

From chaos to order – redefining and clarifying student project assignments.

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Background

In the autumn of 2009 I started as a new teacher in the course “Philosophy of Science” (3 ECTS) within the Bachelor programme in Pharmacy at Copenhagen University. This was a new challenge for me since I knew nothing about the subject and had no background in philosophy. On the other hand it was an excellent opportunity to see the course from the students’ point of view since we started off with the same background knowledge.

The course has a theoretical base of 6·45 minutes lectures – that includes all practical information about the course, some history of science, some major movements in philosophy of science and more detailed lecturing on evidence based medicine. The major part of the course credits come from project work in groups; the students work on projects that should ideally illustrate concepts from the theory and deepen their understanding of the subject. To add relevance and interest for the students, the project assignments are based mostly on pharmaceuticals – cases where there had been controversies, withdrawals or historical development. The exam consists off a group presentation of the project and opposition (reading and posing questions) to another groups report. There are no marks given, only pass/fail, and by tradition noone that has put effort into the group work fails the course.

Before, during and after the course, there were several things I was dissatisfied with as a new teacher and most of them coincide with what the students point out as problem areas: There was a book for the course

– but there was not much correlation between the book, the lectures and the project work. I myself had to rely on other books and the internet to get a clear picture of the philosophical concepts. The students had similar complaints, and they felt that since they had to buy a book the course should follow it more closely.

As a project supervisor I was responsible for setting up a project portfolio of articles and define a set of questions that should guide the project work. It was never stated what the learning outcome of these projects should be or what should be covered – in the end I borrowed some old reports from another teacher to work out the assignments. Since six teachers set up six different portfolios with accompanying questions, the students experienced very different assignments and, depending on the subject, only parts of the theory could be covered.

The students also suffered from not having clearly stated learning goals. The project supervision was aimed at process guidance rather than helping the students to find answers – and most assignments were relatively open. Some of the students expressed frustration over the lack of guidelines and they felt that they didn't know what was expected of them. There was an “unofficial” list of concepts to be covered circulated among the teachers, but this was not to be shared with the students!

The course responsibility have been passed around the different institutes in the faculty several times the last few years, and there is a continuous inflow of new teachers (postdocs on temporary contracts). Despite this, the teacher group is enthusiastic and continuously tries to improve the teaching. But the problems persist, the course as a whole, and in particular the project assignments, lacks focus and clearly stated learning outcomes. As a result the students perceive the course as vague and unstructured. Since there is no real risk of failing the course, it is regarded as “soft” and has low status. From 2010 we have to cope with financial cut downs and added pressure from the study administration to “get things sorted”. In this report I present my own vision of improvements, which has also been presented to the teacher group.

An interview with two former students of the course

From my project supervision and the oral course evaluation for 2009, I had a relatively clear idea of the students' opinions during and directly after the course. But how do they feel about it when a few years have passed? Has

the course left any traces in their thinking? I convinced two of the master students currently at the department to give me time for a short interview. The two students, one man, one woman, had attended the course in the autumn of 2006, almost 4 years ago.

When first approached about being interviewed the students could hardly remember the course or what it was about, during the actual interview two days later they remembered some things quite clearly, while others had faded away. The general impression they both had of the course was that it was relatively easy and provided a break in an otherwise hard schedule. Both students have clear memories of the group work, but only very vague notions of the factual contents of the book and lectures. They were genuinely interested in the subject and felt that it has a place in their education. The students couldn't say that it was the Philosophy of Science course that had specifically contributed towards the critical thinking and awareness they both say they have.

“My expectation of the course was that it would be quite relaxed and probably give me a bit of breathing room in between the other subjects.”

“Thinking back it seems like the whole course was about learning how to work in groups rather than focusing on the factual content.”

“I think it is a really interesting subject, the problem is that the course is so short. When there is so little time you only get to scrape the surface a bit, and you can't get into the really exciting stuff. I felt like most of the theory was things I had heard before.”

“Now I am quite critical in interpreting literature and I am well aware that people may have different motivations and backgrounds. I can't say it is due to this course though, I feel that is something we have been continuously taught and, of course, when writing up Bachelor's and Master's projects you get to think a lot about these things.”

The students said the group work was valuable both as training on team work and because of the discussions it generated, but they also expressed that it could be difficult to produce reports of reasonable quality when many contributions had to be compiled. It is clear that different projects had different power of connecting theory with reality, with the students remembering some other group's projects more clearly than their own because of the connections they had been able to make between theory and real life cases.

“We had endless discussions as I remember it.”

“We adopted an efficient approach, divided up the work, and if there was no particular objection against a piece of work we accepted it as the consensus.”

“I think I did a project that had something to do with ear infections. But what I really remember is the report and presentation of another group that worked with homeopathic treatments – that really brought the message home for me.”

When asked about their abilities to work in group and to give constructive criticism the students feel that they have been properly trained throughout their education.

“I think I am good at giving constructive criticism. Also now when we are in the middle of our Master’s theses me and my friends continuously read and give feedback to each others reports.”

The picture that emerges from the interview is that the students had a positive experience of the course, although they grade it as relatively easy and ask for more depth in theory. They value both the theoretical contents of the course and the opportunity to train group work. It is not so remarkable that the students recall the active project work better than the passive lecturing, what is really remarkable is that the projects they remember are the ones that had the most illustrative power, even though they were made by other students.

Description of the course and its place in the Bachelor programme in Pharmacy

The two courses “Videnskabsteori” (Philosophy of Science) is part of the Bachelor programme in Pharmacy after a government decision that all longer university educations should contain these subjects. The course is 3 ECTS points and is placed in the 3rd semester of the programme.

The course is setup to train the students to study complex problems with an analytical approach and to critically assess their own and other’s work. The course directly addresses the overall goal for the Pharmacy programme: “Uddannelsens mål er på videnskabeligt grundlag at uddanne kan-

didater med teoretisk viden og med en etisk, fagkritisk og analytisk holdning samt eksperimentelle erfaringer, der kvalificerer til funktioner som særligt lægemiddelsagkyndige i en sundhedssektor og i et samfund i udvikling” (Studieordning for kandidatuddannelsen i farmaci; 2006).

Official course description:

T22-1 Videnskabsteori

Formål

At lære de studerende at foretage en etisk analyse/vurdering, og dermed øge den faglige bevidsthed og kritiske refleksion.

Målbeskrivelse

Ved kursets afslutning skal den studerende:

- *dels have forståelse for at videnskab ikke er værdineutral, at sandheden ikke er absolut, men kan ændre sig over tid, samt at forudopfattelser og fortolkninger ikke alene er noget, der har relevans inden for det humanistiske fagområde;*
- *dels kunne foretage en videnskabsteoretisk analyse af hændelser i og omkring den videnskabelige praksis (dvs. at formulere og identificere værdier og forudopfattelser, samt relatere disse til den analyserede hændelse.)*

Suggested changes to the course description:

One of the problems that I perceived as a new teacher, and that the students as a consequence suffered from, is the lack of clearly stated course objectives. The course intention (Formål) is directly copied from the course description of a Master’s course in “Etik” (Ethics) and is therefore misleading – we do not focus on ethical aspects in this course. It should be changed to “*At lære de studerende at foretage en **videnskabsteoretisk** analyse/vurdering, og dermed øge den faglige bevidsthed og kritiske refleksion.*”. The course objectives (Målbeskrivelse) are good enough in intention and ambition, but due to their vague formulation they neither describe the actual contents of the course, nor give any guidelines to teachers on how to approach the subject. In practice the course also contains some history of science and a strong focus on evidence based medicine.

It is important for students that the goals of any learning process are clearly defined, but it is even more important to the teachers! Without defined goals we don’t know how and what to teach. For the course in 2010 we

will have at least two new teachers as project supervisors. They will have to learn the philosophical basis of the course as well as finding the right level of supervision for the students' projects, and clearly stated learning objectives will benefit both teachers and students. To put emphasis on what the students should learn, I suggest that we reformulate the course objectives into intended learning outcomes (ILOs) (Biggs & Tang; 2007). After participation in this course, we want the students to be able to perform certain things, and therefore it would be most suitable to define the ILOs by using verbs describing the level of performance required (Biggs & Tang; 2007). My suggestions of new, clearer course objectives/ILOs are:

After passing the course the students should be able to:

- *Describe* how science and the way we think about science have changed throughout history.
- *Explain* major ideas and development within Philosophy of Science.
- *Critically read* scientific material and *analyze* complex issues with the objectives to *identify* within which values and paradigms the authors operate.
- Clearly *present* their work at a suitable level, both written and orally.
- *Evaluate* their own and other student's work according to a set of guidelines.

All objectives will be explicitly assessed in the project work.

The student projects

The project work serves several purposes:

- By using their theoretical knowledge to analyze real world problems the students get a deeper understanding of the contents of the course as well as preparation for doing similar analyses in their professional life.
- By applying theory to cases related to their own study discipline, the students' motivation increase, and they get a better understanding of their own role in science and society.
- By having to evaluate both the work of members of the same group and evaluating another group, the students are trained to think critically and reflect over their own performance.

The teacher group is convinced that practical project work gives the students a much deeper understanding of the subject and the students generally enjoy the active participation.

Evolution of the project assignments

The first years the course was run, the projects were defined by the students – they chose a subject (with some help and suggestions), searched for literature, chose some for analysis and wrote a report focusing on Philosophy of Science aspects. This approach was chosen to strengthen motivation (the students chose their own subject) and critical thinking (the students had to select which articles to include in the analysis). The limited time the students had for the project work turned out to counteract the learning goals; most of their time was in fact spent on searching for literature, leaving very little time for analysis of the material. The learning outcomes depended highly on the quality of the material the students had found to work with, and the differences between groups were large. Each project group had to hand in a written report and prepare an oral presentation of their work, in addition they had to read another group's report and make some questions for their presentation. The exam consisted of an oral presentation of the project group, followed by questions from the opposing group. The decision to pass or fail the students was made by two attending teachers based on both the written report and the oral presentation.

For 2009, a new approach with pre-made project “portfolios” was tried. Each teacher put together a portfolio of articles and an assignment with some guiding questions. Each student group was given a project according to which teacher they has been assigned. The students got more time for analysis of the material, but since the assignments given were assembled by six persons with different ideas, the students were faced with a very wide distribution of tasks. Removing the freedom to choose project didn't seem to affect the student's enthusiasm, but there were recurring complaints about the lack of correlation between the project work, lectures and the course book. Neither teachers nor students got any clear guidelines for what the project should cover and some students expressed frustration of not knowing what was expected of them. The exam form was the same as before.

Projects 2010

To address the problem of large differences in project assignments, this year all assignments will be designed by one teacher, and there will be only four different variants. They will all have a very similar structure, with the majority of the guiding questions being the same for all projects and the assignments will relate closely to the course book. The four assignments have

been chosen especially for their power to illustrate theoretical concepts as well as being highly relevant for the Pharmacy programme. The students will be allowed to choose which project to work on, and they will have the possibility to submit their work to the project supervisor for formative evaluation and suggestions for improvements. Previously a major complaint has been the absence of guidelines as to what the projects reports should include. We will address this by compiling a list of criteria (Biggs & Tang; 2007; Harris et al.; 2007) by which the students can judge their own performance as well as the performance of other groups. This will be absolutely essential for the exams since my suggestion to the teacher group is to implement *peer evaluation*, after the final submission of reports the students will evaluate each others work to make the final decision of pass or fail.

Peer evaluation – why and how.

In previous years each project group has had the task of reading another group's report and to come with questions and (constructive) criticism during the presentation. This has been emphasized as being important and as a requirement for passing the course. From my talking to students from the 2009 and 2006 courses, I got the impression that most students only get around to reading the abstract of the other report, while one group member gets the responsibility of making some questions for the presentation. This counteracts the teachers intentions that by reflecting on other student's performance, the students will also reflect on their own performance.

Each group will judge the project report by another group against a list of criteria and based on this assessment write a recommendation of pass or fail, accompanied by a short motivation. Likewise the students will have a list of criteria by which to assess the oral presentations, and will be allowed to change their recommendation based on the presentation. This setup doesn't significantly alter the students' workload, they are already supposed to read the report of another group and come with questions and comments. The difference is that the responsibility of assessment will now be transferred to the students.

This may seem like a lot of responsibility to give the students, but with only pass or fail the task is to decide whether the work is good enough or not. I believe that with a set of clear criteria that should be relatively easy to do. It should be noted that the teachers will also read the reports and attend the oral presentations, so in cases of blatant misuse (passing an inferior piece of work, or failing a good piece of work) there are possibilities

of intervention. Formally it is still the teachers that will put their signatures on the exam lists, but it is our intention to follow the students' recommendations.

Why, then? Well it is not because of laziness; in fact the teachers will probably have to put in substantially more work to clearly define the criteria that are now only present in their minds. The benefits of peer evaluation are many (Black & Wiliam; 2001; Harris et al.; 2007). I see these points as particularly beneficial;

- By having to judge other students' work and compare it to a set of evaluation guidelines, the students will reflect also on their own work and how well it fulfills the criteria given.
- The formative evaluation (teacher feedback on project reports) will be clearly separated from the summative evaluation (pass or fail based on the list of criteria).
- The students will learn how to rate other people's performance and giving constructive criticism, an important future task for these students.

For efficient learning it is important that the students have a clear picture of what is to be learned. If the students cannot see the desired goal, they can neither estimate their present position nor find a way to achieve the goals (Black & Wiliam; 2001). Rewriting the course objectives to clearly state the intended learning outcomes is one part of our effort; the other is to provide the students with the list of assessment criteria. In principle it could be enough to let the students assess their own work, but there is a growing consensus is that evaluating others is a very efficient way to reflect on your own work;

“Commonly, peer assessment tasks are designed to encourage and enable students to critically assess their own work. In order to evaluate the work of others, students need to consider the specified assessment criteria and distinguish between different levels of achievement, or ‘standards’ – in this way, peer assessment develops the skills necessary for effective self-assessment.” (Harris et al.; 2007)

I also believe that the added pressure of making the final assessment for another group means that the reports will be read in more detail and the students will reflect better on both their own and other's performance. This will hopefully lead to better discussions at the oral presentations.

Future restructuring of the course

High ambitions vs. economic reality

The courses “Philosophy of Science” is part of the Bachelor program in Pharmacy after a government decision that all longer educations in Denmark should include these subjects. This is an ambitious attitude, which means that students acquire a broader perspective of their own specialization and how it relates to the community as a whole. In the harsh economic climate and constant savings programs, however, it is all too easy to cut resources for subjects that are not considered defining for an educational programme.

In our current setup of the Philosophy of Science course, there are a few introductory lectures but the main part of course credits come from project work in groups. Finding and interpreting information is not trivial and each group of 6-7 students typically has 2 meetings with a project supervisor which also reads and gives feedback on the reports. The exam is an oral presentation/question session for each group with 2 teachers present. In a normal year of 220 students there are 32 projects groups running at the same time, which is of course very expensive in terms of teaching hours.

The teacher group has found that the group work is highly motivating for the students, leads to deeper learning, spurs fruitful discussions and trains critical thinking. The economic reality we have to contend with is that from the autumn 2010 there will be fewer teaching hours awarded for the course, with the possibility of even larger reductions in following years. In 2010 the teachers will just have to accept to get less teaching hours for their work, which in most cases will mean also less opportunity for the students to get feedback on their work. On a longer timescale we may have to rethink the way the course is run.

Alternatives to project work

Keeping the current project setup with less teaching hours will not be possible. Teachers cannot afford to spend more than the officially awarded time on courses. Since there are already 6-7 students in each project group, increasing the group size and thereby reducing the number of groups is not a viable alternative. The students already express frustration about the difficulties in compiling reports based on many contributions, and even the practical planning (deciding when and where to meet for group work) has turned out to be a challenge.

An alternative to project work could be to have case-based discussions in classroom sized groups (25-30). A smaller group of students (6-7) could be given a case to study at home which they then present in front of the class, and this could form the basis for one hour of discussion. With 4 cases per class, a reasonable amount of theoretical concepts could be illustrated this way, the attending teachers would have to spend less time supervising students and there would be no reports to read and give feedback on. The drawbacks are obvious; the students will not go as involved with their subjects and they will not get any feedback on their work. Without a written report it will be difficult to evaluate the individual student's performance in a reliable way and the final evaluation would have to be an additional written exam, with the many hours of correcting exam papers added to the teachers' workload.

Merging the Philosophy of Science course with the compulsory Ethics course, as is already done for several science programs at University of Copenhagen, is a relatively attractive possibility. There is some overlap in the concepts of the courses and the additional time spent for organization and preparations for the course could probably be kept relatively low. That means that the number of teaching hours spent on contact with the students and giving them feedback on their work could be increased. The students' work could include a more extensive project assignment, or alternatively a shorter project combined with classroom discussion sessions. Unfortunately this is impossible to implement within the Pharmacy programmes, since the Philosophy of Science is placed within the Bachelor programme and the Ethics course is placed within the Master programme.

The cheapest alternative, just giving the course as a lecture series, is not as a sensible alternative. It is true that with more teaching (and learning!) hours spent on lecturing the course could go much deeper into theory and get to the "really exciting stuff" the interviewed students asked for. Lecturing is a very poor teaching method though (Gibbs; 1981) and furthermore, one of the interviewed students said he would not attend the lectures if the course was set up like that;

"I wouldn't attend the lectures in that case. I would do a cost-benefit analysis for attending and decide it would be enough to read the book on my own, and hope to pass the exam."

The project based teaching trains so many skills that we consider important for this group of students (to work in group, to find and analyze

material, to critically assess their own and others' work) that changing it to a lecture based course would have to be the very last resort.

Conclusions

The Philosophy of Science course on the bachelor programme in Pharmacy has suffered from problems in the past, despite efforts from the involved teachers. The course objectives for this course were not clearly stated which caused confusion among both students and teachers. The organization and implementation of the student project assignments has been problematic. There was a wide spread of learning outcomes between different project groups depending on what starting material was used and what guidelines were available. The lack of correlation between the book, the lectures and the practical work lead to complaints from the students.

The teacher group will address these problems by reformulating the course objectives to better match the contents of the course, and by describing the competences we want the students to achieve. The project assignments have been completely restructured so that they will be uniform in nature and clear guidelines to what should be achieved will be provided. The available projects have been especially chosen for their power of illustrating theoretical concepts, and will to a larger extent follow the course book. By introducing peer evaluation we hope to make the students reflect more on their own learning.

Acknowledgements

I want to thank cand.pharm. Jeppe Olsen and cand.pharm. Lotte Solvang Christensen for their time and their comments about the Philosophy of Science course.

This project has been highly dependent on long and fruitful discussions with Søren Troels Christensen and Frederik Voetman Christiansen.

All contributions to this volume can be found at:

http://www.ind.ku.dk/publikationer/up_projekter/2009-2-2/

The bibliography can be found at:

http://www.ind.ku.dk/publikationer/up_projekter/kapitler/2009_vol2_nr2_bibliography.pdf/