

# Utilization of Technology by Nursing Programs in North Dakota

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## **Contents**

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Executive Summary	3
Introduction	5
Assessment Procedure	6
Results	7
Distance Learning: Synchronous	7
Distance Learning: Asynchronous	8
Clinical Training Technologies	9
Level of Technology Utilization	9
Faculty Readiness	14
Student Readiness	17
Implications	18
References	18
Appendices	19

## **Executive Summary**

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### **Background**

The Nursing Needs Study was recommended, in 2001, by the North Dakota State Legislature (NDCC Nurse Practices Act 43-12.1-08.2) to address potential shortages in nursing supply. Specifically, the North Dakota Board of Nursing was directed to address issues of supply and demand for nurses, including issues of recruitment, retention, and utilization of nurses. To respond to this request, the North Dakota Board of Nursing contracted with the School of Medicine and Health Sciences at the University of North Dakota.

This study, initiated in 2002, was designed to obtain an accurate and complete picture of nurses in rural and urban areas of North Dakota, compare North Dakota's trends to national trends, and inform institutional and public policy. The study, currently in its eighth year, is approved to continue until 2012 by the Board of Nursing. This study will continue to provide valuable information about the nursing workforce through a 10-year period of time.

### **Technology Survey Results**

- **Distance Learning Synchronous**  
Fewer programs are utilizing synchronous technology for distance learning. Students prefer to utilize archived presentations as it is difficult to schedule times where all students can be in attendance at specific locations.
- **Distance Learning Asynchronous**  
All programs except one utilize asynchronous technology in their nursing education programs. Most programs indicated the biggest barrier was how time intensive it is for faculty initially to educate themselves on how to deliver web-based content and to become technologically savvy.
- **Clinical Training Technologies**  
All programs utilize low fidelity simulations and 82% indicated they utilize some form of medium to high fidelity simulators. Students gaining competence in a safe learning environment adds great value to the programs. The programs also indicated that the nature of the technology limits the number of students that can use the technology at one time.
- **Level of Technology Utilization**  
North Dakota nursing education programs utilize high levels of technology in the areas of performance evaluation and nursing practice, while low end technology continues in the areas of student delivered content and investigative research.

- **Faculty Readiness**

In 2010, half of the programs were considered to have a low percentage of faculty trained and utilizing video conferencing in their programs, however, approximately two-thirds were considered to have a high percentage of faculty trained and delivering web-based courses. For moderate to high fidelity simulation, one third of the programs were considered to have a high, medium and low percentage of faculty trained and using the technology in their courses.

- **Student Readiness**

Between half to all programs regularly have the students utilizing e-mail, PowerPoint, computer adaptive testing, classroom response systems, on-line courses, on-line discussion boards, personal digital assistants and moderate or high simulation in their course of study.

## **Introduction**

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Health personnel shortages can negatively impact health care quality, through reduced health care access, increased stress on providers, and the use of under-qualified personnel. Also, shortages can contribute to higher costs by raising compensation levels to attract and retain personnel and by increasing the use of overtime pay and expensive temporary personnel. Workforce shortages, while a problem for the entire health care system, are likely to be most severe for rural/frontier regions and medically needy population groups such as the elderly. According to Dr. Richard Rathge, “North Dakota’s senior population (ages 65 and older) will grow considerably, reaching 150,000 by 2020 (up from 93,650 in 2005)”. (Rathge, 2006) North Dakota has 41 designated medically underserved areas, and 81 percent of North Dakota’s 53 counties are designated as partial or whole county health professional shortage areas. (North Dakota Primary Care Office, 2010) North Dakota also has the highest proportion of residents aged 85 and older, the age group with the greatest need for healthcare services. (North Dakota State Data Center, 2009)

Nurses are an integral part of the health care system providing nursing services to patients requiring assistance in recovering or maintaining their physical and/or mental health (North Dakota Healthcare Association, 2002). In the United States, nurses comprise the largest group of health care providers. The ability to provide accessible, high quality care depends on the availability of a nursing workforce with the requisite skills and knowledge. Over the past few years, research studies have identified clear relationships between nurse staffing and patient outcomes. For example, higher RN staffing was associated with less hospital related mortality, failure to rescue, cardiac arrest, hospital acquired pneumonia and other adverse effects. Greater RN hours spent on direct patient care was associated with decreased risk of hospital-related death and shorter hospital stays. (Nurse Staffing and Quality of Patient Care, 2007). Directly challenging the health care system’s ability to provide quality patient care is a growing national and international disparity in nursing workforce supply and demand. North Dakota is not immune to this problem.

The Nursing Needs Study was recommended, in 2001, by the North Dakota State Legislature (NDCC Nurse Practices Act 43-12.1-08.2) to address potential shortages in nursing supply. Specifically, the North Dakota Board of Nursing was directed to address issues of supply and demand for nurses, including issues of recruitment, retention, and utilization of nurses. To respond to this request, the North Dakota Board of Nursing contracted with the School of Medicine and Health Sciences at the University of North Dakota.

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North Dakota, a primarily rural state, will see one-quarter of its active nursing workforce retire within the next eight to ten years ([North Dakota Nursing Needs Study Licensed Nurse Survey](#)

Results, Lang & Moulton, 2009). One approach to increasing the number of qualified graduates is the application and coordination of technological programs that maximize the limited faculty, clinical placements, and financial resources available in the North Dakota nursing programs.

The technology assessment was first initiated in 2005 and then in 2009. The study is designed to collect and analyze data in order to obtain an accurate picture of the use of technology in nursing education in North Dakota. Eleven programs were interviewed, ten by phone.

## **Assessment Procedure**

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Following an extensive review of a technology assessment conducted in the State of Oregon, Technology in Nursing Education Oregon Education Based Technology Needs Assessment: Expanding Nursing Education Capacity (Krautscheid & Burton, 2003) as well as all other relevant literature, the tools utilized by the Oregon investigation was selected for the current assessment. The instruments were altered from their earlier forms in order to account for new technologies on the market. In addition, assessment instruments were altered based on consultation with an education and technology specialist as well as local nursing education program technology staff. Copy of the survey tool can be found in the Appendix A.

An interviewer contacted the chair of each nursing program in North Dakota. A copy of the consent form, as well as a copy of each assessment tool was e-mailed to the chairs, who were also informed that an interviewer would contact them by phone at a later date. They were asked to have another faculty member present for the interview if there were questions on the tools they could not answer. Also, they were asked to either talk to a technical support person about any, questions they could not answer, or to provide the interviewer with a phone number for their programs technical support.

The interview was conducted via phone in all but one where the chair interviewed in person. In all cases, the chair of the program was present for the interview. For two programs, a separate faculty member was also present during the interview.

Assessment outcomes were measured in terms of the eleven programs that were interviewed as part of the study: Dakota Nursing Program (Bismarck, New Town, Bottineau, Devils Lake and Williston, ND), Dickinson State University (Dickinson, ND), University of North Dakota (Grand Forks, ND), University of Mary (Bismarck, ND), North Dakota State College of Science (Wahpeton, ND), United Tribes Technical College (Bismarck, ND), North Dakota State University (Fargo, ND), Minot State University (Minot, ND), and Med Center One College of Nursing (Bismarck, ND), Jamestown State College (Jamestown, ND) and Sitting Bull Community College (Fort Yates, ND).

## Results

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### *Distance Learning:*

Nursing programs were asked about their use of distance learning in their programs and discussed their uses of synchronous technology, a mode of online delivery where all participants are "present" at the same time requiring a timetable to be organized, and asynchronous technology, a mode of online delivery where participants access course materials on their own schedule. Students are not required to be together at the same time.

### *Synchronous*

**Video-conferencing:** With video-conferencing (e.g. Interactive Video Network: IVN and BioTerrorism Wide Area Network: BTWAN; and web-conferencing utilizing applications such as Wimba and Breeze) being available in most of North Dakota, fewer programs (64%), compared to 75% in 2005, currently employ regular video-conferencing as part of the nursing education. Video-conferencing programs allow for a live presentation to be sent into, or out of a classroom, thus permitting individuals who are not currently at the site of the live presentation to take part in the learning experience (two-way audio and video). A number of participants reported that video-conferencing capabilities have allowed them to interact in a live capacity with students that would otherwise be prevented from taking part in their programs. For students that can set specific dates and times for their studies, the use of synchronous technology is good. Many programs will record their video-conferences and archive it on a server for student access at a later time. Having the video conferences taped and archived allows the students to be able to download the lectures/presentations at a later time even on their MP3 players to listen to while driving or working out. The programs that utilize video-conferencing indicated that the technology has been successful, but that there were some limitations.


Instructors have difficulty finding times that all students can be available when the specific rooms where the technology, such as IVN and BTWAN, is available as these rooms are shared by other departments. With the use of IVN and/or BTWAN students are required to be at specific locations and therefore the numbers of students are limited. Most programs are utilizing web-based programs and teleconferencing where students can join in from any location on their computer and student numbers can be much higher. For web-conferencing and course management programs are using software such as Moodle, Wimba and Breeze. Many programs found that the students seem to prefer to access archived lectures/presentations at their convenience rather than being in class at the scheduled times. Other limitations include students not having up to date computers therefore may have trouble hooking up, some issues with connectivity especially in rural settings, and initially time commitment by faculty is increased.

Three programs have no plans of using synchronous technology. One program indicated that they will begin to use it on a weekly basis however students still preferred using the archives.

**Video-Streaming:** Sixty-four percent indicated they are now utilizing video streaming compared to 25% percent in 2005, an increase of 39%. Video-streaming allows a video to be viewed as it downloads instead of waiting until an entire file is downloaded to a computer prior to viewing. Video-streaming only allows students to view the video-conference but not participate as it only streams one-way. Video-streaming is limited by the capacity and bandwidth of the host computer system. With internet service providers who are offering distributing servers addressing bandwidth issues, students are able to receive these streams at an acceptable quality and be able to view smooth running videos.


### *Asynchronous*

Asynchronous distance education, where students access their course materials on their own time, via a partially web-based course and/or fully online course is widely available in North Dakota. All programs except one (91%) utilize asynchronous technology such as E-College, Jansibar, Blackboard, Moodle, Wimba, etc. Utilizing this technology allows the students to be more updated as far as what is or is not completed and what their grade is. Sixty percent of the programs that utilize asynchronous technology have discussion boards with the students and most are graded. One of the programs stated, “real-time chats didn’t work out so well so went to the discussion boards”.



“Real-time chats didn’t work out so well so went to the discussion boards.”

Programs indicated a number of barriers to the use of this technology. Initially courses are more time intensive for faculty than on-campus courses due to development of lecture materials for 24/7 education, facilitating student participation in online discussion sections, and re-working the assignment submission procedures and feedback mechanisms. Many programs indicated that their programs do not currently have funding for faculty to educate themselves on how to deliver web-based content, and that the learning curve can be considerably high depending upon



the faculty members’ level of technological savvy. The Oregon report indicated that many Oregon programs overcame this problem by offering release time for faculty who want to gain the skills to provide online courses. Other problems nursing programs found were that some software was structurally unsound or didn’t have enough memory to do a lot of work. Uploading assignments at times failed and students had to resort to e-mailing them. Also, during upgrades which normally took place on weekends when students were doing homework, some student’s work would get lost. A few programs stated that there are barriers associated with trying to deliver an online course to rural and/or low-income students. Some areas of North Dakota continue to only have dialup service and not high-speed internet capabilities such as digital subscription lines (DSL) or cable. Additionally, some of the online courses require specific computer requirements to function, which can involve purchases that low-income students are not capable of making. In both cases, delivery of content is limited for particular populations, thereby limiting the effectiveness of the online or web-enhanced courses.



### *Clinical Training Technologies*

All eleven programs surveyed indicated they use low-fidelity simulators such as Chestor the chest manikin, wound dressers, IV arms, Catheterization and Resuscitation simulators etc. Nine of the eleven programs (82%) surveyed indicated they had some form of moderate to high fidelity simulation equipment including adult simulators, SIM baby, pediatric simulator, and maternal and neonatal birthing simulator. Students gain competence and confidence in a safe learning environment and see the added values simulation gives to their education. The programs that purchased scenarios or case-studies for the simulator, indicated they were well developed.

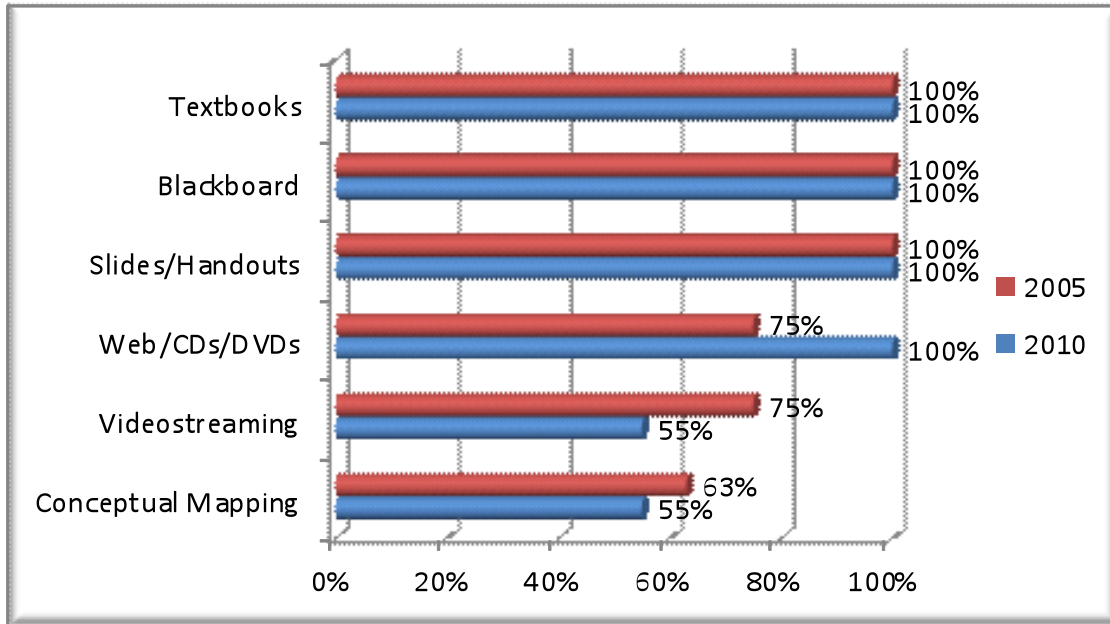
All of the programs that have used simulators reported that the technology was very successful and that the students were pleased with their experiences. However, programs indicated that the nature of the technology limits the number of students who can use it at any one time, thus requiring the purchase of more units should there be an increase in the number of students in each program. The need to purchase more units, and in the case of high fidelity simulations, to build rooms in which these simulators are housed, has severely limited the ability of some programs to add these technologies. Additionally, with a limited number of students being able to utilize the simulators at one time, scheduling is difficult. Other barriers include the high cost of the simulation equipment and technical support, lack of enough faculty trained on the simulation equipment and lack of faculty time to write scenarios as purchased scenarios are expensive.

### *Level of Technology Utilization*

Programs were also rated on a continuum of their level of technology implementation from low technology use (i.e., textbooks, papers, meeting, office hours) to high levels of technology use (i.e., multimedia presentations, video conferencing, intensive clinicals) (see Technology Continuum Assessment tool in appendix). It is noted in the comparisons that interpretation, by nursing administration/faculty and interviewers, of the questions may differ between 2005 and 2010 and therefore results may be skewed in comparisons.

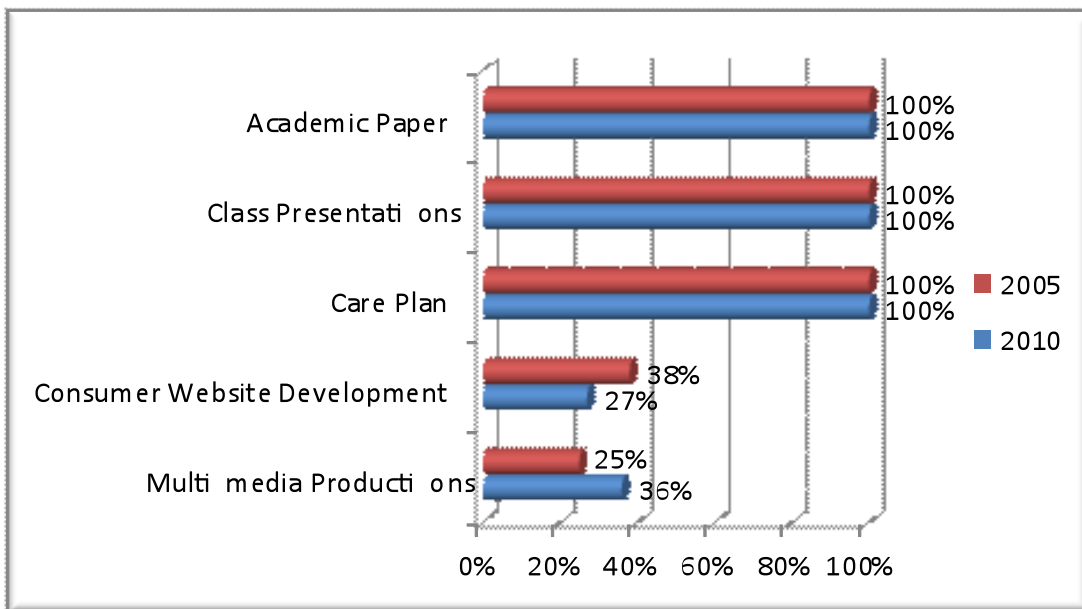
For presentations, media and hypermedia, one hundred percent continue to use textbooks, blackboards, and overheads, while use of Web, CDs, and DVDs increased and video streaming and conceptual mapping decreased in 2010 compared to 2005 (see figure 1).

**Figure 1: Presentation, Media and Hypermedia by Level of Utilization**



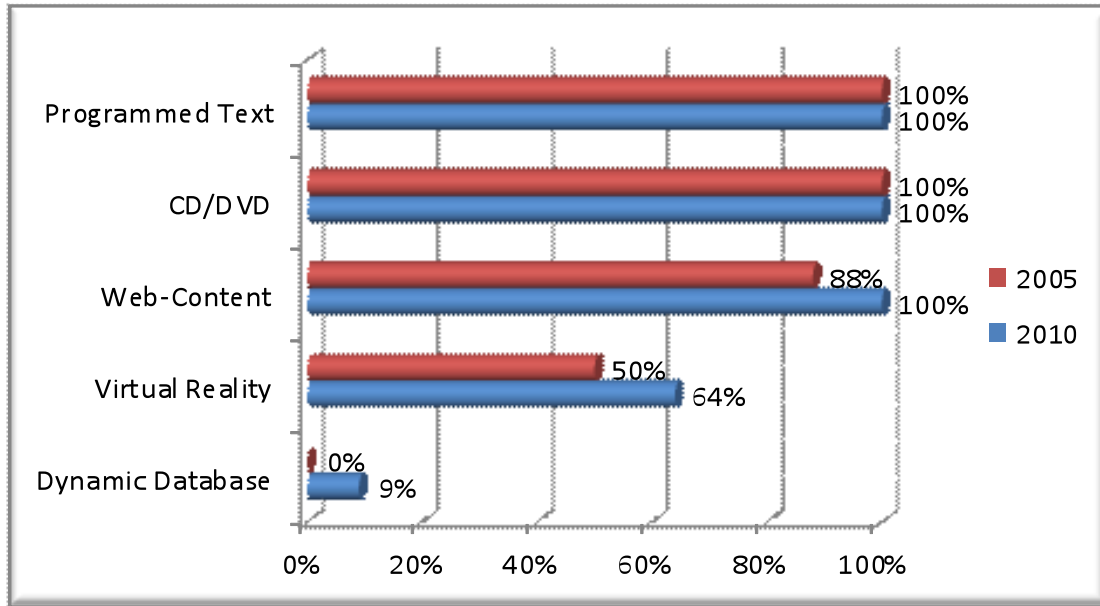
In 2010 use of multimedia productions increased and consumer website development decreased compared to 2005 for student delivered content while, one hundred percent of the programs continue to utilize academic paper, class presentations, and care plan development (see figure 2).

**Figure 2: Student Delivered Content by Level of Utilization**



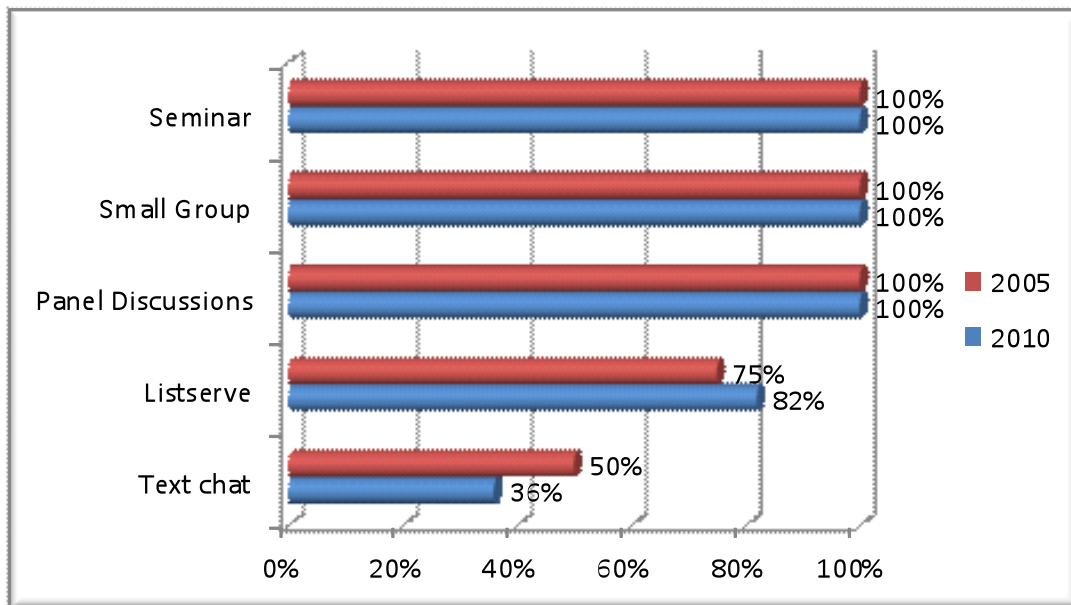
For individual interactions by level of utilization, use of web content, virtual reality and dynamic databases (interactive web experiences) increased in 2010 compared to (see figure 3).

**Figure 3: Individual Interactions by Level of Utilization**



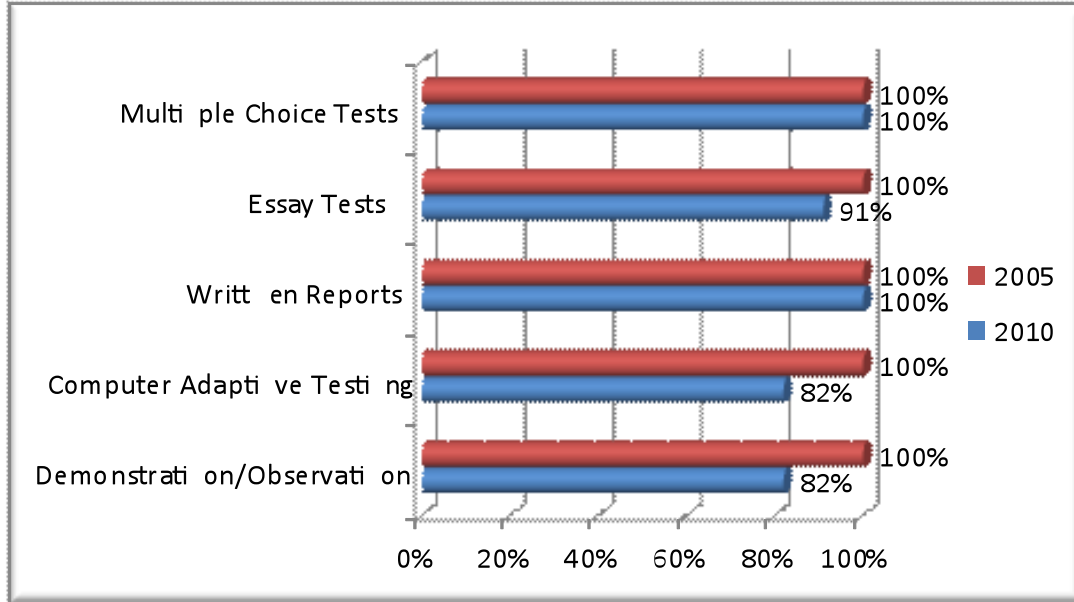
Between 2005 and 2010, there was a decrease in text chatting (live, web-based discussion) and an increase in the use of list serves for discussion by level of utilization. All programs continue to also utilize panel discussions, small groups and seminars (see figure 4).

**Figure 4: Discussion by Level of Utilization**



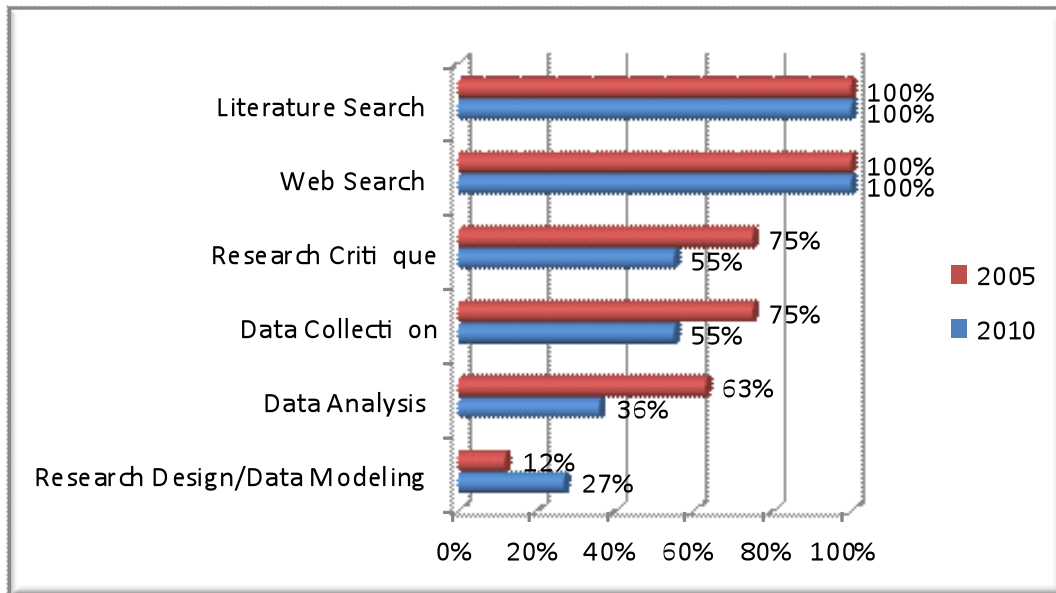
The use of essay tests, computer adaptive testing and demonstration/observation decreased in 2010 for performance evaluation by programs. All programs continue to use multiple choice tests, and written reports. (see Figure 5).

**Figure 5: Performance Evaluation by Programs**



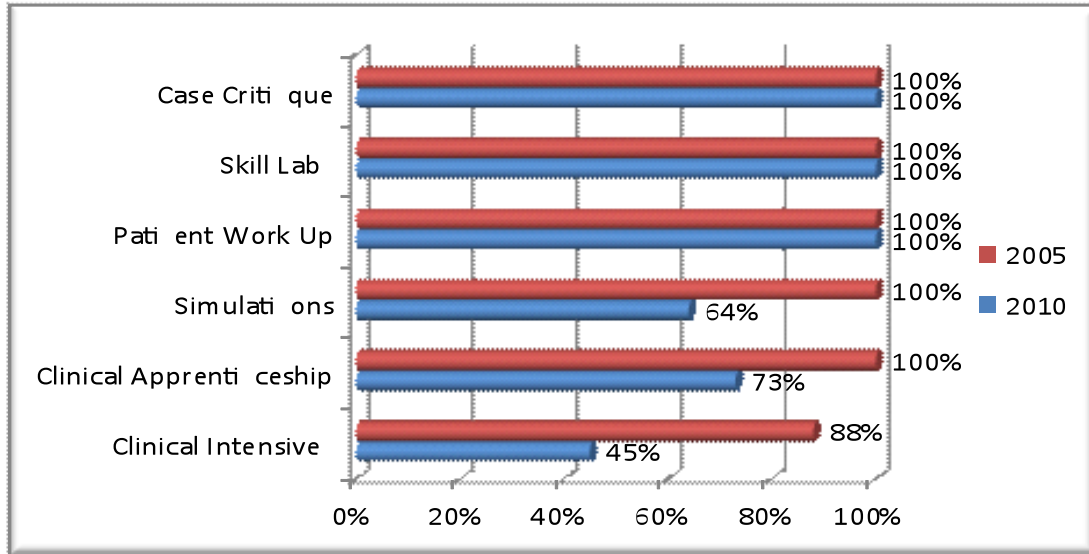
While one hundred percent continue to utilize literature searches and web searches for investigation and research, fewer programs indicated they use research critique, data collection and data analysis in 2010 compared to 2005. An increase was seen in programs utilizing research design and data modeling (advanced statistical software) (see Figure 6).

**Figure 6: Investigation/Research by Level of Utilization**



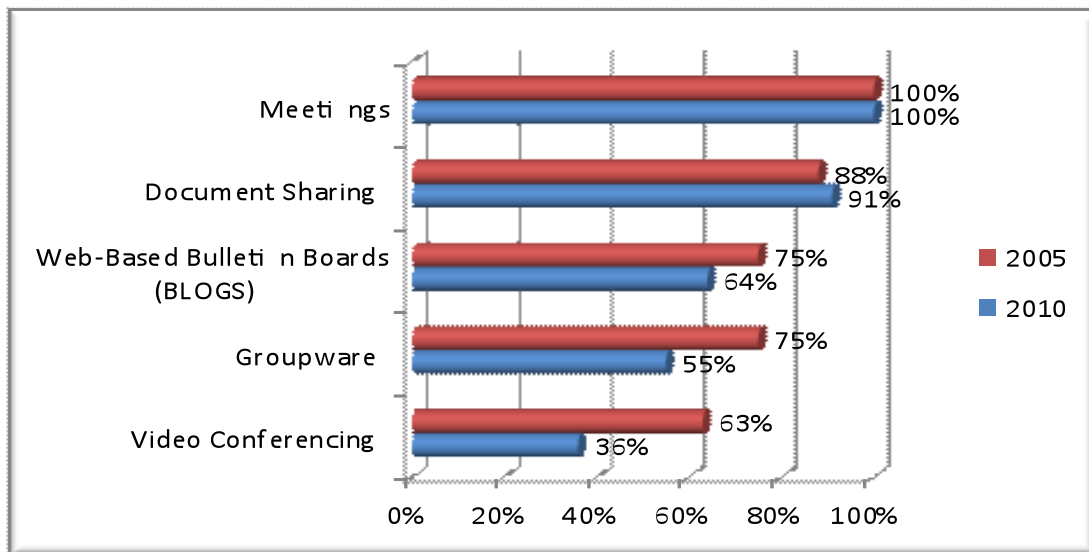
In 2010, a hundred percent of the programs indicated they continue to utilize case critiques, skill lab and patient work ups for practice. Fewer programs indicated the use of simulations, clinical apprenticeship and clinical intensive than in 2005 (see Figure 7). Interpretation of the question may have skewed the results, as many programs had questions about what the difference between the clinical apprenticeship and clinical intensive was.

**Figure 7: Practice by Level of Utilization**



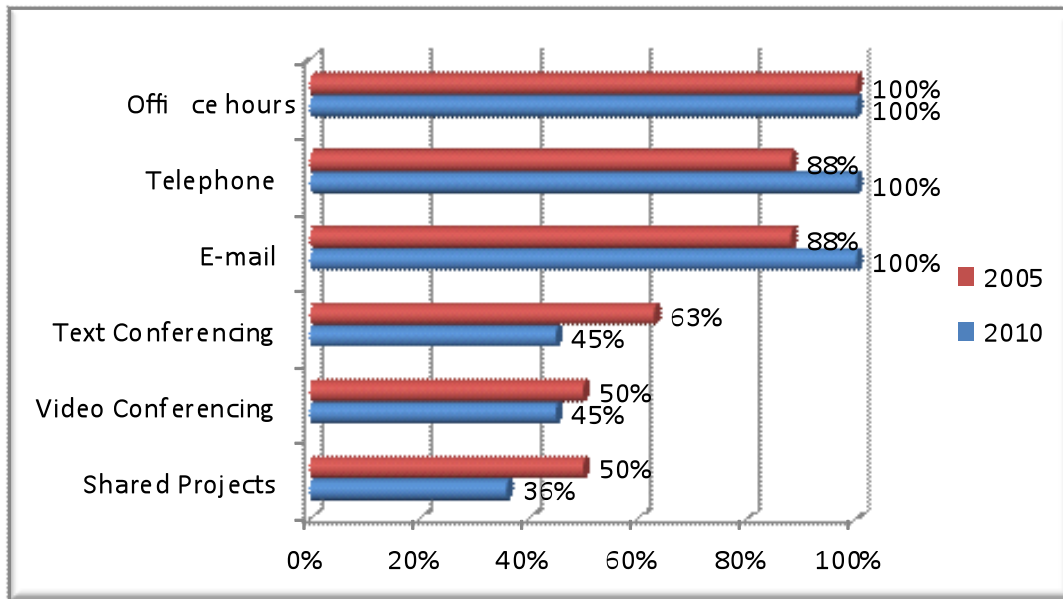
Fewer programs indicated usage of web-based bulletin board, groupware and video conferencing for collaborative activities in 2010 than 2005 however more programs utilize document sharing and all programs continue to convene meetings for collaborative activities (see Figure 8).

**Figure 8: Collaborations by Level of Utilization**



For mentoring, all programs utilize office hours, telephone, and e-mail. In 2010 there was a decline in the use of text conferencing, video conferencing and shared projects for mentoring activities as compared to 2005 (see Figure 9).

**Figure 9: Mentoring by Level of Utilization**



*Faculty Readiness*

Faculty readiness to utilize technology was measured by examining what percent of faculty were trained on distance learning technologies including video conferencing; being trained, develop and deliver web-based courses; and being trained and delivers courses utilizing moderate to high fidelity simulators. Nine of the eleven programs responded to these questions (Table 1). Overall, in 2005, 38% of the programs indicated low, 38% moderate, and 25% high in faculty readiness to utilize technology in distance education.

**Table 1: Faculty Readiness**

	<b>LOW &lt;30%</b>	<b>MEDIUM 31%-60%</b>	<b>HIGH &gt;60%</b>
<b>Trained in delivering course content using video- conferencing</b>	50%	13%	38%
<b>Trained, developed and delivered web-based courses</b>	22%	11%	67%
<b>Trained, developed and delivered courses using moderate to high fidelity simulation</b>	33%	33%	33%

Educating the faculty to become comfortable with the technology so they don't fall back on utilizing lower technologies was the largest challenge in moving toward greater reliance on technology. As one program stated "We tend to go back to low based methods of teaching when we are lacking time." The expense and time required to train faculty on the distance education technologies is also a major barrier to the increased use of technology. Currently, 55% of the programs indicated they have some form of distance education.

"We tend to go back to low based methods of teaching when we are lacking time."

Additionally, programs were asked if they had a faculty expert in informatics. Forty percent of the programs had an expert in informatics compared to 14% in 2005. In many programs, faculty members are expected to become experts enough to carry out their current responsibilities as they apply to technology.

*Student Readiness*

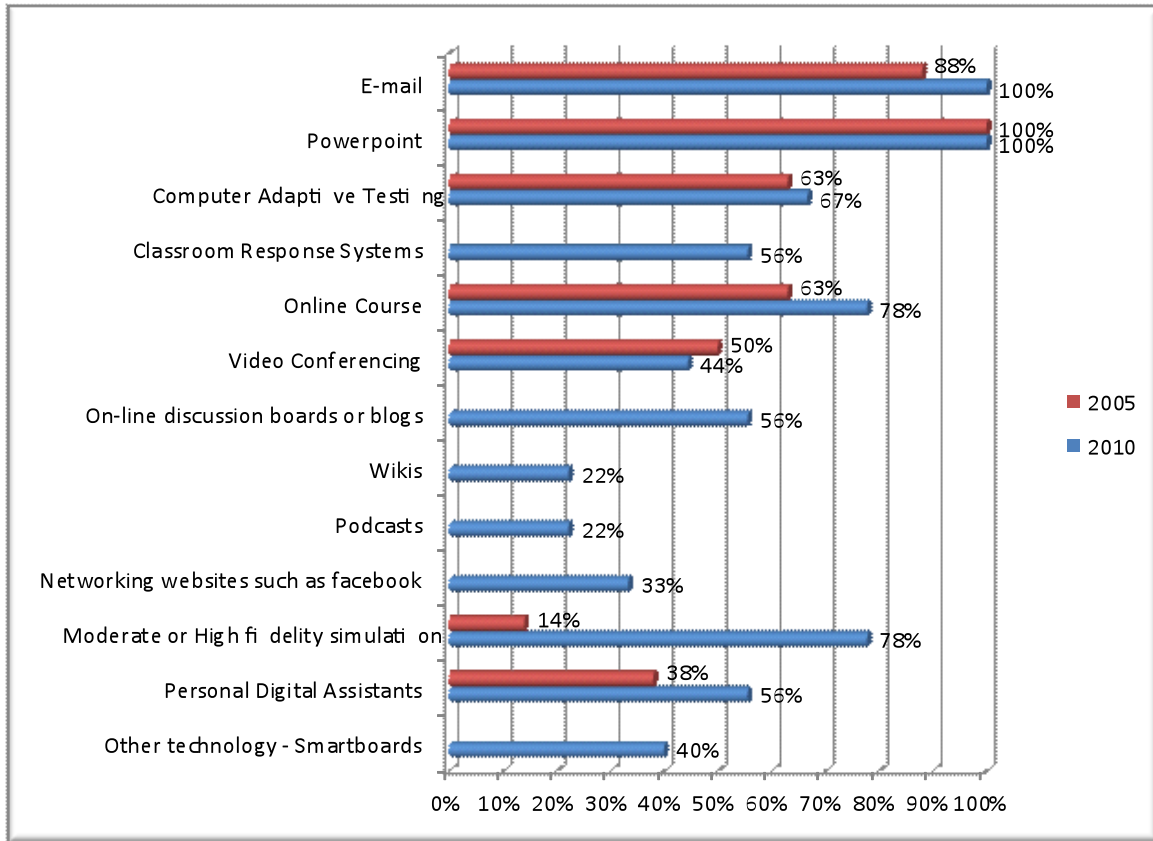
Student readiness was measured by assessing how many out of twelve (thirteen including the other category) standard technologies that the students use on a regular basis. Four or less was considered to be low; five to eight was considered moderate and nine or higher was considered high (Table 2). Nine programs responded to these questions. In 2005, they were measured on seven technologies.

**Table 2: Student Readiness**

	<b>LOW</b>	<b>MEDIUM</b>	<b>HIGH</b>
<b>2010</b>	50%	13%	38%
<b>2005</b>	22%	11%	67%

One hundred percent of students use e-mail and PowerPoint (see Figure 10). In 2005 only 14% of the students regularly used moderate or high-fidelity simulations whereas in 2010 78% of the students do. There was also an increase in the use of personal data assistants, on-line courses, and computer adaptive tests. Findings also indicated a slight decrease in the use of video conferencing by students.

**Figure 10: Percentage of Programs in which Students Use Specific Technologies**





## **Implications**

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Nursing programs in North Dakota have demonstrated that technology can be effectively employed in nursing education. Most programs interviewed indicated a specific desire to utilize technologies that will improve their programs and increase the number of students they can train but realize the barriers may impact their ability to do so. Programs indicated a significant increase in the use of video-streaming and a decrease in the use of video-conferencing.

Programs indicated that lack of funding and lack of time to train faculty were the major barriers to meeting their goals of increasing the use of technology in nursing education. Other barriers identified were student readiness and lack of resources for specific special populations.

An essential step to increasing the use of technology in North Dakota nursing education will be to identify which technologies were most effective for the limited funding that is available. This may be best accomplished on a program-by-program basis, building on the existing technologies at those institutions and combining resources with other programs in those institutions. Additionally, time efficient methods for training faculty and students on the use of the technologies should be investigated. The largest challenge in moving toward greater reliance on technology in the education of nursing students is funding, training and staff support.

In response to the question “what do you see as the preferred vision for increasing technology-based clinical education across North Dakota’s nursing education community” programs indicated that simulation continues to be key however collaboration is necessary with such high costs, faculty time commitments etc. and it was suggested that setting up regional simulation centers would be more cost effective.

In summary, this report indicates that a number of North Dakota’s nursing education programs are utilizing higher technology in their education process i.e. the use of moderate to high fidelity simulators. Many of the programs express a desire to increase use of this technology. If they are able to, these programs report that they will be able to serve a larger population of students and thus increase the number of trained nurses entering the job market in North Dakota which would help offset the anticipated loss of one quarter of its nurses within the next eight to ten years to retirement

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