CHAPTER 5
CONCLUSIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

A non-experimental, quantitative, descriptive research was conducted to address the following interrogative problem statement.

> ***What is the nature of the learners' exposure to computer assisted instruction, how do they benefit and what problems do they experience during computer-based learning?***

A self-administered structured questionnaire was administered to determine the:

- frequency to which the respondents had been exposed to different types of computer assisted instruction applications
- frequency to which the respondents had been exposed to different types of computer-based learning activities
- benefits that the respondents derived from computer assisted instruction and computer-based learning
- problems that the respondents encountered
- respondents' teaching method preferences.

It is important to prepare learners to practice in a computerised environment. Austin (1999:260) cites Sparks (1989) who states that nurse educators are the key to effective use of computer technology in nursing education. The nurse educators have the responsibility to prepare nursing learners to become entry-level, technologically competent professionals. However, nursing education institutions fail to adequately prepare their learners for computer use in the health care delivery environment (Armstrong 1986; Bryson 1991 cited by Austin 1999:260). This view is supported by the research findings of this present research study. Computer assisted instruction had potential benefits for learners. However, the respondents revealed that they encountered many problems, which negatively impacted upon the effectiveness of computer assisted instruction and

computer-based learning. The particular nursing college only partly succeeded in rendering computer assisted instruction.

5.2 SUMMARY OF THE RESEARCH FINDINGS

This section comprises a summary of the research findings, which were discussed in the previous chapter.

5.2.1 Computer literacy

The levels of computer literacy for both categories of respondents were inadequate. Few respondents were proficient; most indicated that they were reasonably computer literate, while 20-25% were not computer literate. Many respondents were therefore unable to effectively utilise the learning opportunities associated with computer assisted instruction. There appears to be a need for computer literacy training, as less than a third of the respondents completed a computer literacy course. It is therefore apparent to improve the computer literacy of the learners at the college.

5.2.2 Engagement in computer-based learning

Both groups of respondents, notably the third year respondents, indicated that they preferred computer assisted instruction above traditional teaching strategies. It is therefore important to strengthen the application of computer assisted instruction at the college. The respondents are generally collaboratively engaged in computer-based learning at the media centre of the college. There is little evidence of access to the information-communication technologies at home or at the clinical institutions where learners work. It is therefore necessary to increase access at home and in the clinical settings.

5.2.3 Exposure to different types of educational computer software

The researcher determined the frequency to which the second year and third year respondents had been exposed to specified computer software, which are associated with computer assisted instruction. Table 5.1 indicates the computer educational software that a substantial majority of

respondents had been exposed to. Although no significant differences occurred, the frequency of exposure to reading skills computer packages appeared to be more in favour of the third year respondents than the second year respondents.

Table 5.1 Educational computer software that were utilised

2nd year	3rd year
	Reading skills computer packages

Table 5.2 indicates the educational computer software, which was under-utilised. The research results revealed that the majority of the respondents had some exposure to it, while many had never been exposed. Although no significant differences occurred, the frequency of exposure to text-based computer packages, which provide scenarios that develop respondents' problem-solving skills, appeared to be more in favour of the third year respondents than the second year respondents.

Table 5.2 Under-utilised educational computer software

2nd year	3rd year
Reading skills computer packages	
Typing skills computer packages	Typing skills computer packages
Computer literacy packages	Computer literacy packages
	Text-based computer packages which provide scenarios that develop respondents' problem-solving skills
Computer packages which enable respondents to achieve their learning objectives though game-playing	Computer packages which enable respondents to achieve their learning objectives through game-playing

Table 5.3 indicates the computer educational packages that were non-utilised, or at best under-utilised**.** The majority of respondents had never been exposed to it, while a substantial number indicated some exposure. Although no significant differences occurred, the frequency of exposure to text-based computer packages, which provide scenarios that develop respondents' problem-solving skills, appeared to be more in favour of the third year respondents than the second year respondents (also refer to table 5.2).

Table 5.3 Educational computer packages that were non-utilised, or at best under-utilised

2nd year	3rd year
Text-based course content computer packages	Text-based course content computer packages
Multimedia course content computer packages	Multimedia course content computer packages
Text-based computer packages which provide scenarios that develop respondents' problem-solving skills	
Multimedia computer packages which provide scenarios that develop respondents' problem-solving skills	Multimedia computer packages which provide scenarios that develop respondents' problem-solving skills
Computer packages simulating clinical situations which develop respondents' decision-making skills	Computer packages simulating clinical situations which develop respondents' decision-making skills

In general, respondents had insufficient exposure to computer educational packages that support the development of higher cognitive skills.

5.2.4 Learner engagement in activities associated with computer assisted instruction.

The researcher determined the frequency to which the respondents had engaged in specified activities associated with computer assisted instruction. Table 5.4 indicates the learning activity that was reasonably practised by both groups of respondents, namely obtaining information from the Internet. A substantial majority of the respondents had utilised this learning resource. However, educators ought to promote more frequent utilisation because approximately 25% of the respondents indicated that they had never utilised it.

Table 5.4 Reasonably-utilised learning resources

2nd year	3rd year
Obtaining information from the Internet	Obtaining information from the Internet

Table 5.5 indicates the learning resources and activities that were non-utilised or at best under-utilised. The research results revealed that a majority of respondents in both groups, had never obtained information from CD-ROM packages, but many respondents indicated some utilisation of these packages.

Table 5.5 Non-utilised or at best under-utilised learning resources

2nd year	3rd year
Obtaining information from CD-ROM packages	Obtaining information from CD-ROM packages

Table 5.6 indicates the learning resources and activities that were non-utilised. The majority of respondents had never utilised this learning resource. This table reveals that information-communication technologies are mainly not utilised for electronic communication, information exchange, or on-line learning. This applies to both groups of respondents.

Table 5.6 Non-utilised learning resources

2nd year	3rd year
Communicating with their peers by e-mail	Communicating with their peers by e-mail
Communicating with their tutors by e-mail	Communicating with their tutors by e-mail
Communicating with field experts by e-mail	Communicating with field experts by e-mail
Participating in on-line chatting with their peers	Participating in on-line chatting with their peers
Participating in video-conferencing with their peers	Participating in video-conferencing with their peers
Participating in video-conferencing with their tutors	Participating in video-conferencing with their tutors
Exchanging information with their peers by e-mail	Exchanging information with their peers by e-mail
Exchanging information with their tutors by e-mail	Exchanging information with their tutors by e-mail
Participating in electronic chatting for educational purposes	Participating in electronic chatting for educational purposes
Doing courses following an on-line learning approach	Doing courses following an on-line learning approach

The Mann Whitney U-test revealed that the third year respondents were more inclined than second years to communicate with their peers and field experts by e-mail. This may indicate some growth from the second level to the third level, although electronic communication remained limited.

5.2.5 Benefits of computer assisted instruction

According to Dewhurst et al (2000:224), learners benefit from computer assisted learning. The utilisation of computers in undergraduate education is widespread, both in the form of computer-based learning, and in the use of generic software tools in support of learners' research, writing and presentation activities. Computer assisted instruction also has the potential to save time by providing an alternative to traditional forms of delivery, such as lectures.

In the present study, the researcher investigated the benefits of computer assisted instruction. Table 5.7 indicates the most important benefits that emerged from the research findings. The respondents benefited greatly from active engagement in self-directed learning, positive affective experiences associated with computer-based learning, and improved learning effectiveness. They also benefited from cognitive and technical skills development, and information management. The third year respondents especially benefited from increased control over their learning, flexibility in terms of repetitive learning, and the freedom to learn from their mistakes. They were also able to achieve their learning objectives by using the Internet to obtain information.

Table 5.7 The benefits that a substantial majority of the respondents derived from computer assisted instruction

2nd year	3rd year
Enhanced motivation to learn	Enhanced motivation to learn
	Being in control of their learning
	Repetitive learning
	A learning climate supportive of learning from mistakes
	Achieving their learning objectives by using the Internet to obtain information
Storing of information	Storing of information
Retrieval of stored information	Retrieval of stored information
Active involvement in learning	Active involvement in learning
Being an independent learner	Being an independent learner
Remaining up to date with the latest developments	Remaining up to date with the latest developments
Experiencing excitement associated with discovering new knowledge	Experiencing excitement associated with discovering new knowledge
	Decreased boredom compared with traditional teaching
	Extended interaction with the learning material
Increased typing skills	Increased typing skills
Increased computer skills	Increased computer skills
Increased critical thinking skills.	Increased critical thinking skills.
	Increased problem solving skills.
Increased creative skills	Increased creative skills
	Experiencing satisfaction during the learning process
Receiving quality education	

Table 5.8 indicates the benefits that many respondents failed to experience, although the majority of the respondents indicated that they enjoyed these benefits. There is therefore room for improvement to ensure that more learners enjoy these benefits. The table reveals that both groups of respondents benefited somewhat in terms of reading skills development, mastering learning content, and developing problem-solving skills through text-based problem oriented computer packages. They also benefited somewhat from collaborative learning. Although no significant differences between the responses of the two groups were obtained, the third year respondents appear to have benefited more from increased learning control than the second year respondents (refer to table 5.7 & 5.8).

Table 5.8 The benefits that many respondents, although not the majority, failed to experience

2nd year	3rd year
Being in control of their learning	
Flexibility in terms of study time	Flexibility in terms of study time
Flexibility in terms of learning pace	Flexibility in terms of learning pace
Repetitive learning	
A learning climate supportive of learning from mistakes	
Increased reading skills	Increased reading skills
	Achieving their learning objectives through text-based course content computer packages.
Achieving their learning objectives through text-based problem oriented computer packages	Achieving their learning objectives through text-based problem oriented computer packages
Achieving their learning objectives by using the Internet to obtain information	
Engaging in collaborative learning	Engaging in collaborative learning
Decreased boredom compared to traditional teaching	
Extended interaction with the learning Material	
Mastering the learning content	Mastering the learning content
Increased problem solving skills.	
Experiencing satisfaction during the learning process	
	Receiving quality education

Table 5.9 indicates the potential benefits of computer assisted instruction, which a substantial majority of the respondents failed to experience. These benefits were therefore not realised in the college. The respondents did not benefit from flexibility to interrupt their learning. The Mann Whitney U-test revealed that the second year respondents were significantly more inclined than third years to agree that computer assisted instruction enabled them to discontinue their learning when their concentration wavers. The second year respondents therefore benefited more from flexibility in terms of resting time. The benefits of electronic communication have not been realised. The respondents also failed to benefit from achieving their learning objectives through various types of educational computer packages. Furthermore, computer assisted instruction failed to contribute towards decreased external pressure placed upon learners.

Table 5.9 The potential benefits of computer assisted instruction, which did not realise

2nd year	3rd year
Flexibility in terms of resting time when their concentration wavers(Change chapter)	Flexibility in terms of resting time when their concentration wavers
Experiencing decreased peer pressure	Experiencing decreased peer pressure
Experiencing decreased educator pressure	Experiencing decreased educator pressure
Achieving their learning objectives through text-based course content computer packages.	
Achieving their learning objectives through multimedia course content computer packages.	Achieving their learning objectives through multimedia course content computer packages.
Achieving their learning objectives through multimedia problem oriented computer packages	Achieving their learning objectives through multimedia problem oriented computer packages
Achieving their learning objectives through computer packages simulating clinical situations which develop respondents' decision making skills.	Achieving their learning objectives through computer packages simulating clinical situations which develop respondents' decision making skills.
Achieving their learning objectives through computer-gaming packages	Achieving their learning objectives through computer-gaming packages
Extended electronic communication with their peers	Extended electronic communication with their peers
Extended electronic communication with their tutors	Extended electronic communication with their tutors
Extended electronic communication with field experts	Extended electronic communication with field experts

5.2.6 Problems experienced with computer assisted instruction

The researcher obtained data on the problems that respondents experienced during computer assisted instruction. Table 5.10 indicates potential problems associated with computer assisted instruction, which were not encountered by a substantial majority of the respondents. The table reveals that the learners' interest in learning and their concentration span did not decrease. Power failures were not problematic. Especially the second year respondents reported that they did not regard feelings of insecurity and inadequate proficiency of the facilitator, to be problematic.

Table 5.10 Potential problems not encountered by a substantial majority of respondents

2nd year	3rd year
Feelings of insecurity in the learning process	
Frequent power failures	Frequent power failures
Proficiency of the learning facilitator inadequate	
Computer assisted instruction not being respondents' preferred way of learning	
Losing interest in their learning	Losing interest in their learning
Decreased concentration span	Decreased concentration span
Being too dependent on the computer for learning purposes	Being too dependent on the computer for learning purposes
Losing sight of their learning objectives because respondents focus too much on the technical equipment	Losing sight of their learning objectives because respondents focus too much on the technical equipment

Table 5.11 indicates the potential problems associated with computer assisted instruction, which were encountered by many, although not the majority, of respondents. The table revealed that the respondents encountered problems with regard to inadequate technical abilities, as well as unreliable infrastructure and equipment. The second year respondents were significantly more inclined than third years to agree that the computer equipments in the media centre were unreliable. This could be due to their relative lack of experience with utilising information-communication technologies. Another problem appears to be the unavailability of the facilitator. Especially the third year respondents were critical of the proficiency of the facilitator. The respondents encountered difficulties in obtaining information on the Internet, and to achieve their learning objectives through various types of computer packages.

Table 5.11 Problems experienced by many, although not experienced by the majority of respondents

2nd year	3rd year
Struggling to operate the computer equipment	Struggling to operate the computer equipment
	Feelings of insecurity in the learning process
Struggling to operate the computer software (packages functions)	Struggling to operate the computer software (packages functions)
Unreliable telephone connections hampering access to the Internet	Unreliable telephone connections hampering access to the Internet
Unreliable computer equipment in the media centre	
Availability of a learning facilitator to provide assistance	Availability of a learning facilitator to provide assistance
	Proficiency of the learning facilitator
	Computer assisted instruction not being respondents' preferred way of learning
Struggling to independently obtain information from the Internet	Struggling to independently obtain information from the Internet
Achieving learning objectives through typing skills computer packages	Achieving learning objectives through typing skills computer packages
Achieving learning objectives through computer literacy packages	Achieving learning objectives through computer literacy packages
Achieving learning objectives through text-based course content computer packages	Achieving learning objectives through text-based course content computer packages
	Achieving learning objectives through multimedia computer packages which provide scenarios that develop respondents' problem solving skills
Achieving learning objectives through computer gaming packages	Achieving learning objectives through computer gaming packages
Achieving learning objectives when trying to obtain information from the Internet	Achieving learning objectives when trying to obtain information from the Internet
	Increasing personal contact with peers

Table 5.12 indicates the problems, associated with computer assisted instruction, which a substantial majority of the respondents encountered. These problems therefore require priority attention. The table reveals that the respondents encountered problems in gaining access to computer assisted-instruction, due to a lack of the necessary facilities, and their inability to afford the required equipment. While utilising available facilities, they were hampered by insufficient technical assistance in the media centre, and by their struggle to remain up-to-date with technological developments. The respondents struggled to achieve learning objectives through computer packages that develop their higher order cognitive skills, and to increase their personal contact with their peers and tutors.

Table 5.12 Problem areas that require priority attention

2nd year	3rd year
Struggling to remain up-to-date with developments in computer technology	Struggling to remain up-to-date with developments in computer technology
Unaffordability of the necessary computer equipment	Unaffordability of the necessary computer equipment
A lack of computer facilities hampering respondents' access to computer assisted instruction	A lack of computer facilities hampering respondents' access to computer assisted instruction
	Unreliable computer equipment in the media centre
Insufficient technical assistance in the media centre	Insufficient technical assistance in the media centre
Achieving learning objectives through multimedia course content computer packages	
Achieving learning objectives through text-based computer packages which provide scenarios that develop respondents' problem solving skills	Achieving learning objectives through text-based computer packages which provide scenarios that develop respondents' problem solving skills*
Achieving learning objectives through computer packages simulating clinical situations which develop respondents' decision-making skills	Achieving learning objectives through computer packages simulating clinical situations which develop respondents' decision-making skills
Increasing personal contact with peers	
Increasing personal contact with their tutors	Increasing personal contact with their tutors

5.3 CONCLUSIONS

The utilisation of information-communication technologies for the purposes of computer assisted instruction and computer-based learning was still at its infancy in the nursing college, at the time of this present research study. Although learners preferred computer assisted instruction over traditional modes of teaching, accessibility to information-communication technologies were inadequate. This was due to access, which was mainly restricted to the media centre at the college. Access appeared to be virtually non-existent at clinical settings where learners work when they do not attend college. While some learners had access at home, most were unable to afford to install the equipment at home. Where equipment was available, its effective utilisation was hampered by unreliable equipment and telephone connections. Reliable telephone connections are important to secure Internet access.

Due to their inadequate levels of computer literacy, many learners struggled to operate the equipment and software packages, and to remain up to date with technological developments. Furthermore technical assistance appeared to be insufficient. Sufficient technical assistance was needed to assist learners who struggled to operate the equipment and software packages.

There was evidence of under-utilisation of educational computer packages. Professional educational packages, which develop learners' knowledge and higher cognitive skills, were generally non-utilised or under-utilised. Although reading, typing, and computer literacy packages were also under-utilised, its utilisation occurred more often than the professional packages. There appears to be room for improvement in achieving professional learning objectives when educational software is utilised. Many learners struggled to achieve their learning objectives when utilising these learning resources, and some indicated that they did not benefit adequately from these resources.

The unavailability of a learning facilitator, and perhaps a lack of proficiency of the facilitator, further contributed towards the problems that learners experienced. There was evidence that the Internet was reasonably utilised to obtain information. The third year learners especially benefited from utilising the Internet to obtain information. There is some evidence that CD-ROM packages were utilised for this purpose.

The research results also revealed that information-communication technologies enabled the learners to store and retrieve information, which is important for effective learning. It should however be noted that seeking, storing and retrieving information for educational purposes are one of many of the educational applications of information-communication technologies (refer to section 2.6).

It appears that, the educators failed to effectively implement the principles of constructivism. They failed to establish a flexible learning climate in terms of study time and pace. The learners inadequately experienced relief from peer pressure and pressure placed on them by their tutors. The educators also failed in establishing an interdependent, collaborative learning climate. The learners inadequately utilised and benefited from collaborative learning, electronic interaction and communication, and electronic information exchange. Despite the numerous challenges, there was evidence that learners benefited from computer assisted instruction.

The research findings revealed that computer assisted instruction enhanced learners' learning, and they were able to remain up-to-date with the latest developments in their discipline. They benefited from technical and cognitive skills development. Affectively, they experienced excitement when they discovered new knowledge. Computer-based learning enhanced the learners' experiences of satisfaction. Because the learners were independent, motivated and actively involved, a basis for constructivist learning had been established on a limited scale. Especially the third year learners benefited from increased learner control and they were able to learn from their mistakes.

5.4 RECOMMENDATIONS

Worldwide, information-communication technologies are increasingly being used for educational purposes. The development, in learners, of competence in utilising health information systems in the workplace and of a positive attitude towards the use of health information systems should start in the class-room setting. However, the research findings indicated that computer assisted instruction should be strengthened at the nursing college where this present research was done. The following recommendations are aimed at improving the situation.

5.4.1 Recommendations pertaining to nursing education

It is recommended that in-service education programmes be developed to improve nurse educators' computer literacy and facilitation skills, which would support effective computer assisted instruction.

According to Austin (1999:264), the current generation of nurse educators has not been exposed to computers as part of their basic professional education. This results in a lack of confidence with regard to computer assisted instruction. They generally feel more comfortable using traditional methods of instruction. Knowledge and experience of information-communication technologies are important because virtual classrooms will be more commonplace in future (Andrusyszyn, Iwasiw & Goldenberg 1999:277). Considering the findings of this present research study, the focus of in-service education would be to develop the necessary technical skills in operating the hardware and software, which are involved in computer assisted instruction. Other areas of focus ought to be electronic information access, electronic communication, and the principles and practices associated with computer assisted instruction.

It is recommended that the principles of constructivism, computer assisted instruction and computer-based learning be included in the curriculum for nurse educator training.

The inclusion of these educational principles in the curriculum will ensure that future nurse educators are able to utilise the information-communication technologies in an educationally sound manner.

5.4.2 Recommendations pertaining to increasing the effectiveness of computer assisted instruction

It s recommended that learners' exposure to information-communication technologies be improved.

The findings of this study indicated that most respondents had limited exposure to information-communication technologies, partly due to inadequate accessibility to the reliable technologies and

facilities. This can be counteracted by extending learners' access by establishing reliable facilities at the clinical settings where learners work.

It is recommended that reliable support structures should be established and maintained.

The college management should ensure the availability of suitably qualified technical and educational support personnel. The technical support personnel should be able to be of assistance to the learners, and also ensure that the technical equipment and computer software are in good working order. Where problems exist, the learners, and educators alike, ought to be ensured of efficient assistance.

The learners ought to have access to ongoing computer literacy courses, which would assist them in keeping up to date with the latest developments with regard to information-communication technologies and educational computer packages.

It is recommended that the learners' exposure to educational computer packages be improved, and that its effective utilisation is ensured.

The learners should have increased access to various educational computer packages which support mastering of subject content, and the development of higher cognitive skills. Learners should also be prepared to operate these software packages. The following packages would be appropriate:

- Text-based course content computer packages.
- Multimedia course content computer packages.
- Text-based computer packages, which provide scenarios that, develop the learners' problem-solving skills.
- Multimedia computer packages, which provide scenarios that, develop the learners' problem-solving skills.
- Computer packages simulating clinical situations, which develop the learners' decision-making skills.
- Computer packages which enable the learners to achieve their learning objectives though game-playing.

The educators should ensure that the utilisation of the above packages should occur within the context of a broad educational strategy. This implies the application of the principles of constructivism and problem-based learning. The educators should ensure that a balance is struck between self-directed learning and collaborative learning.

It is also necessary to enable the learners to develop their basic skills which would improve the learners' abilities to master the prescribed curriculum content, by enhancing their utilization of the following educational computer packages:

- Reading skills computer packages.
- Typing skills computer packages.
- Computer literacy packages.

It is recommended that electronic information dissemination and communication should be enhanced.

The educators should ensure that the electronic communication applications of information-communication technologies should be optimally utilised. This includes communication through e-mail, bulletin boards, chatting and video-conferencing. Electronic communication supports an interactive learning climate and collaborative learning, irrespective of geographical constraints. Increased information exchange further serves to enhance learning. Furthermore, the utilisation of electronic means of obtaining information, in addition to the traditional printed material, should be promoted. This would enable the learners to remain up to date with the most recent developments in the subject disciplines.

5.4.3 Recommendations pertaining to further research

It is recommended that further research be conducted to investigate the:

- attitudes of nurse educators on computer assisted instruction
- attitudes of nursing learners on computer assisted instruction
- effectiveness of established computer assisted instruction strategies
- effectiveness of educational computer packages in enhancing learning
- human (learner)-machine (technological equipment) interaction

- role of the educator and learner in computer assisted instruction
- group dynamics within the context of computer assisted instruction.

5.5 CONTRIBUTION OF THE STUDY

This study established a baseline for establishing computer assisted instruction, or to further develop existing initiatives, to enhance computer-based learning at nursing colleges. The research findings highlighted the potential problems to be avoided, and benefits to optimise. Furthermore the researcher suggested improved exposure to resources and activities, which support computer-based learning.

5.6 LIMITATIONS OF THE STUDY

The population used for this study was drawn from one nursing college in the Gauteng Province because its registered learners had been exposed to computer assisted instruction and computer based learning. The research findings therefore are limited to that nursing college.

The researcher did not conduct a pilot study. A block system was applied and the researcher could only gain access to the learners for the purposes of data-collection. However, the researcher pre-tested the questionnaire, involving expert educators. Furthermore, the statistical reliability tests revealed that the questionnaire was reliable. The researcher did not encounter any problem during data collection. The questionnaires were however long, but irrespective of that, the participants managed to finish them within 30 to 40 minutes.

5.7 CONCLUSION

This non–experimental, descriptive study, described the views of nursing learners with regard to various aspects related to computer assisted instruction and computer based learning. The purpose of this research was to contribute towards improved computer assisted instruction, by optimising the utilisation of information-communication technologies and associated educational principles in nursing education. A self–administered questionnaire was used to collect data. Descriptive statistics was used to analyse data. The findings of this study revealed negative and positive aspects related to

assisted instruction in the nursing college. In general, the application of computer assisted instruction is still at its infancy at the college. The researcher’s recommendations are aimed at improving learner access to the necessary facilities, equipment and educational software. Strategies to ensure that computer assisted instruction is based on sound educational principles are recommended.