Nurse Education Today 35 (2015) 815–822

Contents lists available at ScienceDirect

Nurse Education Today

journal homepage: www.elsevier.com/nedt

Using concurrent think-aloud and protocol analysis to explore student nurses' social learning information communication technology knowledge and skill development

Fern Todhunter *

School of Health Sciences, The University of Nottingham, Room B48, B Floor South Block, Queen's Medical Centre, Nottingham NG7 2UH, United Kingdom

ARTICLE INFO

Article history:
Accepted 12 January 2015

Keywords:
Concurrent think-aloud
Protocol analysis
Social learning
Information and Communication Technology
Observational software

SUMMARY

Observations obtained through concurrent think-aloud and protocol analysis offer new understanding about the influence of social learning on student nurses' acquisition of Information and Communication Technology (ICT) knowledge and skills. The software used provides a permanent record of the underpinning study method, events and analyses. The emerging themes reflect the dimensions of social engagement, and the characteristics of positive and negative reactions to ICT. The evidence shows that given the right conditions, stronger learners will support and guide their peers.

Aims: To explore the use of concurrent think-aloud and protocol analysis as a method to examine how student nurses approach ICT.

To identify the benefits and challenges of using observational technology to capture learning behaviours.

To show the influence of small group arrangement and student interactions on their ICT knowledge and skills development.

Background: Previous studies examining social interaction between students show how they work together and respond to interactive problem solving. Social interaction has been shown to enhance skills in both ICT and collaborative decision making.

Design: Structured observational analysis using concurrent think-aloud and protocol analysis.

Results: Students displayed varying degrees of pastoral support and emotional need, leadership, reflection, suggestion and experimentation skills.

Conclusion: Encouraging student nurses to work in small mixed ability groups can be conducive for social and ICT skill and knowledge development. Observational software gives a permanent record of the proceedings.

Introduction

At a university small groups of student nurses can often be seen huddled and working together around a computer terminal, navigating through an activity. These logged behaviours can give a rich texture of detail and understanding about experiential learning with Information and Communication Technology (ICT) (Ballantine et al., 2007; Kaptelinin and Bannon, 2012). This paper reports on using a structured observational method through concurrent think-aloud and protocol analysis. The purpose was to gather commentary and behaviours from student nurses undertaking an ICT task. Structured observational analysis is a pre-determined organised activity used to gather social phenomena. Concurrent think-aloud is the technique used to collect commentary as evidence. Protocol analysis is the process used to examine the spoken thoughts. The supporting technology has a significant quality influence on the research conduct and outcomes. The outcomes reflect peer support, social interaction and the development of ICT knowledge and skills.

Background

Structured observational methods have been widely used to find out how and why people interact and work together in groups. The components of which can be a defined task or activity and a list of the behaviours. Both components are coded using a shorthand structure which is the researcher's checklist. The researcher then refers to this checklist during an observation and marks against an action as it occurs. In addition to the task and the behavioural actions, asking the subjects to think-aloud yields evidence that can be analysed similar to any other recordable activity. Comments are collected through recording and then transcribed as protocols. Commentary is influenced by information stored in the short and long term memory. Recently acquired information is stored in the short term memory and directly accessible. Verbal comments based on established information are

* Tel.: +44 115 8230945; fax: +44 115 8231324.
E-mail address: fern.todhunter@nottingham.ac.UK.

http://dx.doi.org/10.1016/j.nedt.2015.01.010
0260-6917/

reliant on the long term memory (Ericsson and Simon, 1993; Deschambault, 2012).

A key strength is the capture of commentary and behavioural observations as they occur. The concurrent protocols reflect the information processed and the reactions to the processes (Kuusela and Paul, 2000; Kelley et al., 2014). This method has been shown to provide a rich vein of data. Verbal protocols trace and explain the decision making process at the same time, therefore providing their own interpretation (Jaspers et al., 2004). Working through a task where written instructions are provided, requires verbalization of the immediate memory as opposed to a deeper introspection processes such as unaided recall in a written examination. Errors due to false recall are likely to be low because of the level of cognition involved (Gardin and Martin, 2010).

The verbal protocols from concurrent think-aloud give findings which are objective because of the openness and accessibility of the evidence (Hoppmann, 2009). Therefore a high face validity is associated with a concurrent think-aloud protocol. Crucially this is reliant on the subjects being given clear information about what is required of them. This could be either their reactions to a task or, their evaluation about the usability of the product. Coding and scoring systems can be customized to reflect the questions raised for the study (Horwood et al., 2014).

Limitations are related to participant reluctance, timing, quality and quantity of verbal output, and researcher's presence and interpretation (Ericsson and Simon, 1993). Criticisms have been levelled at inaccuracy, misinterpretation and failure to log vital behaviours at the time of their occurrence, rendering the output as incomplete (Kuusela and Paul, 2000). The contrived nature of being asked to think-aloud is a subtle, but important shift from natural responses and realism (Aitken and Mardegan, 2000; McDonald et al., 2013). Not everyone is suitable for thinking-aloud even in a group situation. Concurrently thinking and verbalizing are unnatural, as thought tends to co-exist with silence followed by speech. Schneider and Reichl (2006) set out the differences between mental health connotations and reactions towards individuals who talk to themselves. Research subjects face a number of behavioural challenges and expected to do just these whilst working through a task. The act of thinking-aloud may be perceived as unnatural and inappropriate as hearing one's own voice is potentially inhibitive (Stratman and Hamp-Lyons, 1994).

Albeit that a task requires immediate recall there may be a void between cognition and verbalization, crucial if timings are of significance. The requirement to think aloud whilst performing will invariably require more time than asking the subjects to work in silence (Van den Haak et al., 2003). This consideration needs to be built into the research design. There appears to be subtle, but important differences between quality and quantity of verbal fluency. Gresty and Cotton (2003, p.48) highlight “meaningful data or merely a rambling discourse.” Schneider and Reichl's (2006) quantitative approach measured verbal fluency as the total number of words produced in a one minute period. It may be doubtful if verbalization can capture every thought, if the researcher's extraction and interpretation of the protocols truly represent what has been both said and meant.

Irrespective of comforting reassurance, researcher's presence may inhibit natural behaviour with a switch from response to performance when individuals know that they are being watched, potentially leading to inaccurate conclusions (Tashakkori and Teddlie, 2010). In reality, the beliefs and expectations of the researcher using structured observational methods will infiltrate every stage of the research process (Dangwal et al., 2006; Leicht et al., 2010).

Study Design

Using Observational Technology

The traditional approach for structured observation was by watching and recording observed behaviours using a pencil and a paper. This is largely reliant on the observer's speed of perception, absorption of information, impartial interpretation and accurate documentation. Technology recreates the principles of the traditional approach through film and software. Subjects are recorded and their captured behaviours analysed. The advantages are: the creation of back-up systems once the observations have been collected, the richness of the logged evidence and the possibility to playback, review, dissect and explore minutiae direct and wider environment details after the event. The Observer XT software (Noldus, 2014) was used to manage, organise and analyse the collected evidence.

The Task

The test object for the task was a section of a Reusable Learning Object (RLO) from the university's repository of online resources. RLOs are useful for learning about and learning using ICT. The user is required to draw on skills and knowledge associated with mental calculation and reasoning for the subject area and the technology (Windle et al., 2011). The task was reasonably demanding, stretching the students' ability to work through its processes, without being too complex or simple (See Fig. 1).

The Task Conditions

The requirement for the study was for student nurses to think-aloud whilst they worked through the activity. Students were asked to give spoken thoughts and feelings in finding their way around the laptop and software. Subtle prompts such as “What are you thinking?” are occasional reminders asking the subject to state their thoughts. Prompts are useful, but should not be confused with instruction (Ericsson and Simon, 1993; McDonald et al., 2013). Likewise speech should not be used just to fill a void. Actual recording commenced only when the participants were ready after the warm-up exercise. Researcher proximity is an important consideration. Being able to observe, operate the cameras, give occasional prompts as gentle reminders to keep thinking aloud, but not have an overwhelming presence. Lodge et al. (2000) identify the subtle differences between the researcher being positioned within hearing distance, but out of the participants' line of vision.

Defining the Coding Scheme

Once collected the commentary is transcribed into protocols which are then content analysed (Ericsson and Simon, 1993; Hoppmann,

This is an extract from a Reusable Learning Object (RLO). **You have 10 minutes to complete the task**	
1. Find the URL for the School Of Health Sciences' list of Reusable Learning Objects. Click on **School RLOs** on the left side-bar. Scroll down the list and click on Home Visiting.	http://www....ac.uk/nmp/sonet/rlos
2. Read the introduction	*Do not click on the voice activator*
3. Go to Living Room 2	*Find the hotspots and work through each of them. State aloud how many hotspots you have found.*
4. Go to the Community Crossword	*Complete any three of the words. State aloud when you have completed them*
5. Find the quiz	*Complete question 6. State aloud when you have completed the question*
6. Close the programme	*Return to the University homepage. State aloud when you have done this*

Fig. 1. The task.