

A COMPUTER-BASED TEACHING PROGRAMME (CBTP) DEVELOPED FOR STUDENT NURSES IN AN ONCOLOGY CLINICAL SETTING

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SAMEVATTING

Die verpleegprofessie, soos ander professies, is daarop ingestel om studente vir die praktyk voor te berei, en aandag moet veral geskenk word aan studentverpleegkundiges se vermoë om hul bestaande kennis uit te brei en verpleegsorgprobleme effektief op te los. 'n Rekenaargebaseerde onderrigprogram (RGOP) vir die kliniese praktyk, om hierdie onderrigdoelwitte te bereik, word bespreek. Doelstellings met die rekenaargebaseerde onderrigprogram, hierna verwys as RGOP, was om 'n program te ontwikkel waar studentverpleegkundiges die verantwoordelikheid vir leer en die identifisering van leerbehoefte aanvaar, asook die ontwikkeling van 'n diep benadering tot leer. Verder moes die RGOP ook in die kliniese praktyk gebruik kon word. 'n Omvattende literatuurstudie is gedoen om vas te stel hoe die bogenoemde doelstellings bereik kan word. Aspekte wat onder andere in ag geneem is, is die verskillende leerteorieë, leer, leerstyle, leerbenaderings, die gebruik van rekenaarsistels in die verpleegprofessie, die aard daarvan, navorsingsbevindinge, redes waarom onderriginstansies rekenaargebaseerde onderrig implementeer, die voor en nadele, en fases in die ontwikkeling asook kriteria waaraan voldoen behoort te word. Om die inhoud van die RGOP saam te stel is onkologiese verpleegsorg gebruik. In die finale vorm bestaan die rekenaargebaseerde onderrigprogram onder andere uit vier kankertoestande en een-en-tagtig meerkeuse toets items om kennis te bevorder, en 'n gevallestudie om probleemoplossing te bevorder. Die outeur stel wat gekies is, het die koppeling van inligting moontlik gemaak. Koppeling van inligting was as belangrik beskou in die bevordering van 'n diep benadering tot leer.

ABSTRACT

The nursing profession, like other professions, is focused on preparing students for practice, and particular attention must be paid to the ability of student nurses to extend their knowledge and to solve nursing care problems effectively. A computer-based teaching programme (CBTP) for clinical practice to achieve these teaching objectives, is discussed. The aim of the computer-based teaching programme, hereafter referred to as the CBTP, was to develop a programme by which student nurses accept the responsibility for learning and the identification of learning needs, as well as the development of a deep approach to learning. The CBTP was also designed to be used in clinical practice. An extensive review of the literature was undertaken to determine how

these aims could be attained. Among the aspects taken into account were the various learning theories, learning, learning styles, approaches to learning, the use of computer systems in the nursing profession, their nature, research findings, reasons why educational institutions implement computer-based instruction, the advantages and disadvantages and phases of development as well as the criteria that should be met. Oncological nursing was used to compile the content of the CBTP. In its final form the computer-based teaching programme consists of, among others, four cancer disorders and eighty-one multiple choice test items to promote knowledge, and a case study to promote problem-solving. The authoring system selected made the linking of information possible. The linkage of information was considered to be important for the promotion of a deep learning approach.

INTRODUCTION AND THEORETICAL PROBLEM STATEMENT

The CBTP for student nurses in oncological clinical practice was part of a study dealing with the development and evaluation of a computer-based teaching programme for student nurses in clinical practice. A comprehensive description of the research method and methodology as contained in the study, does not apply to this article.

Research is being done world-wide to examine methods, techniques and styles of training, learning styles, learning approaches, personality traits, and their effect on students' learning (Barrows & Tamblyn, 1980; Marton, Hounsell & Entwistle, 1984; Day & Payne, 1987:30-35; Entwistle & Meyer, 1992; Finkel & Monk, 1992; Louw, 1994). The problems that have been identified are, among others, poorly constructed curricula, teaching that inhibits critical thinking, decision-making and problem-solving, a teaching milieu that promotes a passive culture of learning, lack of knowledge of students' learning approaches and inadequate guidance of students in clinical settings (Barrows & Tamblyn, 1980; Marton, Hounsell & Entwistle, 1984:36; Entwistle, 1983; Hinds, Burgess, Leon, McCormick & Svetich, 1985:66; Day & Payne, 1987:30-35; Lowdermilk & Hopkins, 1991:34; Finkel & Monk, 1992; Smith & MacGregor, 1992:9; Louw, 1994:117-124; Waterworth & Abbatt, 1997:289-292; Hawley & Desborough, 1998:31-35; Manias, Bullock & Bennett, 2000:265-271).

According to the experience of the researcher these problems also have a bearing on nursing education. In addition, the milieu in which student nurses are trained definitely has unique problems and although clinical settings offer ample opportunities, it would appear that the expectations of neither students, com-

munities nor training schools are met. This suspicion is confirmed by research in which the criticism is expressed that graduates who enter practice do not have adequate skills or knowledge to solve nursing care problems (Chitty, 1993:137-138; Field, Gallman, Nockholson & Dreher, 1984:284-293; Manias, Bullock & Bennett, 1999:23-29; Manias, Bullock & Bennet, 2000:265-271; Kenny, 2000:381-388).

Furthermore it would appear that:

- learning opportunities are under-utilised (Ewan & White, 1984:107; Davidhizar & McBride, 1985:288);
- inappropriate learning opportunities are selected (Ewan & White, 1984:108);
- individual supervision is inadequate and students receive little guidance and support (Hinds, Burgess, Leon, McCormick, Svetich, 1985:66); and
- psychomotor skills that impede students' development towards independence and responsibility are over-emphasised, and dependent and convergent thinking that results in students' being unable to take the lead in practice, is stimulated (Gilbert, 1985:32).

It is also possible that deficient teaching impairs the development of critical thinking and decision-making skills (Lowdermilk & Hopkins, 1991:34), and that the current teaching culture promotes passivity in students (Smith & MacGregor, 1992:9). These problems may contribute to the incorrect or under-utilisation of learning opportunities by students in clinical settings and their inability to focus their learning needs (Fishel, 1981:18-23; Ewan & White, 1984:108; Lewis, Gadd & O'Connor, 1987:94-98).

As a result, alternative teaching approaches for the professional training of student nurses becomes more

essential and demands training that will provide students with appropriate knowledge and skills; will motivate them to be actively involved in the learning process (Smith & MacGregor, 1992:11); will enable them to develop their potential; and will stimulate critical thinking (Gross, Takazawa & Rose, 1987:317-318, 321; Saranto & Tallberg, 1998:79-87; Lowry & Johnson, 1999:521-526).

In response to the preceding criticism and recommendations a computer-based teaching programme (CBTP) for an oncology clinical setting was decided upon in an attempt to improve the existing knowledge and the problem-solving skills of student nurses and to promote a deep learning approach.

LITERATURE REVIEW

Background

The utilisation of computers in health care, together with trends in computer technology has developed since the early fifties. However, the implementation of computer systems for patient care did not gain acceptance in the services until the mid-sixties and nurses were seldom involved in the use of such systems before the 1980's (Saba & McCormick, 1986:8, 46).

In teaching, specialised computer systems were developed during the 1960's with the aim of automating individual teaching and to accommodate large numbers of students simultaneously. In response to this trend computer-based teaching, which includes computer-assisted learning and computer-managed training, began to take root (Saba & McCormick, 1986:12; Lowry & Johnson, 1999:521-526).

Nurses responded slowly to this development too. It was not until the early 1980's that serious attention was given to using computers as a learning strategy for teaching clinical content in nursing education programmes (Strickland & Fishman, 1994:476; Jones & Wainwright, 1998:86-93).

Computer-based education

Computer-based teaching encompasses all activities in which computer systems are used, including those in the teaching process for the management of records

and the evaluation of the progress of students (Saba & McCormick, 1986:362). Two categories, i.e. computer-assisted instruction (CAI) and computer-managed instruction (CMI) are indicated in the literature. Computer-assisted instruction is an instruction technique based on two-way communication between the computer and the student. In contrast to didactic teaching, the aim is to improve learning and retention of content. This is achieved by allowing students to interact with the computer as often as may be necessary. Problem-solving, repetition and practice, teaching sessions and simulation are used (Saba & McCormick, 1986:363; De Wet, 1994:61).

Computer-managed instruction is a teaching strategy in which the computer is used to provide students with learning objectives and learning sources, and to observe the evaluation of student achievement. The lecturer is, to a large extent, released from the task of teaching (Day & Payne, 1987:30-31).

A third concept, that of computer-directed teaching, is also described in the literature and refers to written and visual information offered in logical order by means of a computer. A feature of this type of teaching is the dialogue between the computer and students (Mahr & Kadner, 1984:366). Despite the differences referred to, an investigation indicates that the teaching objectives that lecturers wish to achieve by means of computer-based teaching coincide to a great extent. Bratt and Vockell (1986:247) found that computer-based teaching is employed to a greater extent in teaching to promote learning.

Other uses are computerised drill exercises (Mahr & Kadner, 1984:366; Felton & Brown, 1985:7; Bratt & Vockell, 1986:247; Tan, Voon & Rajendran, 1989:372) and computer-based simulations in which students are engaged as participants in a situation, especially the clinical situation, and they develop their decision-making skills in this way (Mahr & Kadner, 1984:367-368; Felton & Brown, 1985:7).

In selecting teaching methods and techniques educators must also take into account individual learning approaches of students and offer students the opportunity to identify their own learning objectives (Entwistle & Meyer, 1992). Computerised drill exercises, for instance, can support a superficial learning approach.

Students who follow this learning approach are inclined to prefer teaching methods that promote the reproduction of facts. On the other hand those who follow a deep approach like challenges and stimulation (Entwistle & Meyer, 1992:594); try to understand content (Meyer & Dunne, 1991:500; Blunt, 1992:43); interact critically and actively with content; associate ideas with previous knowledge or experience; organise ideas within a framework; connect findings with conclusions; and examine the logic of an argument (Entwistle & Meyer, 1992:598; Marton & Säljö, 1984:46). Research is available about the use of computer technology to support the development of learning styles and cognitive strategies (Ryba & Chapman, 1983:28, 51).

Important disadvantages that must be considered are the fact that feedback is not always effective; that due to problems or deficiencies of available software the objectives that lecturers set cannot always be met; time constraints can hamper the phasing in of CBTP; students do not have the required computer skills and this impedes the implementation of computer-based teaching (Koch, Rankin & Steward, 1990:123-125).

Phases in the development of computer based teaching

Three phases in the process of development are expounded by De Wet (1994:61-62).

Phase 1: Inputs

This phase is concerned with subject content and its transfer to the target groups. A professional contributes, but does not necessarily have computer or multimedia knowledge, background of graphic design or artistic talent.

The developer serves as a consultant to the professional, therefore close collaboration between them is essential. In the planning phase didactic principles are borne in mind and the programme is developed in such a manner that it meets specific needs. The subject or course content is analysed and stored in electronic documents to which specific names are allocated. Provision is made particularly for learning that supports both the students' autonomy and interaction with the programme content (De Wet, 1994:62-63).

Phase 2: Development

The developer is the dominant figure in this phase, and may be assisted by a team of experts. A design team generally consists of a project or team manager, a designer, a graphic artist and a programmer. The formation of a team is not essential. Disadvantages of a team approach are that it is expensive and time-consuming.

In view of the fact that the designer plays an important role, the ability to think creatively, solve problems and to have an artistic sense, can be valuable attributes. Designers must also have appropriate knowledge of author systems, hardware and multimedia (De Wet, 1994:63).

Various principles are taken into account in the development of teaching material. These include the content emphasised in the curriculum, the teaching practices that apply, metacognition, user friendliness and the degree of interactivity required (Cates, 1992:5-11).

Nine teaching components that course developers generally consider (Rada, Wang & Michailidis, 1994:27) are:

- the availability of hard- and software;
- the compilation and editing of the text;
- possible graphics to make learning meaningful;
- graphic editing;
- animation;
- possibilities of interactive video;
- the teaching strategy to be followed;
- calculation of student achievement; and
- the manner in which students and information received will be managed.

Computer-based teaching is designed in such a manner that sufficient human interaction takes place. Interaction is achieved by expecting the student to complete a product (paper-based activity) (Cronje, 1994:50).

For further improvement of computer-based teaching, designers can elucidate important concepts and ensure that they are used continuously; compile a list of concepts; include paper and pencil activities that support computer-based teaching; avoid having the lecturer designed out of the system; make use of intrinsic motivators such as curiosity, challenges and competi-

tion; give students control of functions; and break the monotony of assignments by changing the instructions (Cronje, 1994:51).

Phase 3: Output

The teaching package is utilised, evaluated and quality assurance is done.

CONCEPTS

Computer-based teaching

Computer-based teaching encompasses all activities where computer systems are used in training including the training process, namely record-keeping and evaluation of students' progress (Saba & McCormick, 1986:362).

The researcher uses the concept computer-based teaching in referring to all computer teaching programmes. These include self-directed learning, own learning rate, interaction between computer and student and the hierarchical structuring of content.

Computer-based teaching programme (CBTP)

The CBTP is a learning programme developed by the researcher for student nurses in an oncology clinical setting. It was developed in such a way that its use will promote students' cognitive and problem-solving skills, as well as a deep active learning approach.

Learning approach

According to Marton and co-workers (1984:43) the concept learning approach is used to describe two distinctive forms of understanding, namely deep/superficial and atomistic/holistic.

The deep approach leads to a more comprehensive understanding of content, better retention and more success in examinations (Newble & Entwistle, 1986:164, 171). A superficial approach indicates a process by which students try to memorise content that they identify as important (Entwistle, 1981:77; Marton & Säljö, 1984:36-46).

Learning

The assumptions that constructivists make about learning, and that are taken into account in the development of computer programming, include among others, that learning takes place by the linking of facts;

and that learning is a human process, requires human intervention and is therefore cooperative in nature (Cronje, 1994:47-50).

Problem-solving

Problem-solving is the manner in which individuals use existing knowledge, skills and understanding to understand unknown situations. Problem-solving is therefore viewed as a process and the skills to use the process must be taught. The process of general problem-solving is often described by concepts such as clinical methods, clinical judgment, diagnostic skills or clinical reasoning skill (Krulik & Rudnick, 1984:4; Norman, Tugwell, Feightner, Muzzin & Jacoby, 1985:344; Norman, 1988:280).

RESEARCH AIM

The aim was to develop a computer-based teaching programme (CBTP) for student nurses in an oncology clinical setting.

RESEARCH TECHNIQUE

A comprehensive search of the literature was undertaken regarding computer-based teaching, the development and criteria for the programme. Since oncological nursing lends itself to a comprehensive approach to nursing care it was decided to develop the CBTP for this branch of nursing and the literature search was extended to include this field.

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The programme was developed after completion of an extensive review of the literature regarding computer-based teaching and oncological nursing. The nursing care of four types of cancer was included in the programme. For the developer it was important to reflect a nursing approach to the presentation of the information and that content such as clinical manifestations, pathophysiology, diagnostic examinations and treatment that are generally presented according to the medical model, would be secondary to the nursing approach. The programme was further developed to contribute to the knowledge (cognitive) and problem-

solving skills of the respondents as well as a deep active learning approach.

The written content and educational approach of the CBTP was evaluated by domain experts including registered nurses, a radio-oncologist as well as three nursing education experts for content validity and educational appropriateness respectively, after which corrections were made. A concept proposal of the CBTP was then presented on paper. This meant that the content was planned as it would appear on the computer screen. The face validity of the CBTP was evaluated by three computer experts.

Composition of the programme

A number of authoring systems available on the market to develop computer-based teaching programmes were investigated. The most important requirement was an authoring system that makes the linking of information possible. LINKWAY LIVE was decided on because

it promotes interactivity, as keys can be used to select or print certain information and assignments can also be completed by the user. The opportunity to select and link content was considered the key to the development of a deep learning approach.

The computer-based teaching programme consists of Section A, which includes 81 multiple choice test items; Section B, problem-solving by means of a case study, and Section C, oncology nursing care of patients with carcinoma of the oesophagus, lung, breast and cervix/uterus.

The CBTP was designed to be simple enough to motivate respondents to use it and to ensure that they would be able to locate appropriate information with ease. Measures taken include, among others, the use of colour, uniformity in screen layout, a help function and a number of other keys, for instance "back", "programme content" and "types of cancer" (see Figure 1).

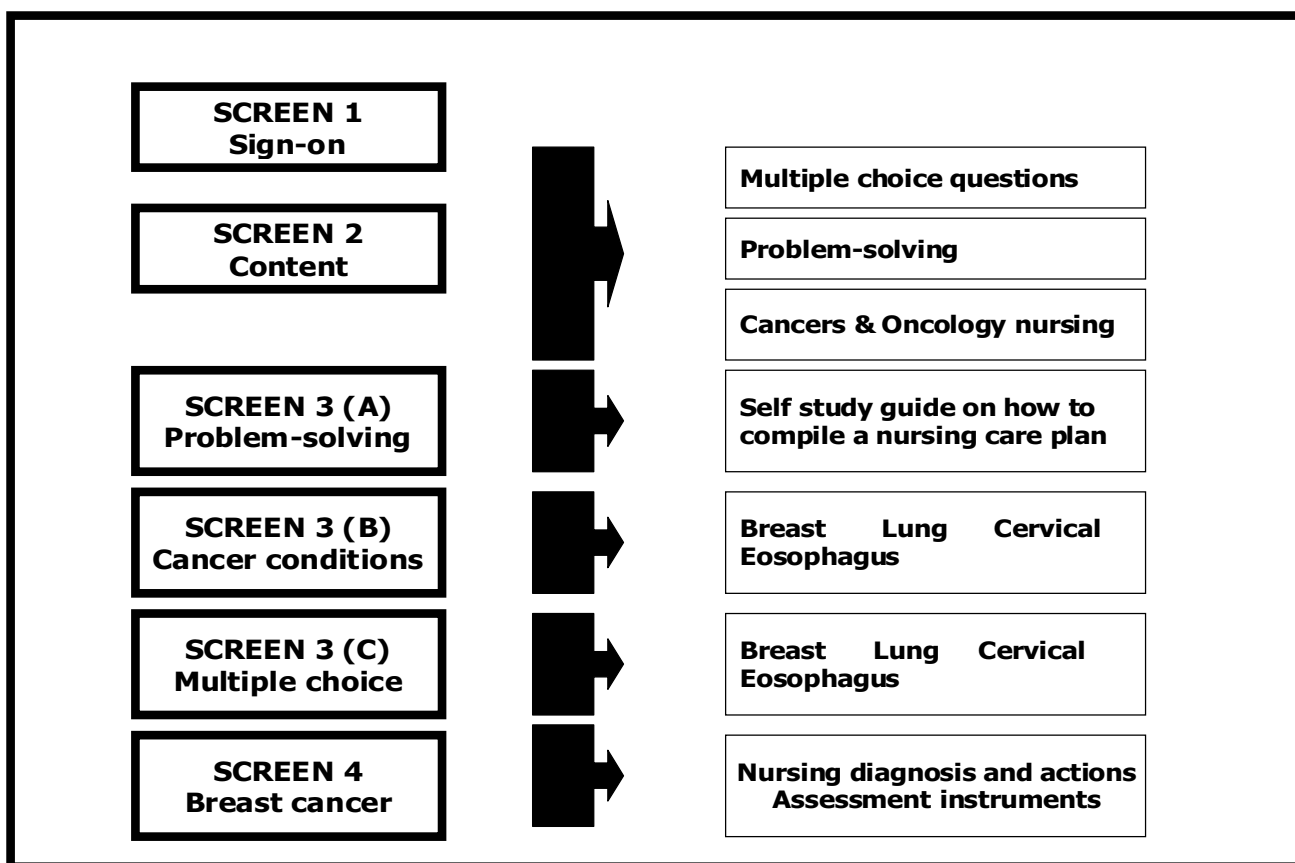


Figure 1: Layout of computer-based training programme (CBTP)

On the first screen that offers access to the programme contents, respondents were expected to activate the signing-in key and to provide personal particulars and a student number. With due observance of the cooperative learning approaches (Goodsell, Maher & Tinto, 1992), respondents were also allowed to use the CBTP as a group, and every respondent's particulars were keyed in. The aim of this was to record certain information of significance to the study, including data such as which respondent was using the CBTP, the times it was used and the type of information that was sought.

The second screen displays the programme content and respondents select the section that will meet their learning needs. The range of choices offered to respondents in each section are set out below:

Section A: The multiple choice test items

The rationale for the inclusion of multiple choice test items in the CBTP is that this type of test item can be effectively used to ensure range validity of the contents and the fact that these items are used in various computer-based teaching programmes as a method of promoting and evaluating knowledge (Garfield, Paskin & Phillip, 1989:457-462).

The multiple choice test items were put together as follows:

After an overview was obtained of the contents of the four cancers, i.e. carcinoma of the oesophagus, lung, breast and cervix/uterus, a total of 81 multiple choice test items was compiled - approximately 20 items per condition, at the different levels of knowledge according to Bloom's taxonomy (*in* Quinn, 1995). Seventy per cent (70%) of the questions were compiled at the level of knowledge and about 30% at a high cognitive level (understanding to evaluation), as the aim was to promote a deep learning approach and to improve the students' knowledge.

Section B: The solution of nursing care problems using a case study

A case study was used to explain the nursing process (as an example of problem-solving) to respondents. This technique is used particularly in medical education research to test the problem-solving skills of medical students (Ridderikhoff, 1991). Case studies also figure strongly in the problem-based learning approach

which is receiving a great deal of attention at present (Schmidt, 1993:422-432).

Schmidt (1993) and Morrison and Murray (1994) recommend the use of actual cases. For this reason the medical and nursing assessments of a number of patients treated in the oncology department were studied and an appropriate case that included various actual and potential problems was selected. This case study was used to guide respondents through the steps of the nursing process, i.e. assessment and planning, implementation and evaluation and to introduce them to the basic principles underlying the formulation of problems, expected outcomes and nursing actions or interventions. A complete nursing care plan in which all the principles were epitomised, was also compiled.

Section C: Cancers and oncology nursing care

This is the most comprehensive part of the CBTP and contains information about cancer of the oesophagus, lung, breast and cervix/uterus. These disorders were selected on the basis of world-wide and local incidence, and in consideration of the clinical setting where the research project would be launched. In the development of this section an attempt was made through linking of content, to promote a deep learning approach because the focus in educational research is on the deep and superficial approaches, their promotion and their implications (Entwistle & Meyer, 1992).

Section C (oncology nursing) is selected by hitting the appropriate key. When a choice has been made a table of contents of the assessment instruments, nursing diagnoses and cancers appears on the screen and respondents then select the facet of the section that will meet their learning needs.

Since mainly first and second year students of the educational institution concerned are placed in the oncology department, it is possible that they may be uncertain about the identification and formulation of problems that patients may have. The aim of the assessment instruments was to give respondents the chance to formulate scientific nursing diagnoses. Assessment instruments for, among others, the limitation of movement and pain, may be printed at the request of a respondent. The instrument may then be used to conduct an interview with the patient and, if necessary, a

physical examination may be carried out. The data obtained are used to formulate a nursing diagnosis.

Should a respondent select nursing diagnoses a list of appropriate diagnoses will appear on the screen. If desired, a specific nursing diagnosis may then be selected and printed. The respondent may select a nursing diagnosis and nursing actions appropriate to the patient, sign the forms and place them in the patient's file for effective nursing care.

The same procedure is followed to obtain information about the different cancers. Text in red, green, yellow, blue and pink provides information about anatomy, physiology, special investigations, assessment interviews, nursing diagnoses and treatment. Respondents can refer to as much information as desired by hitting the appropriate keys. Among the choices are: the selection of assessment instruments, nursing diagnoses and nursing actions, additional information about a disorder, printing documents, back to main menu, paging forward or back and a help function.

In order to give more structure to the learning process, the basic needs of people, such as learning, comfort and elimination, are used to marshall the contents.

CONCLUSION AND RECOMMENDATIONS

To develop a CBTP a comprehensive literature search based on the needs of the educator must be done. The literature search must include an investigation into computer hard- and software and computer-based teaching. Authoring systems available on the market must be investigated and the most suitable one selected. Content must be selected and prepared by the educator according to the stated educational outcomes. Graphics used to explain content or to summarise, must be used only if they promote insight. Representations must be of a high standard and preferably be prepared by a graphic designer. The use of animation must not be forced into the programme. The excessive use of animation can, according to the researcher, distract the attention of students from the teaching outcomes and be time-consuming. The use of colour, fonts, letter size, screen layout must be used consistently and must facilitate navigation by students.

The development of a CBTP programme is a time consuming and comprehensive task, and the expertise of more than one person must be used. The design team usually consists of a project manager, a designer, a graphic artist and a programmer.

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