efforts that she would make would increase the
difficulty, by pressing the head more strongly on the innomine bone.

When the cord is found to have broken off near the placenta, or, as is commonly said, near its
mass, detaching the afterbirth deserves particular attention; for it is to be feared that in
separating it, you cause the womb to turn inside-out, by pulling its back into the orifice, which
we have seen happen more than once. To distinguish the body of the placenta from the womb,
take care that the surface of the former is uniform & smooth, whereas the surface of the
placenta is uneven due to the quantity of branches which make up the arteries & the umbilical
vein. Once certain that it’s the placenta, detach it, as I have said, by inserting the tip of the
fingers between the membranes & the womb, all around the edges of the placenta, to find the
place that yields most easily.

As regards the Ischium bones, which form the lower part of the pelvis, by inserting the index
finger, into the conduit called vagina, they can be felt on either side. The space between these
two bones is ordinarily large enough to allow the infant the freedom to pass through. But when
these are found to be too close, it is a structural defect, all the more dangerous for the infant
since it is impossible to repair.

One can, by examining the woman, be sure that there is no obstacle to the birth, from the
placement of these bones, especially for a first child; for once she has already had one, &
she has carried to full term, we should not fear that these bones be too close: nevertheless if
the infant be monstrous in size, then the limited spreading of the lesser pelvis would render the
delivery very difficult, if not to say impossible, & it would be futile to wait for these bones to
separate to allow the infant free passage, the prejudgment of which we can hardly expect from
uninstructed Midwives. They confidently wait by a woman for several days for these bones to
separate, to facilitate the exit of the infant. Only too often in the country this error causes the
death of an infinite number of women & children.
The operation is not very difficult, for often the foreign body is only retained by the orifice, which, in truth, does not dilate as easily in women who do not have children, than those who already do. Insert the index finger covered in oil or unsalted butter into the orifice, to dilate it little by little; run it all around, bent in half, to form a sort of hook, & in this way, one may easily remove the false-seed, paying attention to not force anything, because the flaccid part of the false-seed, which is presented first, detaches easily from the rest. To make the procedure easier, it is recommended that the woman push downwards while you are trying to pull out the false seed. Sometimes it happens that it adheres strongly, in which case one should then do as I will say in the Chapter on the Afterbirth, the method being about the same, to facilitate the expulsion of the one & the other.

When you have recognized that one of the feet presents itself, that the orifice is sufficiently dilated, & that it has thinned, break the membranes, if they weren’t already; wait for strong contraction to do it, the tension that is then created making it easier to pierce. Once the membranes are broken, take one or both feet, which you pull equally, leading them out of the nether parts: take a soft dry cloth to wrap them in, so they do not slip from your hands. Once he is past the knees, if the child is coming face upwards, turn him over gradually as you pull, so that the nose is downwards towards the mother’s buttocks. This precaution is absolutely necessary to prevent the jaw from catching on the pubic bone. Pull down the arms one after another, & if the head does not come right out, far from pulling it with force, which must not be done, for it could separate from the torso; stop, & have someone support the child, to prevent him from suffocating, & seizing the lower jaw, slip the index finger of the left hand into the mouth, while inserting the right hand behind the head, in order to lower him towards the side of the mother’s buttocks; pull both together, while another person pulls the child by the shoulders.

Two methods are proposed to deliver the Woman. Some prefer that before cutting the cord,
go after the afterbirth immediately; others prefer to wait until it detaches by itself without
putting the hand in the womb, & to aid this detachment with light frictions on the belly, or by
having the Woman blow in her hand. The following circumstances should determine which of
these methods is used. If there be loss of blood, the first is preferable, the only means to make
it stop, being the prompt extraction of the placenta; or if the womb seems disposed to tighten,
take advantage of this favorable moment, to accelerate the detachment of the placenta; but if
there is nothing to fear from the loss, & if placing the fingertips in the womb, you do not feel
that it is tightening, you should not hurry anything, only try to aid its detachment, as I said, with
light frictions on the belly, & the afterbirth comes out naturally, while pulling the cord a little
towards you, which we recommended in the Chapter on natural Delivery. If you notice that the
womb is inclined to tighten, you must immediately place the hand in the cavity, following the
cord which serves as guide, & passing the tip of the fingers between the womb & the afterbirth,
detach it very gently, taking care that the fingers take only the placenta & pull it all out
together, & not in pieces.

Do the same for the adherent false-seed, taking care to detach it all the way around, so
as to have it whole.

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This figure represents the child out but whose head it still stuck in the arcade of the Pubic
bones and in order to free it, shows the fingers of a left hand pressing on the Occipital bone and
underneath, a right hand whose index finger must seek the mouth of the child, into which it is
placed, pulling down the lower jaw with this finger while the other hand presses on the
occipital at the same time, the head is forced to tilt and with this movement, it comes out with
ease.

---

Be careful not to be mistaken; for often the orifice creates a roll on the side of the
urethra tube. This bulge is sufficiently large to be a problem, mistaking it for the waters or for
some other foreign body, which precedes the exit of the infant. I have also seen it taken for the
umbilical cord coming out. Consider the troubling consequences for the mother, if this roll
were to be pulled towards oneself, taking it for the membranes which contain the water, for
which one should be very careful, examining the woman with gentleness. This bulge is often
easy to see, when the infant advances into the passage, by gently sliding the index finger below under the circle of the orifice, & the part that the child presents.

If the child only presents one foot, when it has advanced a little into the [nether] parts, secure it with a ribbon, made with a sliding knot, without tightening overmuch, & following the knee, direct your hand up the thigh to pass over the child’s [nether] parts, or over his bottom, depending on his position, & follow the other thigh & leg: then take that foot and lead it into the passage. Sometimes we must push the first back in, especially if it is too far forward, & by pushing it back in a little, we facilitate the means to bring the other out.

The delivery where the child presents the chin, or the entire face, can be easily finished by making him come by the head. If the chin presents itself first, we will know it by the gap that you feel under the jaw, & by the lower lip that the finger will easily find: then keeping the hand flat, & guiding it gently to the infant’s chest to raise him a little, you move the head back, his weight will make it fall of its own accord, & oblige it to place itself directly on the orifice, which will make him come naturally. Do the same if the infant presents the whole face.

As regards the ear, we cannot be mistaken, & by the way it is turned, we can decide if the face is upward or down, the edge of the ear being easily distinguished, because it is never found on the side towards the jaw. Having made the necessary examination to be sure that the child is turned face down, there is reason to hope that by pulling back his shoulder, the head will present itself at the orifice, but if the neck is leaning too much over the other shoulder, after having unsuccessfully made a few light tries, decide to bring the child out by his feet.
You will recognize that it is the shoulder that is presented, when running the finger all around it, you feel the inside of the armpit to one side, & the infant’s neck to the other, which can leave no doubt; but since it can happen that in this position, he has the face down, & that the shoulder having been pushed back, he settles in this position, the delivery becomes laborious, at which time it must be decided to bring the child out by his feet, by following the parts of the body as I have said. The woman, it is true will suffer more, but this way is preferable to moving the head down into its natural position, which would require much more time.

I have already found myself in this situation, & in the presence of persons who only wanted to use cutting instruments: I only used my hand, by pushing the head into the greater pelvis, turning it so that it faced the side of the sacrum bone, then one finger in the mouth, & the thumb strongly pressed again the occipital, to lower it on the coccyx, & by this method freed it from the arcade of the pubic bone, & extracted it without any violence.

The second & final skewed angle of the womb, is when its base leans forward, such that its orifice is thrown backwards towards the sacrum bone. This situation of the womb more closely approaches the natural position than the others, because the belly bulges to the front, when the woman is standing, & one is often obliged to raise the infant’s head a little to put in a finger, in order to know if she is in labor: sometimes it happens in such a case, that we touch only the edge of the orifice, without being able to feel the different degrees of dilation: when you experience this difficulty, have the Woman placed on the bed, & a little upside-down: for then the base of the womb falls towards the back, & makes it possible to feel the orifice. If the opening does not settle considerably on the sacrum bone, as is found in Women whose belly does not fall exactly over the thighs, leaving her lying down, & a little upside-down, her pains will easily shrink the womb; it is what I see happen every day: it is not necessary in this case to fatigue the Woman; for she will deliver naturally, especially when having her remain reclining as I have just described.
I find it to the side, & passing the hand over the belly, I can easily feel that the womb is leaning. At the same time I notice that when the body of the womb is inclined to the right side, it’s orifice is turned towards the left side of the pelvis: hence, the head of the child pressing then on the innomine bone, it finds strong resistance, & the child and the mother must necessarily perish, in spite of the pains, & the efforts that she could make, if we do not come to her aid. It would be the same, if the child is off to the left side; for then the orifice is turned to the right side. As troubling as the different situations may be, & whatever difficulties they entail, they are easily surmountable, if approached as I am about to say.

If the child presents the buttocks, we can know it through the membranes, when the pain has passed; for then we feel a gap in the middle, & a larger part to each side, but soft. If he only presents the side, this part is also distinguishable by touch; for by passing the finger all around, we feel the fold that the thigh makes, & to the other side the buttocks: we cannot be mistaken as to the difference between this part & the head.

to ease their delivery, insert the whole hand in her [nether] parts, and pass it under the head of the infant, while pressing a little on the coccyx, to force it to move back as the child advances; which will greatly facilitate his exit.

It is easy to distinguish whether the child presents the two knees, or just one, especially when the membranes have broken; for we feel the bone that is in front, called the patella: its roundness & firmness do not prevent it from greatly differing from the head; because by touching it, we feel the gap on each side, & by passing a finger, we find the fold that makes the knee, when the leg is bent. Do not let it enter too far forward, & by following the leg, take a
foot; once you have it, free the other, as I have said.

If the child presents the top of the head, & that he is in the passage, put a finger in his mouth, in the form of a hook, & by this means you can easily pull him out; but if the head has not descended far enough, pass an open hand on each side: since it is still somewhat flexible, you can, by flattening it, bring it a little farther into the canal. Try to free a shoulder with one hand, by inserting a finger in the shape of a hook under the armpit.

If these means are not sufficient, or it is not possible to use them, you can resort to pessaries, which can be made of different materials; the most common are made of a piece of fairly thick cork, about the size of a six livre coin which you give an oval shape, & pierce it in the middle so that a finger can pass through; the pessary should be even in its circumference, & its surface be made very level by melted wax, in which it will be dipped several times, until it is entirely covered, & it has made several layers: then insert it into the vagina, having dipped it into oil, & the woman lying on her back, the knees raised & bent, push it to the end of the [birth] canal, & when you have succeeded, place it so that the opening of the womb corresponds with the opening of the pessary.
APPENDIX N:

INSTRUMENT FOR ANALYSIS OF QUOTES ABOUT MANIPULATIONS
**Instrument for Analyzing Mannequin Features**

Directions: Read the quote from Madame du Coudray’s manual, then review the features of the mannequin as described in *La Machine*. Rate whether it appears that the manipulation described in the manual is feasible on the mannequin.

Definition- manipulate: to examine or treat by skillful use of the hands

NOTE: A number of the quotes talk about lubricating the hands with butter, do not consider this part of the manipulation.

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APPENDIX O:

QUOTES OF SHORT NARRATIVES
Quotes of Short Narratives

Report: 24 quotation(s) for 1 code

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Quotation-Filter: All

storytelling

P 1: Guide to the Art of Birthing, du Coudray_12_01_2010.rtf - 1:4 [Slacking of the womb proves we..] (631:631) (Super)
Codes: [storytelling - Family: Narratives]
No memos

Slacking of the womb proves well enough that the ligaments that secure it, have the ability to stretch. I have often found that the ligaments on one side, having yielded more than the others, have caused the womb to lean to the opposite side, which I have recognized by touch; for instead of finding the orifice of the womb in the middle,

P 1: Guide to the Art of Birthing, du Coudray_12_01_2010.rtf - 1:5 [I find it to the side, & passi..] (642:642) (Super)
Codes: [storytelling - Family: Narratives]
No memos

I find it to the side, & passing the hand over the belly, I can easily feel that the womb is leaning. At the same time I notice that when the body of the womb is inclined to the right side, it’s orifice is turned towards the left side of the pelvis: hence, the head of the child pressing then on the innomine bone, it finds strong resistance, & the child and the mother must necessarily perish, in spite of the pains, & the efforts that she could make, if we do not come to her aid. It would be the same, if the child is off to the left side; for then the orifice is turned to the right side. As troubling as the different situations may be, & whatever difficulties they entail, they are easily surmountable, if approached as I am about to say.

P 1: Guide to the Art of Birthing, du Coudray_12_01_2010.rtf - 1:6 [I have seen on such occasions ..] (753:753) (Super)
Codes: [storytelling - Family: Narratives]
No memos
I have seen on such occasions gouged eyes, & the face deformed by the injuries that were made.

P 1: Guide to the Art of Birthing, du Coudray_12_01_2010.rtf - 1:7 [I found one of these children ..] (219:219) (Super)
Codes:  [storytelling - Family: Narratives]
No memos

I found one of these children on whom a dog had already eaten a toe, without anyone noticing: we feel how much this negligence is painful to humanity; we will find in the fourteenth Chapter the manner in which one should help the infant, & we will see that we should never abandon him unless we are totally convinced of his death.

P 1: Guide to the Art of Birthing, du Coudray_12_01_2010.rtf - 1:8 [I saw a practice worthy of pra..] (246:246) (Super)
Codes:  [Church - Family: Church] [priest - Family: Church] [storytelling - Family: Narratives]
No memos

I saw a practice worthy of praise in the Diocese of Bugey; My Lords the Priests choose a Feast day in the warm season to invite the Wet Nurses to bring their children to the Church; when they are assembled, the Priest gives a moving description of the value of the treasure that they hold in their arms, the care that they should have, the precautions that they should take to preserve them, and the merit there is in all of this, the recompense that they can hope for in this life & in the next; then he blesses these children in the manner prescribed by the Manuel of the Diocese.

P 1: Guide to the Art of Birthing, du Coudray_12_01_2010.rtf - 1:9 [I have seen some that did not ..] (250:250) (Super)
Codes:  [storytelling - Family: Narratives]
No memos

I have seen some that did not survive it by more than a few days, & others remain infirm forever, as well as others unable to breathe from having the bones in the nose too narrow.

P 1: Guide to the Art of Birthing, du Coudray_12_01_2010.rtf - 1:10 [The first Woman that I saw in ..] (404:406) (Super)
Codes:  [storytelling - Family: Narratives]
No memos

The first Woman that I saw in this state surprised me. At the eighth month, she felt sharp pains, which increased by degrees, according to what she told me: I found the opening dilated to the width of a small coin, & altogether thinned & the waters bulging in front of the head with
each pain, persuaded me that the woman would deliver soon; but all of a sudden, the pains stopped, & after having waited some time, hoping that they would return, I decided to examine the woman; I no longer felt the water shape itself as before, & she did not have sharp pains until the end of the ninth month, at which time, she delivered happily. The opportunity which I had to examine her, allowed me to know that the opening stayed dilated for a long time; but the waters no longer bulged, & it was not until the end of her term that they reappeared. I could cite other examples; but this one suffices to prove that nothing should be hurried.

I see happen every day, for lack of this attention.

One day I was called for a similar accident, it was no longer time to take this wise precaution, the slackening being considerable, resembling a sausage folded over on itself. I did nothing else other than supporting it with both hands, by joining the two thumbs close to each other on the urinary meatus side, spreading the hands, the two index fingers rejoining at the bottom. I supported the whole thing in this manner, without touching with the fingernails; I freed the head of the child, & I supported the vagina with all of my strength, to oppose myself to its convulsive movements, while I delivered her; the woman did not suffer after this accident; it was the second time that this had happened to her, & in the first, she remained in a faint for three hours.

I admit to the fear that the idea of superfetation has always given me; for not daring deliver the Woman immediately, for the reason that I have just exposed, & not being able to guess if the placenta is shared by both infants, I am apprehensive that by leaving the foreign body in the
womb, it may be corrupted, if it reclosed, & that she cannot expel it, which would place in great
danger both the mother & the infant: thus it is better to
wait than to attempt to pull the first cord, & if the placenta detaches itself, & that the pains
cease, do not try to deliver the Woman’s second child, nor have her use any remedy to cause
her labor to restart; but wait patiently until the remaining child’s term, has finished.

When the head remains in the womb, I had thought that nothing would be as convenient to
remove it, as a purse. I have no personal experience, & I have no resource to cite other than
persons who have assured me that they have used it with success. But these unhappy
accidents, which are only too common in the countryside, have taught me that it is useless.

I have already found myself in this situation, & in the presence of persons who only
wanted to use cutting instruments: I only used my hand, by pushing the head into the greater
pelvis, turning it so that it faced the side of the sacrum bone, then one finger in the mouth, &
the thumb strongly pressed again the occipital, to lower it on the coccyx, & by this method
freed it from the arcade of the pubic bone, & extracted it without any violence.

It is a remedy which I have seen have great effect

I have found myself several time in these two cases, when having called skilled people, I can
insure that no woman has died from it, & that I have often even received living infants.

The ignorance of most country Midwives causes them to view the womb, which they call the mother, as the source of all sickness. In this idea, they apply all sorts of remedies without discretion, which often have very detrimental consequences; which I have seen only too often happen in the different voyages that I have been obliged to make.

He says that the child of one of his friends, having had the cord bound too close to the belly, with a too narrow thread, & too tight, which added to the delicacy of the cord, which was very small, gave it cause to break very close to the belly the next day after the binding. The blood flowing from the wound, although in small quantity, alarmed the household. The Surgeons who were called, fearing the consequences of this hemorrhage, deemed that they must pinch, with an instrument in the form of a crow’s beak, a little of the surrounding skin, & try to grasp the ends of the broken vessels, persuaded that by closing all that would have been pinched with a waxed thread, they would come to a point to stop the hemorrhage. These Surgeons where not mistaken in their expectation, the hemorrhage ceased; but the effects of this too tight binding were fatal to the infant, who died from the great pain that it caused him, & from the inflammation of the neighboring parts, which extended as far as the belly, which finished him. M. de la Motte blames these Surgeons for having first used a means too violent, considering the delicacy of the infant, & the little blood that flowed from the wound; for it was more of a seepage, than a hemorrhage of any consequence, & this seepage, could have been stopped by the application of some simple remedy, without arriving at the extreme that they employed, as is proved by the following observation.

The third Observation concerns a little girl three days old, whose umbilical cord had just
detached, & had seeped enough blood to saturate a small compress folded in quarters, which caused said M. De la Motte, concern, all the greater, since the age of the mother hardly allowed her to hope for more children; but he soon reestablished calm, by promising a quick healing, which did follow. He applied to the wound a tuft of dry lint, which he covered with a palm oil plaster, & secured the lot with a small bandage, until the place where the cord had detached too soon, was scarred over, which happened seven to eight days later.

M. de la Motte was called to help a woman in labor at two hours past midnight, midnight, regardless of his diligence, he did not arrive until after the exit of the infant, who fell on the floor, the woman being surprised by the last pain, standing, in whom the placenta remained in the womb, & the cord of the navel broken, or rather torn off at the belly of the infant; in a manner that no extremity remained of any vessel which made it up, not even a trace, & where not a single drop of blood came out; the place being like a slightly deep excoriation which was made; which caused M. de la Motte to first give care to the mother, whom he had lie in her bed, after which he detached the placenta, which was very adherent to the womb, & pulled it out, the cord which was very weak & very small not giving him any help. He then applied to the navel wound, a little swab of dried lint, which filled the place where the cord had been torn off, & supported it by a plaster of black pitch, a little compress, a retaining bandage made of a cloth folded in half two or three times. The plaster came off by itself a few days later & the wound of the cord was found scabbed over. The fear that a hemorrhage might occur, after the infant had recovered from his faint, obliged M. de la Motte to support the little apparatus with a bandage.

A similar case occurred in Paris, a few years ago, to one named Duverger: he made mention of it in an Anatomy Book, composed by a Surgeon of that City. He states that this Woman, becoming pregnant, had at the end of her term, a M. Soumain, renowned Obstetrician, attend her, who recognizing, by examination,
the unusual structure of the pelvis, called several of his most famous colleagues, who having also recognized this unnatural arrangement, deemed that it would not be possible to deliver the woman the ordinary way, & agreed on the necessity of a cesarean operation, which is to say, to make an incision, both to the containing parts of the belly, and to the womb, & to open the pouch or sac, formed by the membranes chorion & amnions, in order to remove the fetus. The infant who came into the world by this operation, was the size of a child at full term: he lived several days, & the mother enjoys perfect health today.

We read in a Work by M. Mery, head Surgeon of the Hotel-Dieu of Paris, a Letter which was sent to him by M. Aubert, Surgeon of the same City, which proves the necessity of this binding. This Surgeon was called to help a person who had hidden her pregnancy from her family. The term came when she should deliver, and she was surprised at night, & went into labor with no other help than that of her brother, who ran to her upon hearing the cries that the pains made her make. Astonished to see an infant, which appeared at that moment, he took, as embarrassed as he was, a thread which he tied around the cord near the navel, cut it above the binding, & then left, not knowing that there was more to be done. Not long after this unfortunate girl felt herself considerably weakened, cried out to him that she was dying; which obliged the brother to call M. Aubert, who found the Delivered woman bathed in blood. Upon examination, he felt the placenta attached to the back of the womb, the cord hanging out of the vulva without binding, by which had already flowed two

or three pints of blood. The Surgeon having knotted the cord, the loss ceased at that moment, & the Delivered woman was saved, finding herself out of danger.

If the cord has been bound, without paying attention to the weakness of the infant, accompanied by that which I have just said that must be done, undo again the binding, & this bleeding by the navel, of about twelve drops of blood, will recall him to life; it is with this resource that I have had the happiness, on several occasions, to return to life children altogether abandoned.
Regarding the diet which the newly Delivered woman should follow, it is almost impossible to prescribe it to those poor unhappy ones. I nearly caused the death of one that I had delivered; believing that to restore her strength a good bullion would be the best that I could have her take; but I put her in a very bad state by this change in food; it brought on a flux and would have brought her to her death, if I had not given her a remedy, that was nonetheless less effective than her normal food, which I was obligated to give her.

It sometimes happens that the shoulders of the child are too large in proportion to the size of the head. We do not expect an obstacle to his exit, once the head is out of the [nether] parts; the aid of a skilled hand is nevertheless very necessary to preserve the life of the child; for often he dies at the fault of those who practice this Art, which I have seen happen more than once.

We use various remedies to relieve the woman’s strong stomach pains that she feels the first days after birth. I can say that having tried all those that I had been assured to be good, without having found them the slightest bit effective; the only one that I would recommend, is the use of enemas with the decoction of emollient herbs, & to apply these herbs on the belly: pg 84 take care to maintain heat by way of the cloths, which must be heated from time to time. That is what I have found to be the best for calming these pains.
VITA

Trudy Witt is passionate about lifelong learning. Her passion for learning was instilled in her at a young age by her parents. She has taken advantage of every educational opportunity available to her. She personifies the four pillars of education identified by Jacques Delors in *Learning the Treasure Within: Report to UNESCO of the International Commission on Education for the Twenty-first Century*. Those pillars are: *learning to know, learning to do, learning to live* and *learning to be*.

*Learning to know* is being able to “combine a sufficiently broad general knowledge with the opportunity to work in depth on a small number of subjects.” This she has accomplished by pursuing formal education in a variety of scientific subjects including Chemistry, Chemical Engineering, Biological Science, Biomedical Engineering and Education. She earned a Bachelor’s degree in Chemistry from Brigham Young University, a Master’s degree in Biomedical Engineering from Tulane University and a Doctorate of Philosophy in Curriculum and Instruction from Louisiana State University. Her scientific research has resulted in eight journal articles published in scientific peer reviewed journals.

*Learning to do* is the “competence to deal with many situations and work in teams.” She has had a variety of employment opportunities which provided opportunities for learning. She worked for a major chemical company where she was part of a team that developed a process control package for a 25 million dollar chemical plant. She worked at a world renowned biomedical research facility where she was part of a team that studied the physiology of muscles. In addition, she has served as a volunteer in educational efforts in her community, first as a math
and science tutor, then on the Advisory Council for the High School for the Engineering Professions.

*Learning to live together* is “developing an understanding of other people and an appreciation of interdependence.” Marriage and family have provided Trudy with the opportunity to learn about others and appreciate interdependence. She and her husband Brian raised two sons; they taught their children to love and respect all people. Their children attended public schools, where they were educated in a multicultural environment. Both of their children are bilingual and have lived overseas. The family has taken advantage of learning opportunities provided by travel, and have visited the Middle East, Europe and Asia.

*Learning to be* is to “develop one’s personality and be able to act with ever greater autonomy, judgment, and personal responsibility”. She has always taken responsibility for her own learning and sought out new opportunities. Her interests range from genealogy (including research at the National Archives) to raising orchids.

Her enthusiasm for learning is contagious. She plans to teach science at the college level where she can share her love of learning with her students, thus helping them acquire the habit of lifelong learning and preparing them to meet the challenges of the twenty-first century.