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A TUTORIAL SCRIPT IN MEDICAL EDUCATION

– the PBL-model designed for local needs

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To optimise the benefit of tutorial sessions, the problem handling process must be structured. The Medical School at the University of Tampere first applied the "Seven-jump model" from McMaster University and subsequently the "Linköping model" from Linköping University. Due to cultural differences there were difficulties in application of these established models and we designed our own model in 2003.

In Tampere model, the group problem handling process is structured to eight phases. *The Introduction*-phase of a new problem is short and leads straight to *the brainstorming*-phase. Discussion during brainstorming is analytical and leads to a preliminary hypothesis of the phenomena behind the problem. Thus, the next phase, *the review and organization of the existing information*, means organization of the notes according to the formed hypothesis. After this, learning needs are formulated in *the identification of learning objectives*-phase. With *the checking of the shared understanding of learning objectives*-phase we underline that it is crucial that all students are clearly aware of the learning issues at the end of the sessions. The next session begins with the phase *review of the information gathered* followed by *application of new knowledge to the problem*-phase. The phases are represented on circumference, which underlies that learning is a continuous process and the importance of continuous evaluation. In addition to evaluation of the quality

of learning and group work, evaluation of the phase of *self-study* and sources of information used are emphasized.

The main functions of the tutor groups are systematic analysis with activating, collecting, processing and sharing of knowledge. The Tampere model has served its purpose well. This may be due to the fact that the model has been adapted for the local culture of the faculty. The own model also reflects the process of implementation of PBL in the community.

Introduction

The Medical School at University of Tampere has applied problem-based learning (PBL) in undergraduate medical curriculum since 1991. The curriculum was reformed totally along the principles of PBL in 1994. The first three and a half study years consist of integrated blocks in which biomedical and clinical sciences and public health are studied together with social and behavioural sciences. In the remaining two and a half years the students work in clinical wards and theoretical studies are integrated in seminars and assessments.

PBL emphasizes the role of the individual student in continually incorporating new knowledge into his/her pre-existing cognitive structures, thus keeping these structures in a constant emergence (Schmidt 1983, 1993; Norman 1992). In PBL the skills and the knowledge basis needed in professional practice are constructed in a novel way as far as cognitive processing and management of the student group are concerned. The key to successful learning in PBL lies in the interactiveness and function of its tutorial sessions (Virtanen 1999). PBL assumes that learning is effective when active and independent students handle problems together, inquire into the beliefs and arguments behind their own thinking and actions, deliberate about theoretical explanations for phenomena and thus construct their personal knowledge and understanding (Davis 1999).

The development of the PBL-model in medical education

The details of how PBL process is implemented differ from institution to institution. However the general principles remain the same. In practice, the problems are presented and processed in tutorial groups consisting of eight to ten students and meeting twice a week in a session lasting 1,5–2 hours. The sessions start with a review of the new knowledge that the students have learned about the issues defined in the previous session. The group then tackles a new problem with a brainstorming discussion, which is followed by organization of the existing knowledge activated by the brainstorming and by identification of the learning needs. Finally the students set up learning issues for the next session.

PBL emphasizes active generation of learning issues by students. Students learning activities cover an average 64 % of the intended course content (Dolmans 1993). This imposes demands on case planning and on tutors, both of which should lead students into right learning issues. To optimise the benefit of tutorial sessions, the problem handling process must be systematic and thus structured to give an explicit framework to the tutorial. For this purpose we used to apply the "Seven-jump model" from McMaster University (Barrows 1980; Schmidt 1983) and thereafter the "Linköping model" from Linköping University (Hård af Segerstad 1997).

However, the structure of the curriculum, the other learning methods used to support the acquiring of knowledge, the learning purposes imposed to tutorials and cases used as problems are unique in every university. Also the medical care and medical care systems, the ways how people approach problems, get down to work, think and discuss differ between countries. Due to these reasons there were difficulties in the application of both models designed in other cultures and we have used our own model since 2003.

The development of our Tampere model has been a long process. During the initiation of PBL, tutors were recruited from among volunteer faculty members who were especially interested in the new method. They were trained on PBL in courses given by experts from the Medical Faculties of

McMaster and Maastricht Universities. The Tampere Medical Faculty also obtained practical and theoretical advice from the Faculty of Education in Tampere University. These volunteer faculty members had an opportunity to practice the method during the traditional curriculum in a three-year problem-based study block "Early Clinical Studies". As the number of practical PBL courses given and experience in tutoring increased, the experienced tutors decided to take the responsibility for tutor training. The course of time and increasing experience have lead to elaboration of the curriculum, the course of tutorial sessions and the cases used as problems.

As previously pointed out and found necessary (Kaufman 1996) our faculty has given all teachers an opportunity to take part not only in teaching and tutoring, but also in planning and administrative tasks on all levels. Thus, in addition to experience, knowledge and skills, the teachers have had authority to develop the curriculum, the tutor education and tutorial sessions. In training courses and teachers' meetings tutors reported difficulties in problem handling process in tutorial sessions. The tutor trainers collected this information and in addition visited tutorial groups and observed how well tutorials adhered to the principles of problem-based learning. Students' participation, interaction, discussion, the work of the tutor, student chairman and secretary, and the application of the learning model were observed with a follow-up form. In the form all important elements in a tutorial session were asked using structured and open questions. Collecting and utilizing all this information the tutor trainers developed a new problem handling model suitable for local needs and culture. The new model was then implemented by tutor trainers in training courses and by publishing a manual delivered to all faculty members.

Our Tampere model

In Tampere model, the group problem handling process is guided in 8 phases (see Figure 1). The phases are represented on circumference, which underlies that learning is a continuous process and the importance of continuous eval-

uation. In addition to evaluation of the quality of learning and group work, evaluation of the phase of self-study and sources of information used are emphasized.

In *the introduction* phase first the group selects the chair and the secretary. These roles take turns usually according to the list of students' names, and one chair-secretary-pair deals with one problem. Thus, the change of roles occurs when a new problem is presented. Next, the tutor distributes to the group a new problem and all read it. If there are unclear, unknown terms and concepts not readily comprehensible, they are quickly clarified by some of the students or by the tutor, so that everyone understands enough to be able to participate. The introduction phase is meant to be short and without debate.

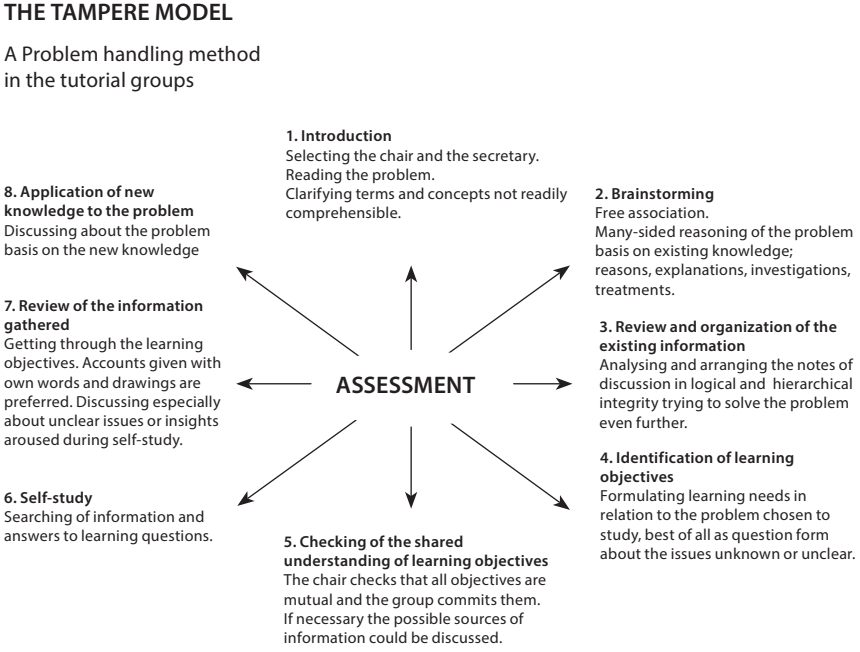

FIGURE 1. PBL-model in medical education, Tampere

Immediately after the group has been acquainted with the problem begins *the brainstorming* phase. It should be a totally free association of all aspects that the problem arouses. The group tries to think of all their experiences or knowledge related to the problem and to find out as many explanations they can imagine for phenomena, investigations they would make and treatments they would give. The secretary's role is crucial in this phase and it is to write down, on memo sticks, keywords of every thought and idea presented.

The review and organization of the existing information phase is the most difficult and laborious of all the phases. The notes of brainstorming are analysed and arranged in logical and hierarchical integrity on the whiteboard. The group tries to explain phenomena and make a sensible hypothesis of the reasons, consequences and solutions behind the problem. During this analysis they are inevitable also faced with the lack of their knowledge. If the group works hard and the analysis is successful, it is easy to formulate learning objectives about these unhandled questions. During *the identification of learning objectives* phase the formulation of learning needs should definitely be based on the discussion and the knowledge of the group, not on the general issues and branches of subjects that can easily but cursorily be deduced from the problems. *The checking of the shared understanding of learning objectives* phase ends the tutorial session. It is very important that the learning objectives are written down and that the chair checks the shared understanding and the commitment of the group. Sometimes it may be necessary also to speculate on the possible sources of information.

Between tutorial sessions in *the self-study phase* the students study individually and search for information in the literature. Also, all given teaching (lectures, laboratory- and clinical skills training groups, study visits) is scheduled between sessions and serves as source of information. The new tutorial session begins with *the review of the information gathered* phase. The group gets through the learning objectives one by one. The students tell each other what they have found out, what insights aroused during reading and in lectures. The hypothesis made and false information presented in the previous session are corrected and completed. The sharing of knowledge should be

a discussion and not a lecture. Accounts given with own words and drawings enliven and clarify this discussion. Finally in *the application of new knowledge to the problem* phase the group reverts to the original problem and discuss it once more, now knowing more.

Discussion

PBL, above all, promotes the activation of prior knowledge and its elaboration (Schmidt 1993). Discussing a problem in the small-group setting strongly activates prior knowledge of participants and the effects of prior knowledge activation in turn facilitates the processing of problem-relevant new information (Norman 2000). The influence of the discussion in the tutorial group on the extent to students' decisions on what to study is remarkable and tends to increase over curriculum years (Dolmans 1994). The level of cognitive congruence influence tutorial-group functioning and that on the other hand affect self-study time and intrinsic interest and time spent on self-study influenced level of achievement (Schmidt 1995). Moreover, the prior knowledge is not simply a bag of facts that students have available but can be described as a 'naive theory' that these students entertain with regard to the problem at hand (Schmidt 1989). The systematic discussion and analysis of prior knowledge is essential to this 'theory' and thus emphasizes the role of the model.

In Tampere model there is no scenario as presented in Linköping and Seven jump models. We found it factitious and enervating to pronounce a scenario, for example "a depressed woman". As in Linköping model, in the Tampere model the beginning of a new problem is short and leads straight to the brainstorm without listing the phenomena to be explained as in Seven-jump model. However, our model is more simple and straightforward than the Linköping model. The discussions in our tutorials are very analytical and arranging already during brainstorming, resulting in an early explanation hypothesis of the phenomena. Thus, review and organization of the exist-

ing information means organization of the notes on this hypothesis. Of note, this phase is the most difficult, demanding and the most crucial for learning, because it requires thinking, negotiations and decisions with insufficient knowledge. The Linköping phases 2 to 4, i.e. free associations concerning the scenario, systematization the outcome of brainstorm into problem areas, reflection upon and appraisal the knowledge of the group in relation to the problem areas, definition one or more problem issues, did never work unforced in our tutorials and usually lead the tutor to restrict the chain of reasoning.

After profound organization of prior knowledge and birth of an 'explanatory theory', it is easy to formulate the learning needs. This also enables a cognitive process called epistemic curiosity or intrinsic interest that is peculiar to PBL (Schmidt 1993). Formulating the learning needs as questions that have remained unhandled during organization further contributes to this. We also emphasize that it is crucial that all students are clearly aware of the learning issues at the end of the sessions. That is why, it is named as a own phase in the model. As in Linköping model, our phases are represented on circumference, which we think, underlies the fact that learning is a continuous process. Both models also point out the importance of continuous evaluation. In addition evaluation of quality of learning and group work, our model also evaluates the areas of self-study and sources of information more clearly.

However, all the models of PBL in fact aim to the same outcome, although the phases and the stress of phases differ. After all, the main functions of the tutor groups are effective activation of existing knowledge, systematic analysis and processing of knowledge, and collection and sharing of knowledge. The model presents an instrument to assure this. The problems used are crucial in facilitating students to identify relevant learning issues (Dolmans 1993; Mpofu 1997) and these guide the students' studying (Mpofu 1997). The problems affect also the validity and working of the model. In addition, initiation of the tutors to the principles of PBL and the problem handling model is

a key to the success of tutorial sessions and learning (Barrows 1988; Moust 1990; Holmberg-Marttila 1998; Virtanen 1999).

The model is a tool that serves learning, not the main issue in tutorials. The high turnover of tutors, the rush and many responsibilities of medical faculty members impose pressure to tutors and student training. This may compromise the problem handling model that students apply and tutors guide in tutorials. Thus, it is important that the model is adapted for the faculty and to the people working and studying there. The fitness of the model mainly determines how well tutorials adhere to the principles of PBL.

The main functions of the tutor groups are systematic analysis with activating, collecting, processing and sharing of knowledge. The Tampere model has served its purpose well. This may be due to the fact that the model has been adapted for the local culture of the faculty. Our own model also reflects the process of implementation of PBL in the community.

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