Using computer based multi-actor multi-criteria evaluation methods in master logistics classes

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Abstract

The purpose is to provide insights into how to integrate a computer-based evaluation tool to improve the understanding of different perspectives when the teaching of logistics at masters' level. This study has had an action research approach to student centred learning by introducing a theme of cross-functional decision making through combining lecturing, case assignment and computer based tools. What can be seen is that this inclusion has filled a gap in the education and course. Adding the combination of the preparatory case work and the computer exercise gave the students the activity independence and gave room for new reflections.

Keywords: student-centred learning, cross-functional decision-making, logistics

Introduction

The course Logistics in Supply Chains is given as an elective course in the two masters programmes at Linköping University, Department of Science and Technology. The course covers inter- as well as intra organisational views of logistics and supply chain management (SCM). It is one of the final courses that the students have before starting their master thesis projects. The goal of the course is for the students to be able to view different SCM problems from different perspectives and on different aggregation levels. The course has previously been organized around four themes:

- Supply chain management
- Supply chain design (outsourcing/offshoring) and risk management
- The inbound flow of the focal company
- The outbound flow of the focal company

Lectures introduce the themes and provide the general definitions, applications, drivers, barriers and prerequisites around that theme. The lectures also aim to link the different themes of the course in order to create an understanding of how they are related and their mutual dependencies. After the lecture the students are provided with journal

papers to read and questions to answer based on the papers and the lectures. The questions are thereafter discussed in seminars in smaller groups.

To add another level of awareness regarding the different perspectives within a supply chain, a new theme was added to the syllabus in the fall of 2016; cross-functional decision-making. Often making decisions within a supply chain, inadvertently the decision made will impact other departments or supply chain stakeholders to some extent. Literature used in teaching logistics and SCM often take the perspective of a focal company or department, and discuss these decisions solely based on how the focal company or department perceives the changes, thus giving little regard to how a decision affects the other departments and the rest of the chain. Often, it is not until the students start their master thesis projects that other stakeholders become part of their analytical discussions, and this can seem daunting to some. Often this leads to a delimitation where thesis projects, much like the literature taught during the education, delimit the studies to include only one perspective. Thus, it was considered important by the course examiner to add this cross-functional decision-making perspective. The question was how it should be designed to make the students understand the complexity of cross-functionality as well as prepare them for the compromises of working life. Furthermore, the examiner did not just want to add another case to the education.

The cross-functional decision-making theme consisted of further literature studies (three peer-reviewed journal articles), one lecture (90 minutes), one written group assignment based on the literature, a pre-prepared case-assignment, a computer exercise (240 minutes), and a final evaluation seminar (90 minutes). This was the final theme in the course and comprised approximately a fifth of the total course work load. Important for the examiner was that the added case should not only be another case, which the students have done lots of during their four and a half year at the university. Therefore, the computer exercise was seen as vital as it was the possibility of the students to apply their case and also help them see the different perspectives with the help of different evaluation tools. To capture the different perspectives the students were in the case and the computer assignments to represent different departments of the company making the decision. They were not to take part of the other group's perspectives before the final seminar.

The purpose of this paper is to provide insights into how to integrate a computer-based evaluation tool to improve the understanding of different perspectives when the teaching of logistics at masters' level. Focus is on how the theme was developed and carried out, as well as to evaluate the outcome of this theme, from both student and teacher perspective. The contribution is the combination of a case assignment and a computer exercise which is a novel approach to show the potentials and drawbacks of cross-functional decision-making within supply chains.

Methodology

This study has an action research approach, which is considered to be especially useful for practicing educators since it allows for systematic reflection, enquiry and action (Costello, 2011). Action research concerns processes or phenomena that would not take place if not the researchers affect or start an action (Wallén, 1996). Action research is not a combination of first research and then application, instead the application is a way to carry out the research by both data collection and testing (Wallén,1996). As the action research contains an action, it implies that the research contributes to some kind of change (Rönnbäck, 2010). Thus, from a methodological perspective it is important to describe

and discuss the actual research process. The research process is also a learning process and one of the most important learning outcomes is increased and improved experiences by the participants (Wallén, 1996). Action research, does however have some problematic areas; it takes time and requires a lot of resources, there are ethical issues and there are several contextual factors that the researchers cannot influence that influences the research (Wallén, 1996).

This study has had an iterative approach (Wallén,1996) where the initial action (the change of the syllabus) was introduced in the fall of 2016. During and after the cross-functional decision-making theme of the course, this action was evaluated by the teaching personnel together with the students. Some alterations were introduced to the theme and implemented as a new action in the fall semester of 2017, i.e. changes in literature, an update of the case descriptions and a revamped lecture discussing the mechanisms of cross-functional decision-making. This action was again evaluated during and after the theme during the course of 2017. The evaluation have been group and individual evaluations by the students as well as the examiner and the course assistant reflecting upon the theme based on their experiences and the students evaluations.

Student-centred learning approaches

Due to the influence of the constructivist learning theory on the pedagogical field, a wide range of new teaching methods were developed, which defined learning as an active process in which learners are active sense makers who seek to build coherent and organized knowledge (Mayer, 2004). Findings suggest that the success of courses aiming to develop a relative view of knowledge in the learner may depend upon the way in which they are taught (Sheppard and Gilbert, 1991). Teaching that manage to give the learners high personal meaning are perceived by students as providing good teaching and allowing freedom in learning (Sheppard and Gilbert, 1991). Students to teachers with a student-centred learning approach have been reported to have more deep learning approaches and students with deep learning approaches accomplish higher qualitative learning but not necessarily quantitative learning (Baeten et al., 2010).

Characteristics of student-centred teaching methods are: 1) an activity independence of the student, 2) a coaching role of the teacher, and 3) knowledge which is regarded as a tool instead of an aim (Dochy et al., 2003). These teaching methods that emphasize students' activities are often presented as the opposite of traditional lectures where the teacher provides information that is passively received by the students (Prince, 2004). However, to set the students totally free is not the best way forward, instead the students need cognitive activities to learn, i.e. selecting, organizing and integrating knowledge (Mayer, 2004). Individual work is seen by learners as enjoyable and directly related to their future lives, as it enables them to consider ideas in the light of their own personal experiences (Sheppard and Gilbert, 1991).

Skeff et al (1986) show that the use of seminar as a teaching method, is effective for improving skills in teaching by physicians. It made them change teaching behaviour, increase the impact on the learners, and promote more positive attitudes about teaching in attending learners. They also experienced more positive long-term effects. To give the students the opportunity to consider alternative conceptions of knowledge, both disciplinary and more general gives a more dynamic view of knowledge (Sheppard and Gilbert, 1991). Participation in sustained discussions of powerful questions can be both a mind expanding and community-building endeavour (Parker and Hess, 2001). A discussion-based teaching style, that encourage the learners to discuss concepts in relation

to their own experience during the lectures and were required to present and debate seminars of their own choice (Sheppard and Gilbert, 1991). Teaching with discussion is to use discussion as an instructional strategy to help students to more richly understand the text at hand or to make a decision about the issue at hand (Parker and Hess, 2001). Discussions widen the scope of any individuals' understanding of a text by building into that understanding the interpretations and life experiences of others (Parker and Hess, 2001).

When attempting to induce a deep learning approach by means of a student-centred learning environment, it is important to take perceived contextual factors into account by maintaining an appropriate workload and information load, by providing support, clear goals and possibilities for independent studying (Baeten et al., 2010). According to Parker and Hess (2001) are the inquiry skills and dispositions needed to apprehend the world (the purpose of the seminar) and to help us decide what changes should be made (the purpose of deliberation) an important input to the design of the teaching activity. Deliberation is planning for the right action; it is weighing alternative courses of action and deciding on one, or a combination of them, and to improve discussants power of understanding (Parker and Hess, 2001). Teacher involvement contribute and a positive perception of the course quality is positively related with deep learning approaches (Baeten et al., 2010). Concrete teaching behaviours such as answering questions, giving feedback, structuring the course, providing materials and illustrating lectures was positively related to deep learning, whereas an excessive perceived workload is negatively associated with a deep learning approach (Baeten et al., 2010).

The organisation of the new theme in the course

Case assignment and literature

The course examiner and the teacher's assistant (TA) prepared a group assignment, based on a case study at a major Swedish automotive company (SAC) utilizing a set inbound logistics strategy, consisting of a lead-time-based procurement system. The case takes it departure in that SAC wishes to evaluate whether to keep their current inbound logistics strategy where suppliers must be located geographically within three days' delivery time, or to move to a new setup where SAC instead can have free pickup at the suppliers site, regardless of the distance from SACs production facilities. The case aims to evaluate which solutions is best from three departmental perspectives; production, purchasing, and logistics. In this incarnation, the evaluation was to be performed using the Multi-Actor Multi-Criteria Analysis (MAMCA) methodology developed by professor Macharis *et.al.* at Vrije Universiteit Brussels. The methodology consists of a framework defining different stakeholder criteria and indicators as well as an internet-based software to perform the evaluation and analysis (cf. Macharis, *et al.*, 2009; Macharis, *et al.*, 2012).

For the group assignment, the class was divided into a number of subsets of three groups based on the above-mentioned departments, production, logistics and purchasing. For 2016 when 35 students were attending we used four times three groups and for 2017 when eight students were attending only one subset of three groups was used. Each group was given a case description of SAC decision from their respectively perspective, describing the background of the decision, the goals of the department and their opinions with the current solution. One of the feedbacks of 2016 from the students were the need of increased descriptions of the rationale behind the decision and this was added to the case description of 2017.

As preparation for the computer exercise, the groups were tasked with reading about the MAMCA methodology in Macharis, *et al.* (2009) and Macharis, *et al.* (2012) and based on what they learned from these papers, identify and motivate criteria that best suited the goals of their departments. The groups were further tasked with identifying the indicators (operationalised measures) for the identified criteria. All this was summarised in a preparatory report by the groups and sent to the teaching staff ahead of the computer exercise. The reports were reviewed by the course responsible and the TA and feedback was sent to the student groups and discussed during the computer exercise. The feedback was by the teachers in 2016 seen as to be given to late and therefore to 2017 a tutorial opportunity was given for each group. More on that in section *Teacher perspective*

Lecture

To add more understanding for how and when cross-functional decision-making processes can be used and what they imply for a company and supply chain, a lecture was given by the TA on the subject. Time-wise, in the 2016 edition of the course, this lecture was given after the students had sent their case reports to the teaching staff. The thought behind this was to give the students additional views on cross-functional decision-making with an additional methodology added to their understanding. In retrospect, this was perhaps not ideal. One of the actions introduced for the 2017 edition was that this lecture was moved in time to come *before* hand-in of the case assignment. More on that in section *Teacher perspective*.

The lecture started with a background in change management, discussing why change sometimes is needed and how this can and should follow a formalised change process. It further discussed the importance of continuous feedback and the need to institutionalize the change within the organisation where change is to occur. One of the key messages was that change should be systematic and not ad hoc. The lecture then went on to discuss another methodology for cross-functional decision-making as described by Moses and Åhlström (2009), again highlighting the need to plan for change.

Computer exercise

The computer exercise was, as mentioned earlier, performed as groups. Prior to the exercise, a MAMCA instruction was developed and sent to the students. The teaching staff had also set up the MAMCA project in the portal with the three stakeholder groups represented. Neither criteria nor indicators were added to the MAMCA projects as this was part of the computer exercise. The student groups were to decide on criteria and indicators and were tasked with entering these into the MAMCA portal during the exercise. The teaching staff did however formulate and add three possible scenarios to the MAMCA projects in the portal. They were;

- Business as usual, suppliers located a maximum of three delivery days away from the production site
- Collection at a pick-up point, performed by SAC
- Delivery to SAC by the suppliers

When sending in the preparatory reports, one student per group was made responsible and the teaching staff had created MAMCA users and login for them to be able to perform the exercise. The groups worked with one computer per group, meaning that the participants had to be active in the discussions during the setup phase if they wanted to have a say in what their groups added as criteria and indicators.

During the exercise, the student added their criteria and indicators from the three departments perspective into the same project. This way the overall project would have input from all three departments. The initial plan was that the three groups would then weigh the criteria as a pairwise comparison to find the criteria that were most important from their perspective, and this worked satisfactory in 2017. However, during the 2016 computer exercise, the servers were not working properly, affecting the exercise and the functionality of the MAMCA tool. The pairwise comparison was not possible to carry out, neither was the option of entering weights manually. The only possibility was to equalise weights, meaning that the students could not actually use their preparatory work to its full extent. This is also a reoccurring theme in the students' evaluation (see section *Students evaluation* below).

The final part of the exercise was a discussion amongst the students and the teaching staff with regards to the exercise that they had performed. In this part, the class was supposed to decide what option of the three scenarios that they should choose, based on what MAMCA had taught them and the evaluation performed. As the weighting could not be performed according to the plan in 2016, this had to be decided based on the evaluation that was made. In this case, business as usual came out as the best possible decision, but many students objected to this due to what their preparations had indicated. For the 2017 edition, the evaluation worked, and this gave the opportunity for deeper discussions based on the results. Also in 2017 the decision was business as usual, as two out of three departments preferred that alternative. Though most of the discussion was about the students being surprised that the different department had so varying criteria and that they did not prefer the same alternative. This discussion lead the students to think of if the alternatives could be adapted to better fit the criteria of all three departments and how this could be accomplished. Thus, the discussion was on areas that were sought after by the teachers.

Results

Students evaluation

For the final course seminar, the students were asked to read one additional journal paper (in 2016 and 2017) by Moses and Åhlström (2009) and in 2017 also Platts et al. (2002) and Ronnenberg et al. (2011) and consider the following three questions;

> Q1: What criteria did the other departments bring up that you had not considered from the perspective of your department? Discuss three criteria that you consider the most important. Discuss why and how they were important to the other department and why you in your department had not considered these.
>
> Q2: What do you think the decision would be outgoing from the result of the MAMCA? Motivate why and discuss who should make the decision. Compare with the Moses and Åhlström paper.
>
> Q3: What did you think of the case assignment? Did you have all the information that you needed? What was missing?

The first two questions and the additional articles were meant to allow the students to reflect on cross-functional decision-making as a phenomenon and how decisions are made within companies and supply chains, whereas the third was designed to evaluate the course segment and the MAMCA exercise. This chapter will address the final questions.

In general, the case assignment seems to have been appreciated in 2016 and even more in 2017. The students were interested in the assignment and took an interest in the preparatory MAMCA readings (Macharis, *et al.*, 2009; Macharis, *et al.*, 2012). A few of the students highlighted the difficulty in taking only one perspective as they have been taught continuously in their education to have a holistic view of problems and solutions. This manifested itself not at least in connection to Q1, when some students felt that they had indeed thought of criteria that the other groups also had considered, but at the last moment had to rethink those criteria as they did not affect the own department greatly. This is quite interesting; can the "normal" teaching focus on holistic SCM distort the ability to consider just one side of the story? Though, to help the students further into this reflection, 2017 the tutorial session was added.

Some students also considered the lack of quantitative data as an issue. With more data on logistics costs and cost of quality etc., they felt that they could have derived at the "correct" answer in the preparatory work. In general in 2016, more knowledge was requested with regards to the case assignment and how the scenarios affect the different stakeholders, which was added to 2017. However, this can partly be due to the aforementioned "need" to see things holistically; more knowledge leads to a better understanding of what one suggestion will lead to from a holistic perspective. In essence, this is not a bad thing, but as the assignment was set in order for the students to experience a focus and narrow perspective, it may not be desirable for the case assignment.

In general, consensus is that MAMCA is a useful tool for evaluating changes in logistics setups, make decisions on infrastructure projects, and similar as it does allow for different stakeholders to have their say in the decision-making process. Most students really saw this and made sure to highlight that they feel that it is a powerful tool. A student had this to say;

> *"I think that the idea of MAMCA is a good way of handling situations like the one in the example we did. The good parts about it is that all departments have their will to say and list what is important for them as a department. I also think that it is good that you can adjust the importance of the stakeholders such that not everyone's word is equal in all situations."*

Some issues were however also brought forth in the evaluations; some of the students felt that MAMCA can be used as a guidance but that the final say should not be based entirely on the evaluation in MAMCA. The issue of bias is raised in this as there is a possibility to weigh different criteria and even stakeholders and one of the students wondered whether it would be possible to rig the outcome of the MAMCA evaluation to better suit one's purposes.

Another, but similar, point that was brought up is whether we reach the right conclusion based on the MAMCA evaluation or if this needs to be an iterative process with multiple evaluations. It was by some students felt that one can easily be misled by the grading of how the indicators are affected in the different scenarios. One student gives the following suggestion;

> *"What the methodology could do better is to get more specific ways of how the indicators are affected in the different scenarios. Instead of having "slightly positive" etc. they could have had some kind of scale in numbers, which maybe then could easier have been seen in plots or similar displays."*

Again, as was the case in the evaluation of the case assignment, more quantitative knowledge is asked for in the computer exercise, specifically in the preparation and in setting the weights on criteria.

> *"I think MAMCA can be useful, however I think that it takes a lot of preparation to achieve an interesting result. How you weigh what is important has to be done very carefully. I think empirical data should be used as much as possible when setting the weights."*

The roles of stakeholders and their level of comprehension and subsequent "right" to make decisions was also discussed. Many students voiced concerns with letting "just anybody" influence decisions too much, citing that preparation, experience, and understanding of the problem must weigh more than just opinions.

> *"I (also) think that there may be problems when inexperienced decision makers have too much say in the decision-making process, different risk profiles and experiences have a great effect on the final decisions quality."*

Related to this, the students experienced some confusion of what criteria and indicators are, etc. In part this can be due to different explanations in Macharis, *et al.* (2009) and Macharis, *et al.* (2012) and this is something that could benefit from further elaboration. This was something that the teaching staff felt had to be more clearly explained and the tutorial session was added in 2017. The tutorial session before the hand in of the case assignment helped with clarifying what a criteria is and also to clarify why the students shouldn't care about the other department's criteria, i.e. because these will be covered by these departments that have a better knowledge of their goals and problems. That is for the students to know that they cannot cover enough detail if they do not properly take one perspective.

Teacher perspective

From a teacher perspective, some things were good with this theme and other things have development potential. The theme as such has its place in the course, but the order in which it is taught had to be changed, which was also carried out in 2017. For instance, the lecture on cross-functional decision-making was moved so that the students could benefit from it before submitting their case reports.

As the 2016 edition was the teaching staffs first more in-depth encounter with MAMCA, this too had development potential, both for the teaching experience and the teaching staff. For the 2017 years edition, the following actions were introduced;

- One of the Macharis *et al.* articles was replaced with two other cross-functional decision-making article to broaden the understanding of cross-functional decision making as a whole
- The case description was further developed to create an understanding for "why" and "how" SAC is changing their inbound logistics strategy
- With time, the teaching staff gained better understanding of what criteria and indicators in the MAMCA methodology are which allowed them to better explain the concepts to the students and to use the MAMCA tool for research activities. The tutorial session for each case group was also added to allow for this opportunity.
- The teaching staff added mandatory criteria groups within which the students were to classify their criteria. This also acted as a guidance on what type of criteria were of interest to investigate further in the evaluation.

The introduced changes from 2016 to 2017 helped both the students and the teachers in understanding the flow between the activities in the theme. In 2016 the theme was more teacher centred, however in 2017 the theme through the changes became more student centred and the teachers acted more as coaches leading the students to find their own knowledge. For 2018 we will try to further develop the case description to also include some quantitative numbers as well as exchange one of the journal papers, the Ronnenberg et al. (2011) which for this purposes was not a relevant paper.

Discussion and conclusions

What can be seen is that the inclusion of the new theme and the computer based evaluation session has filled a gap in the education and course. When it comes to the learning of the students, adding the combination of the preparatory case work and the computer exercise gave the students the activity independence as discussed by Dochy *et al.* (2003) and allowed them to use knowledge as a tool while simultaneously achieving knowledge as a goal (Dochy *et al.*, 2003). By being faced with a problem and a stakeholder role, the students had to take charge of their own learning, giving them freedom in how they approached their learning to solve the case (Sheppard and Gilbert, 1991). By having the freedom to decide on what aspects were of particular interest for their department, the students engaged with literature and sought out criteria and indicators that they believed would be of interest in a real-life setting. This led to, amongst other things the reflections on power and the interaction of decisions made in one department on the operations of other departments as mentioned above.

From the student's evaluations, it can be seen that they reflected upon questions such as power, who should be able to decide as well as how these types of decisions should be prepared and made. We do not consider that the depth in the reflections would have been reached without the combination of the case and the computer exercise. Because the students become immensely aware of how they only just put up something that sounded nice in the case description and then at the computer exercise several of them sat and reflected, *"What can we have intended with this criteria?"* or *"Are these two criteria the same but with different names?"* It can also be seen that this new teaching method helped them to see the different aggregation levels regarding logistics questions in a supply chain, i.e. that decisions are not only a question of strategy it is also something that have to be accomplished in reality. These are very important insights as many master students within logistics have a tendency to focus only on strategic long-term issues or short-term practical issues and miss the link between the aggregation levels as well as just write without really know what they have intended.

The teaching staff acted more as coaching capacity (Dochy *et al.*, 2003), and the students drove the learning process forward. As such, the action of introducing the case-based computer exercise led to the community-building endeavour and mind-expanding tendencies discussed by Parker and Hess (2001). This was noticeable not least in the discussions during seminars where the students reflected on different goals of different departments. These discussions became less passive (Prince, 2004) and the students interacted with each other in a more insightful way than had it been just based on literature studies and information passed on by the teachers (Prince, 2004). For example, the students asked each other "*Why did you include this criteria?" "Didn't you think that this would be a problem?"*. What was also noticeable in these discussions was the absence of "right or wrong" as the students discussed the decisions and decision-making process more from the stand-point of the department that they were representing. As such their arguments were more along the line of "better for my department", showing that they

acknowledged the experiences of other departments, while still arguing the cause of their own department (Parker and Hess, 2001).

As a conclusion, we strongly believe that the inclusion of the new cross-functional decision-making theme has helped the students to gain greater understanding of the interaction between decision made in supply chains and how they affect different stakeholders. By running the theme with a clearly student-centred approach, the students have gained a deeper knowledge and understanding of the issues discussed in the theme than had they been confined to passively receiving the teachers knowledge in lectures. The students have expressed that they have a deeper understanding, and this would not have been possible to achieve without the combination of a case and the computer exercise, as this allowed the students to more actively drive their own knowledge seeking efforts. The coaching approach adopted by the teaching staff meant that the students had a sounding board with which they could discuss unclear statements and issues encountered, but as coaches the teachers were more of a passive knowledge base than in regular lecture based teaching.

References

Baeten, M., Kyndt, E., Struyven, K., and Dochy, F. (2010), *Educational Research Review*, 5, pp. 243-260

Costello, P.J.M. (2011), *Effective action research – Developing reflective thinking and practice*

Dochy, F., Segers, M., Van den Bossche, P, and Gijbels, D. (2003), Effects of Problem-based Learning: A Meta-analysis, *Learning and Instruction*, 5, pp. 533-568.

Mayer, R. E. (2004), Should There Be a Three-Strikes Rule Against Pure Discovery Learning? The Case for Guided Methods of Instruction, *American Psychologist*, 59, pp. 14-19

Macharis, C., De Witte, A. & Ampe, J. (2009). The multi-actor, multi-criteria analysis methodology (MAMCA) for the evaluation of transport projects: Theory and practice. *Journal of Advanced Transportation*, 43, 183-202.

Macharis, C., Turcksin, L. & Lebeau, K. (2012). Multi actor multi criteria analysis (MAMCA) as a tool to support sustainable decisions: State of use. *Decision Support Systems*, 54, 610-620.

Moses, A. & Åhlström, P. (2009). Nature of functional involvement in make or buy decision processes. *International Journal of Operations & Production Management*, 29, 894-920.

Parker, Walter C. and Hess, Diana. (2001), Teaching with and for discussion, *Teaching and Teacher Education*, 17, pp. 273-289

Platts, K. W., Probert, D. R. & Cáñez, L. (2002). Make vs. buy decisions: A process incorporating multi-attribute decision-making. *International Journal of Production Economics*, 77, pp. 247-257.

Prince, M. (2004), Does Active Learning Work? A Review of the Research, *Journal of Engineering Education*, 93, pp. 223-231

Ronnenberg, S. K., Graham, M. E. & Mahmoodi, F. (2011). The important role of change management in environmental management system implementation. *International Journal of Operations & Production Management*, 31, pp. 631-647

Rönnbäck, Åsa (2010), *Co-creation of value in public transportation – A quality management perspective*, Chalmers Reproservice, Gothenburg

Sheppard, Christine and Gilbert, J. (1991), Course design, teaching method and student epistemology, *Higher Education*, 22, pp. 229-249

Skeff, Kelley M., Stratos, Georgette, Campbell, Marilyn, Cooke, Molly and Jones, Henry W. (1986), Evaluation of the Seminar Method to Improve Clinical Teaching, *Journal of General Internal Medicine*, 1, pp. 315-322

Wallén, Göran (1996), *Vetenskapsteori och forskningsmetodik*, Studentlitteratur, Lund