INTERACT
INTEGRATE
IMPACT

Proceedings of the 20th Annual Conference of the Australasian Society for Computers in Learning in Tertiary Education (ASCILITE)

Adelaide, Australia
7–10 December 2003

Editors
Geoffrey Crisp, Di Thiele, Ingrid Scholten, Sandra Barker, Judi Baron

Citations of works should have the following format:

Author, A. & Writer B. (2003). Paper title: What it's called. In G.Crisp, D.Thiele, I.Scholten, S.Barker and J.Baron (Eds), *Interact, Integrate, Impact: Proceedings of the 20th Annual Conference of the Australasian Society for Computers in Learning in Tertiary Education*. Adelaide, 7-10 December 2003.

ISBN CDROM 0-9751702-1-X WEB 0-9751702-2-8

ascilite
Australasian Society For Computers
In Learning In Tertiary Education

Published by ASCILITE www.ascilite.org.au

AN INTERACTIVE MULTIMEDIA APPROACH TO PREPARING CHILDREN AND THEIR FAMILIES FOR HOSPITALISATION

Marijke Mitchell
School of Nursing
Royal Children's Hospital, Melbourne and The University of Melbourne, AUSTRALIA
marijke.mitchell@rch.org.au

Mike Keppell
Centre for Integrating Technology in Education
Hong Kong Institute of Education, HONG KONG
keppell@ied.edu.hk

Linda Johnston
Professor and Chair, Neonatal Nursing Research
Royal Children's Hospital, Melbourne and The University of Melbourne, AUSTRALIA
l.johnston@nursing.unimelb.edu.au

Abstract

This paper describes the rationale, theoretical underpinnings and the process of developing an interactive multimedia preparation program for eight - ten year old children undergoing elective surgery. It is well recognised in the medical literature that hospitalisation is a stressful experience for children and their families. A number of preparation programs (books, hospital tours, education programs) have been designed, implemented and evaluated. Hospital based preparation programs, although successful in addressing the issue, are not well attended in Australia due to the need for the child and family to visit the hospital before hospitalisation. A multimedia preparation program utilised in the home setting before hospitalisation has a number of advantages including the potential to benefit a greater number of children. The other advantages of a multimedia approach include the ability to address the needs of both the child and family before hospitalisation and allow revisiting of information. An added advantage of the approach is the use of a workbook to accompany the child to the hospital setting and reinforce coping strategies learned in the CD-ROM.

Keywords

Nursing, authentic learning environments, multimedia design, paediatric hospitalisation, preparation program

Introduction

Hospitalisation during childhood can be a very stressful experience not only for the child but for the entire family. The fear, pain, distress and anxiety surrounding treatments and procedures have been studied in great detail by researchers (Melamed & Siegel, 1975; Tiedeman & Clatworthy, 1990; Vernon, Foley, Sipowicz, & Schulman, 1965; Vernon & Thompson, 1993; Visintainer & Wolfer, 1975). Within the literature and within the medical and nursing community it has been recognised that children and families must be prepared for the process of hospitalisation in order to promote effective coping and reduce the potential for negative long-term emotional effects. The aim of this paper is to discuss the difficulties in preparing children and their families for this experience and outline an approach undertaken in an attempt

to ease the transition of the child and family into the hospital setting. Nurses witness on a day-to-day basis the first hand experiences of children coping with the challenges of the hospital environment. This paper examines an intervention using a multimedia preparation program which may offer some support for children undergoing elective surgery.

A review of the literature

It is reasonable to assume that most adults faced with impending hospitalisation would articulate feelings of anxiety and concern. It is reasonable to suggest that children who are old enough to understand the concept of hospitalisation would be just as concerned, if not more so. There is substantial evidence in the literature to support these assumptions. Researchers have been studying the effects of hospitalisation on children for over fifty years (Knight et al., 1979; Prugh, Staub, Sands, Kirschbaum, & Lenihan, 1953; Vernon et al., 1965). There are numerous aspects of the hospitalisation process that have been identified as stressful for children. Having surgery, painful procedures and separation from parents are key aspects of hospitalisation that have been identified to cause children distress (Hart & Bossert, 1994; LaMontagne, Hepworth, Byington, & Chang, 1997; May & Sparks, 1983; Timmerman, 1983). This knowledge of the negative effects of hospitalisation on children has resulted in marked changes to the care of children in hospitals. Numerous measures have been implemented to reduce the stress of hospitalisation for children and their families. Restriction of parental visiting has been abolished. In addition there is an increased emphasis on making hospitals more child-friendly and play is encouraged. In addition, a range of hospital preparation programs have been designed and implemented to assist children to understand and manage the events they will face when hospitalised.

A review of the literature surrounding hospital preparation programs for primary school-aged children illustrates a range of different approaches. One popular approach provides information about the hospitalisation process utilising a variety of mediums including print, film and picture books (Uzark, Klos, Davis, & Rosenthal, 1982; Vernon & Bailey, 1974; Wolfer & Visintainer, 1979). A second approach to preparing children promotes familiarisation with the hospital, procedures and medical equipment through a hospital tour and medical play (Cassell, 1965; Peterson, Ridley-Johnson, Tracy, & Mullins, 1984; Zahr, 1998). A third approach involves programs that teach a variety of coping skills (Broome, Rehwaldt, & Fogg, 1998; Jay, Elliott, Katz, & Siegel, 1987; Siegel & Peterson, 1980). These programs work on the premise that children often have difficulty in managing the stress of hospitalisation due to their limited repertoire of coping mechanisms and their limited life experience. Another set of programs includes a combination of preparation methods with the most sophisticated programs providing both information and coping skills training to the child and parents (Campbell, Kirkpatrick, Berry, & Lamberti, 1995).

As part of the research and development approach of this study, the effectiveness of various preparation programs was evaluated. The most effective programs appear to be those that utilise a diversity of preparation methods (Brennan, 1994; Brewer & Lambert, 1997; Lau, 2002; Lynch, 1994). While these programs have been shown to be beneficial for children and families, there are some major limitations. The major problem with these programs is that they are often costly to conduct and resource intensive because of the multi-faceted methods of preparation that are utilised. These programs require trained staff to coordinate and conduct the programs as well as a suitable venue, materials and equipment to demonstrate the concepts. These items may also be costly to purchase and maintain. The second major problem with many of the programs evaluated is that they require patients and families to visit the hospital prior to the admission date. This need to visit the hospital results in the program being inaccessible to patients who live significant distances from the hospital. Programs that are conducted during working hours are also restrictive for families where both parents work. Some preparation programs have overcome the accessibility issue by preparing children on the day of admission. The third difficulty relates to retention of knowledge and practice of skills taught when the child may be anxious and vulnerable just prior to or on the day of admission. Evidence suggests that children may not fully understand the concepts taught when they are anxious, such as upon admission to hospital, and may not retain the information delivered (Melamed & Ridley-Johnson, 1988). As expected, the timing of teaching coping strategies is crucial in their adoption and the day of admission may not represent

the most appropriate time to teach coping strategies. These strategies need to be taught in advance, in a non-stressful environment, to allow adequate understanding and practice of the techniques (Mansson, Bjorkhem, & Wiebe, 1993).

It is difficult to find programs that effectively meet all the desired criteria. There is a definite lack of literature that identifies effective programs that are both cost-effective and accessible. The aim of this project is to develop a preparation program for primary school-aged children undergoing elective surgery at the Royal Children's Hospital, Melbourne, which utilises the best available clinical evidence while remaining cost-effective and accessible. A projected sixteen thousand (16,000) children requiring elective surgery will be admitted to the Royal Children's Hospital (RCH) in Melbourne in the year 2004. Currently the information

provided for these children and their families regarding the hospital experience may include the provision of written materials, some of which were last revised in 1980. These materials provide information regarding the hospital experience but do not provide any education addressing patient and family anxieties or strategies for coping with such issues. An in-house preparation program is offered, but anecdotally, is poorly utilised.

The use of multimedia to teach the concepts taught by previously evaluated programs has been considered as a viable option for developing a program that meets all the desired criteria. The package would allow for children and parents to prepare for hospitalisation in the home environment at a time that is convenient for learning, reinforcement and adoption of their principles. The flexibility of the program would allow for revisiting of information, practice of skills and the facilitation of discussion between the child and the parents. Once developed, the project should be cost-effective to conduct and accessible to a greater proportion of patients and families. A search of the Internet indicates there is currently no children's hospital in Australia providing multimedia-based information in preparation for hospitalisation nor strategies for coping with the anxieties that may accompany that experience. The challenge of this project was to develop an interactive CD-ROM game which is based on the best available clinical evidence to provide optimal preparation for hospitalisation that is educationally sound, interesting, enjoyable and engaging for both the child and family. This style of preparation, if shown to be educationally effective, could have important implications for the preparation of children for hospitalisation worldwide.

Aim of the project

The objective of this project, therefore, was to design, develop and formatively evaluate a multimedia hospital preparation program for children undergoing elective surgery and their families.
The project was conducted in collaboration with the Royal Children's Hospital, Melbourne and the Biomedical Multimedia Unit at The University of Melbourne. Ethics approval was sought and granted from the Royal Children's Hospital Human Research Ethics Committee prior to commencement of the research. The project utilised a four-phase design process.

Phase 1: Analysis

The purpose of the needs analysis phase was to determine the goal of the instructional design according to the needs of the target audience. Three processes were utilised to inform the content and design of the CD-ROM. Firstly, an extensive literature review of the effects of hospitalisation on children and the effectiveness of previous preparation programs was undertaken. This resulted in the need for a cost-effective and focussed intervention which could be utilised with numerous children. Secondly, two hundred questionnaires were sent to parents of children who had recently undergone surgery to determine the major causes of concern for the target audience. By identifying these key areas of concern, the design attempts to address these issues through the educational design of the module. Preliminary analysis of these questionnaires suggest children who have recently undergone surgery are most fearful of 'getting an injection,' 'having an operation,' 'being alone without one's parents' and 'not being able to breathe.' The aspects of hospitalisation which children identified as most stressful included the 'insertion of a drip,' 'pain,' 'removal of a drip or drain' and 'having an anaesthetic.' Most parents indicated that they preferred

to prepare their children for hospitalisation at home prior to admission. Some parents, however, indicated that they were surprised that discussing the hospitalisation process with their child at home did not totally alleviate their child's fears and believed that information and support from health professionals could assist them in the future to more adequately prepare their child:

> *"A video might have been beneficial as I thought I had prepared him well but I saw the utter fear on his face when the anaesthetist approached him prior to going in for surgery."*

The negative effects that hospitalisation can have on some children following discharge from hospital was illustrated by this comment from a parent:

> *"He seemed to accept everything well but on being told of his follow-up appointment three weeks later, he emphatically said he would not go to hospital. I had to do a lot of talking to explain that he was just going in for a visit to see the doctors again as he had in the past and would be returning home again on the same day. This did surprise me."*

Thirdly, six interviews with children currently in hospital and their parents were conducted to gain more insight into the child's concerns regarding hospitalisation. This interview demonstrates that children worry about being in hospital:

E Um, before my operation there was some risk, but I don't know how much. There wasn't that much risk so I shouldn't have worried, but I don't know, I just worried about it...[trails off]
I ...that something might happen in the operation?
E Mmm [yes] Oh, yeah. Brain damage was the thing I was most worried about.
(Interview with Emma, aged 12)

The children interviewed described a number of their fears and were most concerned about pain, waking up after their operation and having blood tests. The following quote sums up a number of the fears that these children discussed:

I So were there any things about being in hospital that were scary for you?
A Changing the bandage.
I Mmm, tell me about that.
A Um, because I thought it would hurt ...and the operation ...and all the needles.
I And what was it about those things that was scary?
A The needles I didn't like because then I couldn't move my muscles.
I Yes.
A And the blood tests hurt a lot, it was a sting.
I Was it?
A Yes. And the operation I was scared because I didn't like people cutting me.
(Interview with Annie, aged 9)

Phase 2: Design of CD-ROM package

The purpose of the design phase was to outline the content of the program in detail before developing the multimedia component. The major components of this phase included content development and review, formulation of the macro-design (concept map) and micro design (storyboard). The content was developed from the major themes that emerged from the literature review, parent questionnaires and the patient interviews. The most frequently reported stressful aspects of hospitalisation, that being 'having a drip inserted,' 'having pain,' 'having a drip or drain removed,' 'waking up in Recovery' and 'the fear of the unknown' were addressed in the content of the CD-ROM. In addition, clinicians at the Royal Children's Hospital who had knowledge and experience in the content areas of the program were invited to review the content. The content was modified according to the feedback provided by the clinical experts.

The macro design focussed on outlining the sequence of the module in the form of a virtual tour of the hospital and the areas that the child would visit during hospitalisation and surgery. The micro design of the CD-ROM included dividing the content into separate scenes which included three major components: an overview, an activity and a reinforcement activity. Storyboards were produced for each scene to assist communication between the nurse educator, instructional designer and graphic designer. The descriptions of what each scene was to look like including the content and activities to be included on each screen was

detailed. A concept map was developed to outline the sequence of scenes and navigation of the multimedia game.

Phase 3: Development of CD-ROM package

The development phase of the project incorporated a number of instructional design activities. The visual theme and text conventions were determined and a program "shell" developed. The development of the shell allowed input of text content followed by the creation of animations and illustrations. At the completion of the first draft, lingo programming and beta testing were conducted followed by proof reading of the text and input of voice-overs. Changes and corrections were made prior to evaluation of the program. A handbook was produced to accompany the CD-ROM utilising the images and graphics from the multimedia program.

A constructivist learning approach

To guide the instructional design of the module a constructivist approach to learning was utilised as the major educational theory underpinning the design of the game. Constructivist learning, according to Simons (Simons, 1993), encourages learners to build complex memory representations which show a high degree of connectedness. Constructivist learning is active, constructive, cumulative and goal orientated (Shuell, 1988). The CD-ROM design ensured that learning was active by utilising activities and games to learn and understand the material that was being presented. The CD-ROM design followed the hospitalisation process in a typical sequence, which ensured that new information was elaborated on and related to previous information thus promoting the engagement of the learner with the activities. The learning was cumulative in that certain activities required knowledge and skills learnt in previous sections of the CD game to be reinforced in subsequent sections as new information was related to the previous knowledge of the learner. The CD-ROM design utilised a game style approach, which ensured that the learning for each activity was goal orientated. The overall goal was to successfully complete all sections of the game, thus gaining an understanding of the entire hospitalisation process. This goal was communicated to the learner at the commencement of the game which ensured that the learners expectations were directed towards the desired outcomes.

Authentic learning environments

In order to be effective, Brown et al (Brown, Collins, & Duguid, 1989) believe that learning should take place in the context of an authentic environment. Authentic activity allows the learner to act meaningfully and purposefully while providing experience similar to the real-world experience (Brown et al., 1989). This concept was particularly important for this project, as the major aim of the multimedia program was to provide children with a simulated experience of the hospitalisation process. It also aimed to teach children to practice the skills within a non-stressful environment at home and would be useful to use while in the hospital awaiting surgery. The practice of placing learning objects in the context of the environment in which they are to be used, enables the skills of 'knowing' and 'doing' to be interlaced (Brown et al., 1989; Young, 1993). Knowledge, therefore, becomes a tool with the learner able to utilise practical strategies in real life problem solving (Brown et al., 1989). It was anticipated that children who utilise the CD-ROM will not only 'know' the hospitalisation process but also learn how to manage stressful experiences once admitted to hospital. Extensive evaluation of the CD-ROM and follow-up with patients over a period of time to examine this research question will not be examined in this paper.

Learning design

The process of providing meaningful learning through authentic activities is termed situated cognition which encourages the transfer of knowledge to real life situations (Choi & Hannafin, 1995). The model of instructional design for the CD-ROM was based upon a situated learning approach. The major principles considered in the design of the CD-ROM were based on the framework developed by Herrington & Oliver (1995). Herrington & Oliver, (1995) outline nine critical characteristics of situated learning for instructional design which were utilsed as guiding principles in the design. These include an authentic context, provision of authentic activities, provision of expert performances and modeling of processes, provision of multiple roles and perspectives, reflection, collaborative construction of knowledge, articulation, coaching and scaffolding and provision of authentic assessment. The following discussion adapts these principles to emphasise the key point areas of design which were utilised.

1. *An authentic context that reflects the way knowledge will be used in real life.* The context utilised within the multimedia module attempted to replicate a specialist children's hospital situated within a large city. The text described the experience of a child being admitted to hospital and undergoing elective surgery. The narrative was written so that the user felt that they were experiencing the situations while observing a child of a similar age going through the same process (see Figure 1).

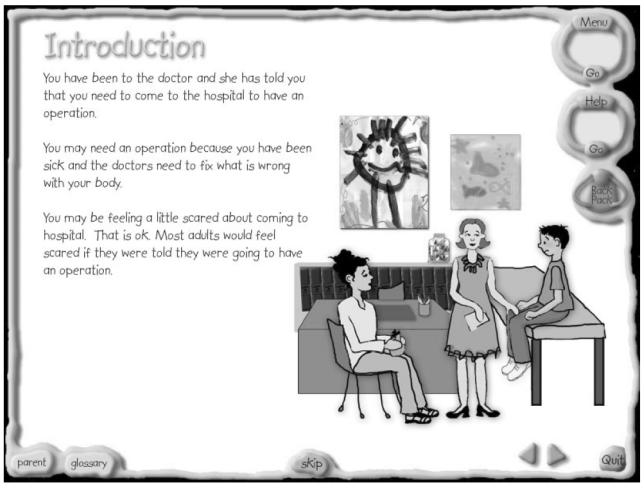

Figure 1: Introduction Screen

2. *Provision of authentic activities.* The learning environment provided the child user with real-life problems and challenges that they could typically face while hospitalised. These challenges included coping with pain, stressful procedures, separation from parents and immobility. Strategies to assist with the management of these issues were taught and practised within the game environment. The user was given the opportunity to apply these concepts throughout the game. Each major stage of the hospitalisation process was represented by three screens: an information screen to introduce the topic; an activity screen to apply the information presented in the previous screen and a reinforcement screen to reinforce the major concepts presented in the three-screen series (see Figures 2, 3 & 4).

Figure 2: What should I pack? (Information Screen)

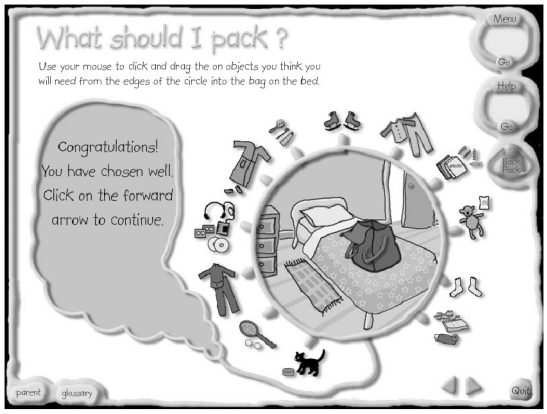

Figure 3: What should I pack? (Activity Screen)

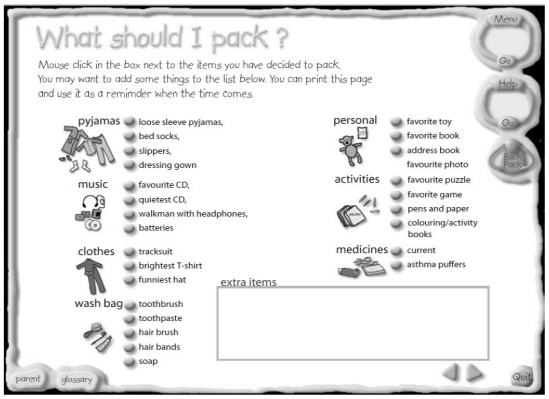

Figure 4: What should I pack? (Reinforcement Screen)

3. *Provision of expert performances and modelling of processes.* The learning environment modelled coping strategies and allowed the user to observe and emphasise with a child character successfully managing stressful procedures and events that occur throughout the hospitalisation process. The coping skills utilise best practice strategies so that the user observes the correct way to apply the techniques to situations that may occur during their hospitalisation process.

4. *Provision of multiple roles and perspectives.* The child should begin to see the roles of other people in the hospital setting which should ease their anxiety when in hospital. This is achieved by hospital staff describing their roles within the context of the game's activities. In addition, four children currently experiencing hospitalisation also provided their own perspectives at key points within the game. The child should be provided with other perspectives in relation to the experience.

5. *Reflection.* To address the concept of reflection for the learning of coping strategies we felt that a specific learning tool would be required in addition to the CD-ROM. A handbook which would accompany the child to the hospital was designed in order to reinforce key information and provide opportunities for the user to write down their thoughts, feelings, reactions and memories related to their experiences encountered while in hospital.

6. *Collaborative construction of knowledge.* The learning environment provided the opportunity for the user, that is, the child, to collaborate with their parent(s) to problem solve and practice the skills learnt. Tasks were incorporated into the software to encourage this interaction. This was a major feature of the intervention. Many initiatives have not considered how the child and parent can learn about the hospitalisation process. It was an explicit design consideration to provide information to both the child and parent. At pertinent times during the game, the child is asked to discuss the content with their parent which should begin to prepare both the child and parent for the experience.

7. *Articulation.* The CD-ROM may trigger the child to begin speaking to their parents about their fears and anxieties in relation to their experience. By providing more information about the process of hospitalisation the child should have many questions for their parents. In addition, the child will be provided with opportunities to learn the language relating to hospitalisation and health care. Audio verbalisation of keywords was utilised to promote the users articulation of keywords and concepts. The users were encouraged to discuss the concepts presented with their parents and siblings in order to increase their understanding of the hospitalisation process.

8. *Coaching and scaffolding.* Coaching involves providing advice and guidance while learners attempt to perform a task (Choi & Hannafin, 1995). The learning environment ensured that parents were able to provide coaching by providing them with adult focussed information and explanations within the software. This information included suggestions for parents on how to assist their child to complete and practice the tasks. A range of scaffolding exists throughout the game from detailed instructions on how to perform a task through to limited hints and suggestions. The child will begin to learn skills in a non-stressful environment in which the CD-ROM and parent will provide maximal support. It is hoped that the parent and child will be able to call upon these coping strategies when required, in the more stressful hospital environment. Stressful situations which children commonly face while in hospital include having a blood test or having an intravenous cannula inserted, which both could be made easier for the child to deal with through the use of appropriate coping strategies.

9. *Provision of authentic assessment.* Assessment of the concepts and skills taught via the software occurred seamlessly throughout the learning environment. Each new set of information was assessed through activities and reinforcement activities with a balance of contextualisation and decontextualisation within the authentic environment (Simons, 1993). That is, some activities were based on the real hospital situation while others, such as the coping strategies activities, were initially taught utilising more imagined situations and then applied to the hospital context. The assessments were designed to be fun and interesting for children so as to maintain motivation.

Phase 4: Formative Evaluation of CD-ROM package

The aim of the formative evaluation phase was to systematically collect information to inform decisions relating to design and to ultimately improve the product. Evaluation consisted of two phases and was conducted in conjunction with the Biomedical Multimedia Unit (BMU) at The University of Melbourne. The first phase of evaluation involved the evaluation of the instructional and conceptual design for orienting of information, flow and sequence, interactivity, navigation and orientation, learning objectives and outcomes. Three education and graphic experts reviewed the interface and graphic design for clarity and consistency, usability and structure. The second phase involved pilot testing of the product with the target age group for user friendliness, interactivity and the ability to engage in the process. Satisfaction with the educational process was evaluated via questionnaires and interviews. The results of this phase of the study are still being analysed and will determine the modifications that need to be made to the package prior to the implementation of the intervention. Summative evaluation to determine the short-term effects of the product in relation to the user's knowledge, skills and attitudes will be undertaken as a separate research study and will not be addressed in this paper.

Conclusion

It can be concluded that children undergoing elective surgery require preparation prior to admission to hospital in order to increase their understanding, promote effective coping and reduce the negative effects of hospitalisation. Parents need to be included in this process in order to alleviate their anxiety and assist them to effectively support their child. Utilisation of hospital-based preparation programs is restricted by accessibility. The hospital-based style of preparation excludes families that cannot travel to the hospital prior to admission. These type of programs are also costly to conduct and resource intensive. A strategy to improve accessibility would be to develop a multicomponent preparation program that can be utilised at home. An interactive multimedia program, which addresses the needs of the child and family and allows revisiting of information while being fun, flexible and cost-effective, may be the answer. This form of

preparation is currently under development and if shown to be effective, enjoyable and cost-effective, could have important implications for the preparation of children for hospitalisation worldwide.

References

Brennan, A. (1994). Caring for children during procedures: a review of the literature. *Pediatric Nursing*, 20(5), 451-458.

Brewer, S. L., & Lambert, C. S. (1997). Preparing children for same day surgery: innovative approaches. *Journal of Pediatric Nursing*, 12(4), 257-259.

Broome, M. E., Rehwaldt, M., & Fogg, L. (1998). Relationships between cognitive behavioral techniques, temperament, observed distress, and pain reports in children and adolescents during lumbar puncture. *Journal of Pediatric Nursing: Nursing Care of Children & Families*, 13(1), 48-54.

Brown, J. S., Collins, A. S., & Duguid, P. (1989). Situated cognition and the culture of learning. *Educational Researcher*, 18(1), 32-42.

Campbell, L. A., Kirkpatrick, S. E., Berry, C. C., & Lamberti, J. J. (1995). Preparing children with congenital heart disease for cardiac surgery. *Journal of Pediatric Psychology*, 20(3), 313-328.

Cassell, S. (1965). Effect of brief puppet therapy upon the emotional responses of children undergoing cardiac catheterization. *Journal of Consulting Psychology*, 29, 1-8.

Choi, J., & Hannafin, M. (1995). Situated cognition and learning environments: Roles, structures and implications for design. *Educational Technology, Research and Development*, 43(2), 53-69.

Hart, D., & Bossert, E. (1994). Self-reported fears of hospitalized school-age children. *Journal of Pediatric Nursing: Nursing Care of Children & Families*, 9(2), 83-90.

Herrington, J., & Oliver, R. (1995). *Critical characteristics of situated learning: Implications for the instructional design of multimedia*. Paper presented at the 12th Annual conference of the Australian Society for Computers in Tertiary Education (ASCILITE), Melbourne, Australia.

Jay, S. M., Elliott, C. H., Katz, E., & Siegel, S. E. (1987). Cognitive-behavioral and pharmacologic interventions for childrens' distress during painful medical procedures. *Journal of Consulting & Clinical Psychology*, 55(6), 860-865.

Knight, R. B., Atkins, A., Eagle, C. J., Evans, N., Finkelstein, J. W., Fukushima, D., et al. (1979). Psychological stress, ego defenses, and cortisol production in children hospitalized for elective surgery. *Psychosomatic Medicine*, 41(1), 40-49.

LaMontagne, L. L., Hepworth, J. T., Byington, K. C., & Chang, C. Y. (1997). Child and parent emotional responses during hospitalization for orthopaedic surgery. *MCN, American Journal of Maternal Child Nursing*, 22(6), 299-303.

Lau, B. W. K. (2002). Stress in children: Can nurses help? *Pediatric Nursing*, 28(1), 13-19.

Lynch, M. (1994). Preparing children for day surgery. *Children's Health Care*, 23(2), 75-85.

Mansson, M. E., Bjorkhem, G., & Wiebe, T. (1993). The effect of preparation for lumbar puncture on children undergoing chemotherapy. *Oncology Nursing Forum*, 20(1), 39-45.

May, B. K., & Sparks, M. (1983). School age children: are their needs recognized and met in the hospital setting? *Children's Health Care*, 11(3), 118-121.

Melamed, B. G., & Ridley-Johnson, R. (1988). Psychological preparation of families for hospitalization. *Journal of Developmental & Behavioral Pediatrics*, 9(2), 96-102.

Melamed, B. G., & Siegel, L. J. (1975). Reduction of anxiety in children facing hospitalization and surgery by use of filmed modeling. *Journal of Consulting & Clinical Psychology*, 43(4), 511-521.

Peterson, L., Ridley-Johnson, R., Tracy, K., & Mullins, L. L. (1984). Developing cost-effective presurgical preparation: a comparative analysis. *Journal of Pediatric Psychology*, 9(4), 439-455.

Prugh, D. G., Staub, E. M., Sands, H. H., Kirschbaum, R. M., & Lenihan, E. A. (1953). A study of the emotional reactions of children and families to hospitalization and illness. *American Journal of Orthopsychiatry*, 23, 70-106.

Shuell, T. J. (1988). The role of the student in learning from instruction. *Contemporary Educational Psychology*, 13(3), 276-295.

Siegel, L. J., & Peterson, L. (1980). Stress reduction in young dental patients through coping skills and sensory information. *Journal of Consulting & Clinical Psychology*, 48(6), 785-787.

Simons, P. R.-J. (1993). Constructive learning: The role of the learner. In T. M. Duffy, J. Lowych & D. H. Jonassen (Eds.), *Designing environments for constructive learning* (pp. 291-313). New York: Springer-Verlag.
Tiedeman, M. E., & Clatworthy, S. (1990). Anxiety responses of 5- to 11-year-old children during and after hospitalization. *Journal of Pediatric Nursing*, 5(5), 334-343.
Timmerman, R. R. (1983). Preoperative fears of older children. *AORN Journal*, 38(5), 827, 830-831, 834.
Uzark, K., Klos, D., Davis, W., & Rosenthal, A. (1982). Use of videotape in the preparation of children for cardiac catheterization. *Pediatric Cardiology*, 3(4), 287-291.
Vernon, D. T., & Bailey, W. C. (1974). The use of motion pictures in the psychological preparation of children for induction of anesthesia. *Anesthesiology*, 40(1), 68-72.
Vernon, D. T., Foley, J. M., Sipowicz, R. R., & Schulman, J. L. (1965). *The psychological responses of children to hospitalization and illness. A review of the literature*. Springfield: Charles C. Thomas Publisher.
Vernon, D. T., & Thompson, R. H. (1993). Research on the effect of experimental interventions on children's behavior after hospitalization: a review and synthesis. *Journal of Developmental & Behavioral Pediatrics*, 14(1), 36-44.
Visintainer, M. A., & Wolfer, J. A. (1975). Psychological preparation for surgery pediatric patients: the effects on children's and parents' stress responses and adjustment. *Pediatrics*, 56(2), 187-202.
Wolfer, J. A., & Visintainer, M. A. (1979). Prehospital psychological preparation for tonsillectomy patients: effects on children's and parents' adjustment. *Pediatrics*, 64(5), 646-655.
Young, M. F. (1993). Instructional design for situated learning. *Educational Technology, Research and Development*, 41(1), 43-58.
Zahr, L. K. (1998). Therapeutic play for hospitalized preschoolers in Lebanon. *Pediatric Nursing*, 24(5), 449-454.

Acknowledgements
The authors would like to thank the children and families who participated in this project. We would also like to thank Avril Martinelli , Jennifer Kirk and Jacqui Jewell for their graphic design work on this project.
This project was funded in part by the Telematics Course Development Fund, Helen Macpherson Smith Trust and The Royal Children's Hospital Allied Health and Nursing Seeding Grant.