UNIVERSITETET I BERGEN
Institutt for geografi

Emnerapport høsten 2013:

GEO-SD304 System Dynamics Modelling Process

Innhold:

1. Informasjon om emnet
2. Statistikk
3. Egenevaluering
4. Studentevaluering
5. Oppfølging

Emnerapporten er gjennomgått i Undervisningsutvalget ved Institutt for geografi

Dato: 13.02.2014

1. Informasjon om emnet

Emne	GEO-SD304 System Dynamics Modelling Process
Undervisningssemester	Høst
Emneansvarlig	David Wheat
Vurderingsform	Assessment consists of evaluating a modeling project. The modeling project consists of a simulation model, a conference-style poster describing and explaining the model, and an oral presentation and response to examiner's questions.
Undervisningsform	Lectures and computer labs
Obligatoriske arbeidskrav	Ingen

2. Statistikk

Eksamensmeldt	63
Bestått	44
Stryk	0 (0%)
Ikke møtt	19
Gjennomsnittskarakter	B

Karakterfordeling

Ordning	Antall studenter	A	B	C	D	E	F	Andre
OS Semesteroppgave og en skriftlig	63	27	10	0	3	4	0	0
	%	61	23	0	7	9		
	%	61	23	0	7	9	0	0

Karakterfordeling
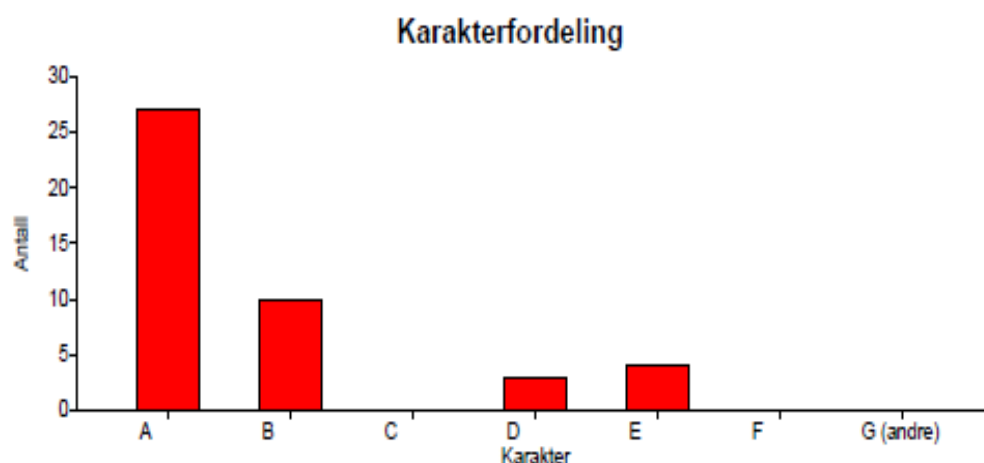
3. Egeneevaluering
Vurdering av undervisningsopplegget i forhold til mål og resultater (emneansvarlig)

Overall, this year's group of students was stronger academically than previous year's groups, as can be inferred from the grade distribution: the grades are skewed towards the "high" end. Comparing with last year, for example:

	A	B	C	D	E	F
2012	29%	32%	21%	13%	3%	3%
2013	61%	23%	0%	7%	9%	0%

The uniiquely challenging feature of this course is that the students are required to build a model from scratch. They must conceptualize the problem, collect data, formulate equations in both theoretically and technically sound ways, validate the model, and make a presentation--all in less than six weeks. Generally, the course works well, but it is intense for both students and the instructor (and teaching assistants). This year, 51 students were creating individual models of complex problems, and providing useful and timely feedback to the students was extremely time consuming.

4. Studentevaluering:

31 studenter har svar på undersøkelsen

#1 The course objectives were clear. (choice)
>   5: Strongly agree: 13
>   4: Agree: 15
>   3: Unsure: 2
>   2: Disagree: 1

#2 The course content was relevant to course objectives. (choice)
>   5: Strongly agree: 13
>   4: Agree: 17
>   3: Unsure: 1

#3 The course content was well structured. (choice)
>   5: Strongly agree: 10
>   4: Agree: 13
>   3: Unsure: 5
>   2: Disagree: 3

#4 I was confident in the instructor's knowledge of the subject. (choice)
>   5: Strongly agree: 24
>   4: Agree: 7

#5 The lectures were useful learning experiences. (choice)
>   5: Strongly agree: 12

4: Agree: 16

3: Unsure: 3

#6 The reading assignments were useful learning experiences. (choice)

5: Strongly agree: 12

4: Agree: 15

3: Unsure: 4

#7 The modeling project was a useful learning experience. (choice)

5: Strongly agree: 21

4: Agree: 9

3: Unsure: 1

#8 The case studies were useful learning experiences. (choice)

5: Strongly agree: 13

4: Agree: 16

3: Unsure: 2

#9 This course has prepared me for further study in system dynamics. (choice)

5: Strongly agree: 21

4: Agree: 10

#10 I would recommend this course to other students. (choice)

5: Strongly agree: 18

4: Agree: 13

#11 The instructor was well prepared for class meetings. (choice)

5: Strongly agree: 23

4: Agree: 8

#12 The instructor stimulated interest in the course. (choice)

5: Strongly agree: 21

4: Agree: 10

#13 The instructor explained what the students were expected to do in their assignments. (choice)

5: Strongly agree: 13

4: Agree: 13

3: Unsure: 2

2: Disagree: 3

#14 The instructor used technologies that enhanced learning. (choice)

5: Strongly agree: 14

4: Agree: 13

3: Unsure: 2

2: Disagree: 2

#15 The instructor encouraged class discussion. (choice)

5: Strongly agree: 21

4: Agree: 10

#16 The instructor's explanations of course material were clear. (choice)
5: Strongly agree: 13
4: Agree: 15
3: Unsure: 2
2: Disagree: 1

#17 The instructor showed concern for students' progress. (choice)
5: Strongly agree: 17
4: Agree: 10
3: Unsure: 4

#18 The instructor was responsive to my questions during the course. (choice)
5: Strongly agree: 16
4: Agree: 14
3: Unsure: 1

#19 I would recommend this instructor to other students. (choice)
5: Strongly agree: 19
4: Agree: 11
3: Unsure: 1

#20 The instructor presented course material... (choice)
at an appropriate pace.: 26
too slowly: 3
too fast: 2

#21 What is the most useful thing you learned in this course (text)
- What it takes to do good modelling.
- Policy making, Limitations of the model thinking Grouping the sectors into one model
- to build a model of real-life problems, policy designs.
- How to use the software in modelling
- Firstly is the fact that we must model the past behavior not using actual data. It was not clear to me for quite some time as I mistakenly thought that modelling of past/actual had to be exogenous. Ultimately I discovered what was meant by modelling of the past and above all understand the reason behind it. Secondly but directly linked with the first it was unquestionably the logic behind modelling historical data, which is: we need to create a model of the past which inasmuch as possible replicates the problematic dynamics of the past in order to analyse the most feasible policy recommendations by weakening the problematic loops and strengthening the good ones. Without understanding this logic I was not able to correctly model. This was my experience and this logic was not clear for quite some time and I ended up understanding on my own. Above all this was the most valuable thing I learned form the course (the feedback aims to be a constructive and positive observation)
- How to build a model from scratch
- -all of the things I will do differently the next time I start a modeling project -it was a very

frustrating but useful learning experience
- The actual process of building a model from the beginning to almost the end. By actually doing it one learns so much more than only reading about it.
- The hands-on experience of a (group) modelling process.
- I learned a lot about modelling by doing it for the project.
- To think operational when building the models.
- The nuances of SD modelling
- Pitfalls of modelling, but I expect to face more!
- Assignments
- The course has given me valuable insights on the modeling projects/tasks. It facilitated me with the modeling skills that could actually replicate the real life behaviors.
- how to use sd to solve problems.
- I learnt what the modeling process can involve, from the gathering of data (which can be a very long and tedious process!) to beginning the structuring of the model, and so on. Seeing the modeling process as a whole experience was the most valuable thing I took from this course.
- Experience about application of SD on totally different examples.
- to be creative and initiative
- How to work together and put together a model.
- How to understand modelling process, policy analysis and stipulation of project proposals.

#22 What is the least useful thing we did in this course (text)
- None.
- "Infection" game
- we had some lectures that covered some topics too late (or later than we were supposed to know while building our individual models)
- The infection game, mainly because the previous course presented a detailed explanation of s-shaped growth
- None that I can readily recall
- all contents of the course were highly useful
- The written exam
- -in the first lab sessions, doing 10 minute presentations on our first model structure was neither beneficial for me nor my classmates watching me present -would have been much more productive for all of us to have brief one-on-one meetings with the TAs to get us started in the right direction
- Some labs were not that usefull due to the fact that the TA's were really busy. They did a really good job in managing this and put a lot of afford in it, but sometimes there were to many students for one TA.
- There was not much emphasis on testing, so I didn't learned a lot about that.
- The first lecture was about the same things we saw at the end of the previous course.
- The lectures for case studies (Brazoria and the Telecom company)
- Readings
- I don't believe any.

- everything is useful.
- probably the case studies. they were still useful but I think we could have focused more on our own projects with more time for questions from our own modeling project.
- Everything seems to be useful enough.
- The shaking hands activity the first class. Could have been good at a later stage with an explanation of various SD games.

#23 Please write specific suggestions for improving the course. (text)

- Written exam is not necessary.

- The reading list and some objectives of the course came a little bit late. Sometimes you got the feeling that the course was being planned as we went along. You never had any doubts that the TA's and David were doing a bad job, but it would have been helpful to have more guidelines and the reading list up a little bit sooner.

- Make exam computer-based! More guests / practitioners lectures (webinar?) Improve the selection process of TAs

- give lectures on sensitivity tests and validation tests earlier.

- Starting with the discover the flows approach in the first lecture will probably make it easier to start modelling.

- Other softwares such as POWERSIM and VENSIM could be used along side.

- The most important suggestion is the one already mentioned in question 21. Other suggestions which I believe could enhance the learning process are: a) some level of follow-up of how the groups are evolving in a technical and qualitative manner as it can hurt the outcome. In our group one student did not get involved at all with the other two members and did not submit the first and the second drafts. This student did not produce the sub-model under his/her responsibility.Only after pressure of the professor in the last class, on the eve of presentation, did this student produce the sub-model but refused to submit to the group. This inconsequential behavior caused a lot of damage to the group, its objective, its harmony. In addition I propose that in the opening lecture the professor informs and emphasizes that all members' participation is mandatory and the consequence for those students who do not adhere to this directive. This bad behavior hurts the learning process and outcome of the team's project. I believe this requires professor's direct supervision since it is the heart of the course and needs to be identified as early as possible. b) Like anybody else TA's are not perfect but in case of my TA I feel he needs to be more effective. His contribution with some guidance/clarification to the development of my team's model was very low. SD303 TA Andreas is a perfect reference as to how to be an effective TA. Again, these are objective observations intended to be constructive and positive to improve the future versions of this extraordinary course.

- 1- More options for students to choose the topic for the project, maybe even they can have complete freedom to choose the topic they desire 2- Get constructive criticism from the TA's

- -make the proposal due the first week of November, not in September -start earlier in the course with guidelines for how to begin the modeling process -provide clear concise expectations for the modeling project before proposal due date -make requirements less strict for submitting drafts of the project. I spent too much time trying to get the software to cooperate and trying to fulfill all of the requirements for the drafts (story, unit check, interface, etc).

- The exam was of little purpose for the course. As i mentioned earlier, the process of building a model is by far of more value compared to the exam.

- Present material (esp. texts) and tipps on "how to get started" and how to structure (esp. the beginning of) the modelling process in the beginning of the course and not after 2.5 weeks when it is already too late.

- The sequence of the project itself and the supporting lectures is not useful. When we already started the project, we got lectures how to start a modelling project. I liked to see that turned around (and maybe even before the proposal). Also more specifications (like requirements) to be sure what is expected from us would be nice. The instructor did this in some way but not enough (for example: is it required to have a CLD of the individual model? He didn't tell us, we had to found out via via from the teaching assistents).

- Just one. Extending the course a couple of weeks more could help to understand better all the modeling process (for some persons the learning curve is longer).

- Fewer students. The lecturer did as much as he could but we were just too many!

- Trying to coordinate the pace of classes with the pace of the modelling project.

- Background check of the students could possibly enhance the learning experiences and also practical exposure with the relevant companies in Norway could really facilitate students to understand the real life problematic behaviors and actually conceptualize it via the SD modelings.

- learn this course before sd303.

- I would spend more time explaining the process of data collection, or at least giving us more information as to how necessary it is to spend time looking for data. I feel like I spent so long looking for data that I wasn't left with enough time to focus on the modeling. So my recommendation is that you give clear outlines as to how accurate the data has to be (can you take it from irreputable sources, like wikipedia say?) and how necessary it is to find it (do I have to find data even for something very obscure, or can I just make an assumption and move on?). I'd also spend some lecture time discussing the best ways of finding data (good sources, and good methods of finding other sources) as well as the quickest ways to process/use the data (some tips fro Xcel for example- myself and some other people spent a lot of time putting data into excel one row at a time before realizing how to copy and paste data in. This would definitely be worth pointing out to students- saves time that could better be spent thinking about the model!!

- It would be great to see different approaches to modelling of one single case.

- The class with the prison example of how to start building a model with a stock and its in- and outflows should have been the first class and made relevant to our initial building of our models.

- Avail course study materials on time. Group students among those earlier informed such that they can learn from each other

5. Oppfølging

Oppfølging av/kommentarer til tidligere evalueringer. Hvordan rapporten følges opp, evt. tiltak eller endringer som er gjort/planlegges gjennomført på bakgrunn av emnerapporten

The students' survey comments are similar to what we have seen in past years. One "new" comment by 2 or 3 students concerned the usefulness of the hand-shaking "epidemic game" and accompanying lecture on the first day of the course.

That surprised me a bit, so I sent a follow-up email to get additional information:

Thanks to all of you who completed the 304 evaluation survey. I am in the process of summarizing the comments & suggestions, and I need a quick response from each of you. Your "response" is not part of the survey but should help me interpret the results, and I will send you the final summarized results. Two or three of you mentioned the epidemic game exercise (1st lecture) as being among the least useful things we did in the course, and comments were something like: "we had already learned about s-shaped growth." Those of you who thought that learning about s-shaped growth was the purpose of the epidemic game lecture would, quite rightly, question its usefulness. But that was not the purpose of that lecture, and next time I will do a better job of explaining its purpose. Here's is my question for each of you: What do you think was the purpose of the epidemic game exercise and the accompanying lecture?

Responses from students are listed below in blue.
1. I think that the purpose of the lecture was to show the relation between the practical reality and the way the epidemic model behaves. In other words, showing that the model isn't just a theoretical representation, but is really a reflection of reality (at least, if the modelling exercise is done correctly).

2. I believe it was to show that real behavior originates from a certain structure, which might not be obvious, and SD is a very useful tool in discovering and modeling that structure.

3. Unfortunately I have missed epidemic game lecture, so I can tell only about its purpose according to further course references to it. As I can conclude, it was useful to indicate influences of different parameters on system behavior (amount of handshakes, amount of initially infected people and so on) and necessary to make an introduction to "backward thinking", to teach us indicate links that lead to final result, which is a basis of policy constructing.

4. For me the purpose of the epidemic game was to experience how to connect 'real life' (the game) and the process of modelling that.

5. I believe the goal of the epidemic game exercise was to make easier to draw a link between the theory we learn in class and how those issues actually develop in the real world so we could understand and relate in a way that bridge the theory and practicality gap.

6. One, to show how can be exemplified a dynamic situation in a simple game (to help us understand how our relationships are part of this kind of systems). Second, to introduce ourselves into modeling from scratch, i.e., from just the situation observed.

7. To show the usefulness and practicality of SD in describing reality and to introduce learning SD through games. Also, having an exercise to refer to throughout the course.

8. I think the purpose of the game and the lecture was to go through the whole SD modelling process using the epidemic game.

9. In my oppinion, it was about the dynamics of starting of some "disease" in the society with a very small number of "infected" and some certain probability, the behaviour of this spread in time and change of the state in dynamics. It also was about understanding of how good does the SD technics can describe the chaotic spread of some phenomena in the society and why this "spread" cannot be expressed in terms of linear growth that is frequently used in math and econometrics.

10. I personally liked the epidemic game. It gives an insight much specifically of how we could examine experimentally how S SHAPED growth are generated and misperceived in SD..its the easiest way t understand the SIR model. I actually recomended it should be a major focus.

11. To my mind the idea of the game was to give a real-life 'in-the-flesh' simulation of a dynamic process (which in this case happened to be S-shaped growth) so that we could empirically see how these systems really can behave in such ways in real life, instead of us just being told so in a textbook. If this was your purpose in playing this game, then I think this goal could have been better explained at the beginning - some people did think we were merely trying to understand S-shaped growth, which we had already studied many times before. So I would recommend that next time you make it explicit that what you are trying to do is to give a real life empirical example/simulation of a dynamic system's behavior, if that's what you were trying to do.

12. I felt that one of the main reasons for the game was to get a fresh start for the course outside the stereotypical lecture hall setting and to activate the students. Maybe also making the very abstract SD concepts a little more tangible through real-life simulation.

13. I consider the purpose of "The Epidemic Game/Model" was to explain the concept of reinforcing and counteracting loops and the gravity of loop dominance over time. Further, I believe the lecture not only clarified the concepts and missing links, it was really one of the interesting lectures that I had during the semester...

14. The purpose of the epidemic game exercise and lecture was to have fun with an experiment outside to produce data that fits a model, and to show us how to construct a vaccination policy to change the results of the model.

15. The purpose of the game was to know how to build a model given the dynamics of the game and to see whether the simulated behavior of the model (in this case, SI model) corresponds with the real data obtained from the game.

16. If it was not to show that this behaviour 'S-Shaped' exists then it would be to validate the structure/behaviour with what actually happened. That's why you had results of different years plotted for comparison.

17. For me the epidemic game was about relating SD model building with real life scenarios. To link the model on the screen with the world outside. Also, as i remember in that lecture there was also some ideas about implementation challenges, which also helps to relate it to real life.

18. I though the epidemic game was too challenge our non-system dynamic world view and promote critical approach to perceiving for the first sight not complicated (but in real life, more complicated) situation and process dynamics.
-------------end of student comments-------------

What was my main purpose of the epidemic game exercise?
To demonstrate in one 3-hour period the entire process of building and validating a model and testing policy options; i.e., to give the students an example of what they are expected to be able to do by the end of the course.

Of course, most lectures have multiple purposes, and this is one is no exception. I find it interesting that the "take away" message varied so much among the students. It is a useful reminder that instructors should always make very clear to students what the learning objectives are in any assignment.