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Analyzing Students' Opinions about their Learning Environments and Study Approaches with Bayesian Modeling

Liisa Kuikka[1,*], Pirkko Salokekkilä[2], Saara Repo[1], Olli-Pekka Ryynänen[3]

1. Clinical teacher, University of Helsinki, Department of General Practice , Finland

2. Chief physician, co-ordinator of medical training, Dept. of Social Services and Health Care, Helsinki, Finland

3. Professor of General Practice, University of Eastern Finland

Abstract

Our own long term experiences as clinical teachers among undergraduate medical students have generated the interest to investigate the plausible connection between students' study orientation and their learning experiences in small groups. The objective of the study was to assess the hypothesis whether learning in small groups may contribute to study motivation.

Participants were 52 undergraduate medical students (10-12 in each group) in the primary health care course between 1st and 5th year during the spring term 2012. The questionnaires used were the Inventory of General studies (IGSO) for study orientation and IQ questionnaire for group learning. The data were analyzed by Bayesian network modeling.

In this study, the application used was the Bayminer (www.BayMiner.com) non-linear visualization modeling software.

Positive atmosphere in a small group increases study motivation and commitment and predicts mutual trust and gives space to new ideas, where contradictive views can raise interesting discussions. Based on Bayesian modeling it seems that the experience of motivational problems in the present studies may be an indicator of study alienation and connected with the perception of small group dysfunctionality.

Corresponding author: Liisa Kuikka. D.Med.Sc, University of Helsinki, Department of General Practice and Primary Health Care, P.O. Box 20, FIN-00014 University of Helsinki, Finland, E-mail: liisa.kuikka@helsinki.fi tel. +358-40-7213556 fax +358-9-191 27536.

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Introduction

Educational psychologists indicate that in learning processes affective or motivational (why to learn) dimensions may powerfully influence the outcomes of the studies. (Kursukar 2012). It has been assumed that emotional and motivational problems may turn out to be risk factors for underachieving (Clinkenbeard PR et al 2012). Study motivation is often divided into two contrasting types: intrinsic and extrinsic. People who are intrinsically motivated to learn are interested and focused on the task. People who are extrinsically motivated are interested in the outcomes of learning (grades, prizes etc) more than the task itself (Schunk et al 2008). The study motivation develops in a dynamic process between the student and the learning environment. According to Johnson & Johnson (2009) for example cooperation tends to promote higher intrinsic motivation compared with competitive or individualistic learning environment. Furthermore, students would engage in their studies more if the staff members are for their part engaged in the students, the subject and the teaching process (Bryson & Hand 2007).

The best-known instrument for measuring students' strategies of learning is to study students' approaches to learning (SAL) (Biggs 1999). A large number of scales in different inventories have since been developed, such as the Revised Approaches to Studying Inventory (RASI; Tait and Entwistle, 1996) and the Approaches and Study Skills Inventory for Students (ASSIST; Entwistle et al 2013). These methods are measuring the students' individual learning processes. Approaches to learning are not students' permanent abilities, normally the approach varies depending on the situation.

The learning in small groups, a kind of team based learning (Dolmans et al 2015 , June et al 2017), is an essential part of the learning environment for undergraduate medical students in Helsinki. In small-group learning the social interdependence between the members of the group should be taken into account. Positive interdependence tends to enhance cooperation and negative interdependence competition. (Johnson and Johnson 2009).

According to Johnson & Johnson (1989) the quality of social interdependence has influence on achieving academic goals, the relationships between peers and the psychological well-being. Positive interdependence increases all named before and negative interdependence diminishes them. (Sahran Y 2010, Slavin 1990, Johnoson and Johnson 1989). Furthermore, the social interdependence theory (Deutsch 1949, Johnson & Johnson 1989) argues that positive interdependence between students in a small group increases study motivation and commitment. According to Thompson (2008) and Christie et al. (2008) academic students need emotional support to feel secure enough in their learning environment. The importance of motivation in learning is well-researched in general education, but much less in medical education.

The present study aims at gaining a better understanding about undergraduate medical students' conceptions of learning in small groups and the plausible benefit of them as a learning environment. Our specific research question was whether there is dependence between students' perceptions of learning, the usefulness of working in small groups. Do the small group experiences lead to commitment to the contents and meaningful learning? What kind of evaluation is needed to get adequate feedback on learning and motivational factors influencing the learning outcomes?

Materials and Methods

Participants were 52 undergraduate medical students during the primary health care course between the 1st and the 5th year in the spring 2012 .Medical students in Helsinki have courses in general practice

during the first (e.g. following family physicians' practice, N= 12), second (early patient contacts in community care, N=14) and third or fourth year of curriculum (students' first own patient consultations in primary health care, N=14) and fifth year of curriculum (working in primary health care, N=12). Of the group that responded to the questionnaire, 29 (64%) were female. The respondents' ages ranged from 19 to 39years (mean 24). An average number of the credit points of medical studies were 178 (range from 28 to 340).

Medical undergraduate studies during the Primary Health Care course take place in a context where a particular educational method is applied. As an introduction to the course there are group discussions conducted on various themes connected to the primary health care at the university by the clinical teachers. The student learning and perception of the topics are influenced by the interpersonal relationships of the learning group in question. After the small group learning period, the students visit the primary care doctors at their surgeries and observes the consultations. At later stage of their studies, they also participate in the patient work.

Students were given approximately 10 minutes to complete the assessment questionnaire at the end of a teaching session. It was possible to answer anonymously and everybody did this. It was voluntary to participate and the students were not rewarded for their cooperation. The students gave their permission after filling in these questionnaires to use them for research purposes.

The questionnaire included two sets of questions: IGSO and IQ questionnaire. The Inventory of General studies (IGSO) has been validated by Mäkinen (2003) which represents SAL (students' approaches to learning) orientation. The general study orientation is measured by 35 different questions. Statements included in IGSO show the student's opinions of the importance of the university studies in general. Also, other dimensions of university life like mixing / socializing with other students and collaborative work and the meaning of social events are dealt. (Mäkinen et al 2004).

We wanted to study the topic content motivation connected with the present studies. The statements to extrinsic motivation were phrased as follow: Finding any motivation for my studies is very difficult. / I don't find any meaning in the contents of my present studies/. I want to develop myself by studying /. The statements exploring intrinsic motivation were: I find gaining good professional competence important for myself. / When learning, I try to perceive large entities. / I enjoy studying theoretical issues.

The influence on the motivational processes by a small group learning was studied by IQ-questionnaire (a validated instrument, Helsinki University Faculty of Education 2001). The statements were phrased as follow: There was a positive atmosphere in the group. / There was mutual trust in the group/By working in the small group I learn better./The teacher makes the group members take responsibility of their own action/

The questionnaire included statements that were rated using a five-point Likert-scale ranging from 1 (totally disagree) to 5 (totally agree). As the demographic variables, students were asked to fill in their year of birth, gender, and the amount of the university credits they had achieved.

Analyses

The data were analyzed by Bayesian network modeling. In this study, the application used was the Bayminer (www.BayMiner.com) non-linear visualization modeling software.The three dimensional Bayminer cloud encodes the joint probability to a vast number of variables. In the Bayminer cloud the locations of the dots represent the posterior probabilities of the variables. They are described as geometric distances

in relation to whole data

This is known as Bayes' theorem. Given some phenomenon A we want to investigate and an observation X that is evidence about A. Bayes' theorem tells us how we should update our probability of A, given the new evidence X.

Bayesian modeling is a convenient means to manage uncertainty and it is highly applicable to human sciences where the research problems are often connected with people's opinions and attitudes and how to model them mathematically. We used for our analysis b-course tool which is a free on-line data (dependence) analysis tool and the b-course service can be freely used for educational and research purposes (http://b-course.cs.helsinki.fi)

Results

In the Bayesian network model using the b-course tool the model can predict the values of the end variable related to an individual. The model can be used to infer the probabilities of any set of variables given any other set of variables leading to a game where the model can be examined interactively by probing it.

Figure 1

In this model, we predicted the scene where everybody is to agree completely with having motivation problems connected with their present studies. In this case, the ma-jority (75%) would also agree with having difficulty finding meaning with connecting with their studies .Two out of three students with motivational problems did not find obtaining professional competence important. Among those students who had motivation problems 77% find the atmosphere in the small group quite negative and over half (56%) felt that there would be lack of mutual trust within the peer group.

Figure 2

If we predicted that nobody was to have

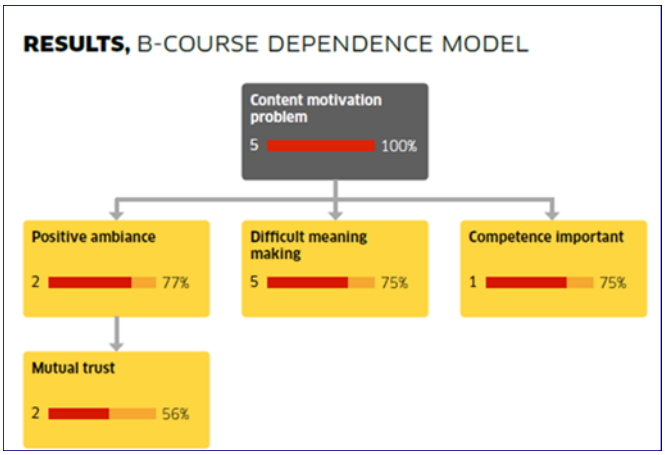

Figure 1. In this model we predicted the scene where everybody is having motivation problems connected to their present studies (1= totally disagree, 5= totally agree)

motivational problems with their present studies, the majority would have no difficulties in finding meaning and connected with their studies. Among these students almost everyone would find obtaining professional competence important, 37% agreed and 63% totally agreed this with argument. Those students find the atmosphere positive in the study group. The majority (88%) of these students felt mutual trust within the peer group. The argument was agreed by 41% of these students and totally agreed by 47% of them.

Discussion

The Bayesian modeling demonstrates the significance of motivation to the learning experience. Motivation includes interplay between both personal and contextual influences (Pintrich et al 1993). According to von Glasersfeld (1989) motivation to learn is strongly dependent on the learner's confidence in his/her potential for learning. The teacher's important role is to create an optimal study environment (small group learning, peer learning) to allow the student to develop his own learning strategies for learning and motiva-tion.Based on the Bayesian modeling there is evidence that the experience of motivational problems in the present studies could be an indicator of study alienation and connected with the perception of small group dysfunctionality.

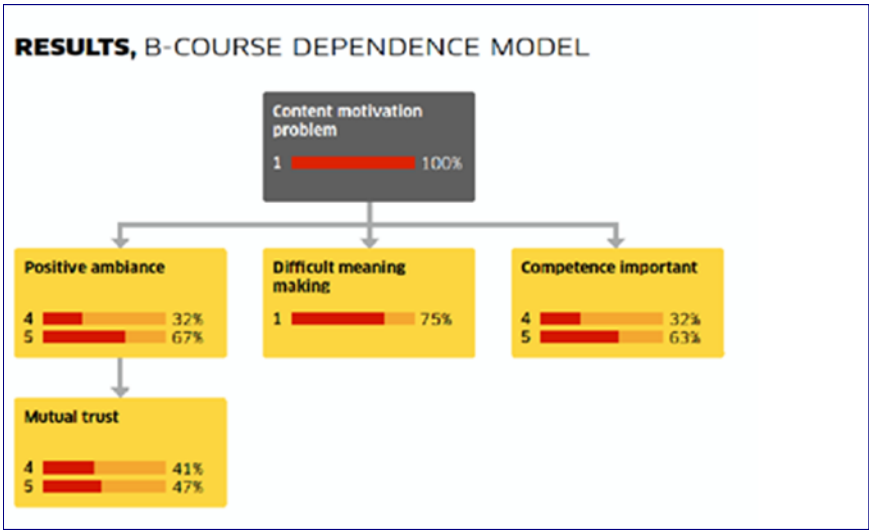

Figure 2. If we predicted that nobody was to have motivation problems, the majority would have no difficulties in meaning making (1= totally disagree, 5= totally agree)

The modeling gave the result where students having motivation problems in the contents of their present studies thought that the atmosphere in the small group was negative and they did not have mutual trust in fellow students. They also had difficulties in meaning making connected with their studies and they did not find gaining professional competence so important. The experience of motivation problems reflects study alienation and reaching the goals seems less important. According to Entwistle and Tait (1993) students with the disintegrated perceptions of their learning environment and approaches to studying seem to lack commitment to their academic environment.

Students who were not having content motivation problems found small group learning rewarding. Most of the students in our study found no difficulties in meaning making connected with their studies. They also found obtaining professional competence important.

Our results are compatible with the previous studies. The social interdependence theory (Deutsch 1949, Johnson & Johnson 1989) argues that positive interdependence between students in a small group increases study motivation and commitment. According to Thompson (2008) and Christie et al. (2008) academic students need emotional support to feel secure enough in their learning environment.

Team functioning, or team cohesion, reflects the degree to which members are committed to one another in the achievement of team goals. On the flip side are suggested that more cohesive teams are associated with better performance outcomes.(Thompson et al 2015).

According to Lonka et al 2008 the authoritarian and strictly teacher-controlled learning environment may cause destructive friction. On the other hand, if the learning environment is control free, the students may experience helplessness and insecurity. According to Entwistle and McCune 2004 student perceptions for a good teaching-learning event consist of a teaching level appropriate for most of the students with prompt feedback, interest, enjoyment and relevance, staff enthusiasm and encouragement and support from other students. The idea that the learning group can become a holding environment also emerged in the analyses. The peer support can be psychologically meaningful in a way that other students" hold" their fellow students.

(Winnicot DW 1965, Repo 2010).

The contradictive views of others enrich and contest the students' own thinking. Positive atmosphere in the small group predicts mutual trust and gives space to new ideas, where contradictive views can raise interesting discussions. Mercer (1996) points out the importance of exploratory talk. Such talk among the peers generates socio-cognitive conflict, which motivates enquiry and conceptual change. This exploratory talk can prompt learners to think constructively about events they experience after the group task is completed. It is important to understand how and why students perceive their learning environment in the way they do.

Some methodological reflections

Earlier studies concerning students' opinions about their learning environments and study approaches have been analyzed using logistic regression, by one-dimensional methods. The aim of using the Bayesian method in the analyses was to investigate how the relatively small data would fit into the Bayesian networks and what kind of dependencies might emerge. The Bayesian network model presents a joint probability of the data as a product of conditional probabilities. As opposed to many classical estimation procedures, no Bayesian analysis is ever non-viable due to too little data. The Bayesian analysis takes into account all the data and there are no preset sample sizes that have to be satisfied to be able to perform dependence analysis. If the data are small, the dependencies are weaker. (Myllymaki et al. 2002) The Bayesian modeling offers a good compromise between complexity and predictive performances and can therefore be a convincing alternative to other much more extensively used predictive models such as logistic regression model. (Cevenini et al. 2007).

Educational and theoretical significance

The assessment instruments used in this study, combining two sets of questions, allowed us to get broader information not only from the learning environment, but also from the student approaches to studying /learning. It is equally important to support students' learning skills and teachers' teaching skills.

At our medical school, in Helsinki University we have paid much attention to designing learning environments that consistently encourage students to deploy the deep learning approach by arranging courses on university pedagogy to the faculty members of the medical school. Based on the results of the Bayesian analyses we conclude that the same learning environment may not be perceived in the similar way by all students.

Conclusion

We argue that the very critical feedback from some undergraduate students at the end of the course towards small group learning sometimes may reflect the students' motivation problems and study alienation concluding with low-cohesion in teams. The constructive answer to this kind of feedback could be to offer a chance to supportive tutoring for the students.

Declaration of interest:

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the article.

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