

**STUDENTS EXPERIENCE OF CS1022B IN THE FIRST SEMESTER
OF 2003-2004**

Conducted & Prepared by

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INTRODUCTION

Student centred learning sees teaching not as a static process, but a dynamic process, which continuously needs adjustments to meet the requirements of the students (Ramsdem, 2003). Awareness of the students' needs and experiences is crucial, and therefore, at the end of the first semester of CS1022B I asked the students to fill out a questionnaire which I administered online in the module's WebCT environment. Of the 200 students that enrolled for the module, 85 completed the questionnaire. The questionnaire was based on the model of student learning (Figure 1). This model describes the chain of events in learning, starting from: teacher's approach, students characteristics, context characteristics; and link them with the students approach to learning which eventually determines the learning outcomes. The questions and the data can be found in the appendix A. The following sections will present the major findings, discuss them, and suggest improvements.

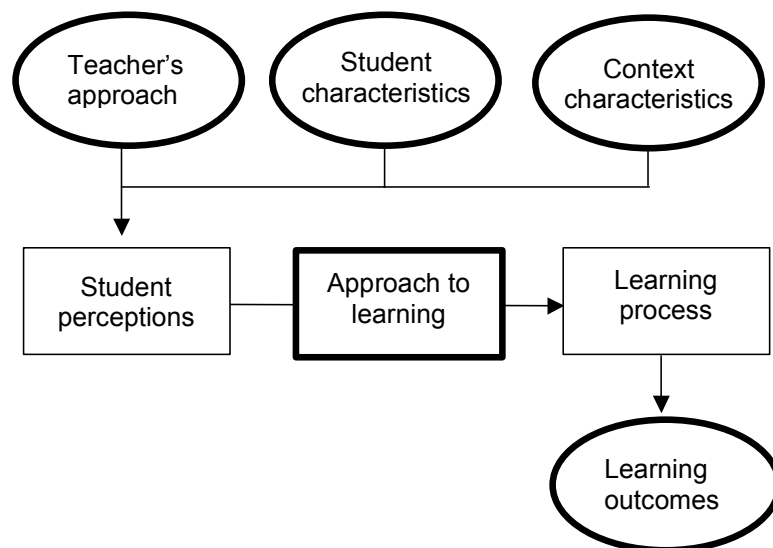


Figure 1 Model of student learning (Cannon and Newble, 2003, p.2)

TEACHER'S APPROACH

The teacher's approach has been identified to correlate with the quality of students-learning (Trigwell, Prosser and Waterhouse, 1999). A teacher's approach described as transmitting knowledge has been related with students applying a surface approach where deep learning is associated with teachers

adopting an approach more centred on students and on changing their conceptions. In the first semester we adopted an approach we hope would improve the students' effectiveness of learning. Our expectation was that discrete mathematics is best understood by solving problems instead of being taught in a lecture. Therefore, the module was centred on lab sessions and seminars. A major aim of the lectures was to motivate students and raise their interest for the subject matter by giving examples where discrete mathematics has been applied in computer science. The results of the survey seems to suggest that this approach had been successful, since a significant correlation ($r = 0.31$; $p. < 0.01$) was found between attendance and how useful students rated the lectures (Table 1), and between attendance and the overall quality of the module in the first semester ($r = 0.25$; $p. < 0.05$). The perceived usefulness of the lab and the seminar sessions did not correlate with the attendance, instead they were more associated with the content of the module such as perceived usefulness of example questions ($r = 0.22$; $p. < 0.05$) and specially written material for the module ($r = 0.29$; $p. < 0.01$).

Table 1 Attendants versus useless/usefulness lectures

		How useless/useful did you find the lectures?				Total
		useless	some parts useless and some parts useful	useful	very useful	
Roughly what proportion of the lecture/ lab/ seminar sessions have you attended?	0-20%	0	0	0	0	0
	21-40%	0	1	1	0	2
	41-60%	0	5	3	3	11
	61-80%	0	4	7	6	17
	81-100%	0	5	21	29	55
Total		0	15	32	38	85

The comments made by students in an open question at the end of the survey shows that students did like the lectures, but had problems with the labs and seminar sessions. Take for instance the following remark of two students:

Student 1

The leaning towards learning online and via videos troubles me. The seminars and labs have been a complete waste of time, if you have teaching assistants with poor knowledge of the subject or who are just disinterested then this will affect the students learning. I have done most of my learning either from a book or from the videos, I sometimes get the feeling that I would have been better off taking an open university degree. I appreciate that this method is a cheap form of teaching, but at what cost? On a positive notes have enjoyed <name lecturer removed> lectures immensely, his enthusiasm for the subject is plain to see.(sic)

Student 2

Lab sessions and seminars are not very useful, because we come all the for only one seminar session. In the seminar when you ask about coursework and your problems. There is no or very little help available. when you ask for help you are told. "yeah this is a very difficult question". I found seminars very little helpful. All i have learned about this module so far is from lectures, videos and my own efforts. (sic)

It seems that the teacher's approach was not clear for some students. They were not expecting that they had to take responsibility for their learning, and therefore regarded the lab and seminar sessions as not useful. Although these students were unsatisfied with the lab and seminar sessions and satisfied with the lectures, their approach of reading the material and watching the videos was exactly what I hoped they would do. Although the teacher's approach was explained in the first lecture, it apparently was not understood or picked up by all students or as one student remarked:

I think it needs to be made clearer that the learning requires students to be self-motivating, as moving from Teacher-based learning environment to this module, where almost all learning has to undertaken individually, was a large step and almost no support was given. (sic)

Clearly students entering university are not always aware of the difference in approach to teaching on universities and previous educations. Although students may initially be unsatisfied and want to have a more lecture-style approach, ultimately when they adjust their expectation to a more student-active teaching approach I hope to help them to apply a more deep learning approach.

STUDENT CHARACTERISTICS

Besides the teacher's approach, I expected the characteristics of the students also to determine the learning outcomes. The survey clearly showed a significant effect ($\chi^2(20, N = 84) = 41.87; p. < 0.01$) for the students' previous education on their grade for the mid semester test (Table 2). Since the module is heavily depending on the use of a PC, students were also asked if they had access to a PC outside the lab session. Eleven students responded with 'sometimes' whereas all other students with 'regular'. An interesting significant negative correlation ($r = -0.35; p. < 0.01$) was found between usefulness of the labs and PC access out side the lab. This can be interpreted that labs are valued for their access to PCs.

Table 2 Grade mid semester test and educational background

		Which grade did you receive for the mid semester test?						Total
		F	E	D	C	B	A	
What is your educational background?	A levels	0	5	3	4	9	23	44
	BTEC	3	0	2	6	2	1	14
	GNVQ	0	1	2	1	1	1	6
	Access	4	0	1	1	4	5	15
	Other	0	0	2	1	0	2	5
Total		7	6	10	13	16	32	84

CONTEXT CHARACTERISTICS

The last factor, in the model that may influence the students' perception, is the context characteristics. Questions associated with this factor related to WebCT, written material, books etc that were used in this module. For the WebCT to be effective, a requirement is that this environment is easy to use

by the students. Two students rate usability of WebCT environment as low, the other between average and very high, with the last option being the modus with 33 students. Since this questionnaire was administered via WebCT, the actual usability of the WebCT environment may be lower. The limiting factor usability may have is indicated by the significant correlation ($r = 0.26$; $p. < 0.05$) with the usefulness of the online discussion board. None of the students commented on the use of the discussion board.

APPROACH TO LEARNING

The main tenet of the model is that the factors discussed in previous sections affect the approach to learning students apply. In the survey I asked students to select a suitable description of their approach to learning for this module. The descriptions were taken from Cannon and Newble (2003) (Table 3).

Table 3 Description of the approach to learning

Classification	Ss	Description offered to the students
Surface learning	16	I am predominantly motivated by a concern to complete the module or by fear of failure. I focus on the material and tasks and not on its meaning or purpose.
Deep learning	42	I am predominantly motivated by an interest in the subject matter and a need to make sense of things and to interpret knowledge. My intention is to reach an understanding of the material
Strategic learning	27	I am predominantly motivated by the need to achieve high marks and to compete with others. My intention is to reach understanding on those topics that are important for the assessments.

Close inspection of students that mention to apply a surface learning approach instead of another learning approach, revealed the following significant correlations:

- ($r = -0.25$; $p. < 0.05$) usefulness example questions mid semester test
- ($r = -0.25$; $p. < 0.05$) usefulness written material (modules 1-4)
- ($r = -0.31$; $p. < 0.01$) usefulness feedback form regarding mid semester test
- ($r = -0.42$; $p. < 0.01$) overall rating first semester of the module
- ($r = -0.41$; $p. < 0.01$) perceived difficulty of the module
- ($r = -0.28$; $p. < 0.01$) interest for the module
- ($r = -0.35$; $p. < 0.01$) previous knowledge about subject matter

- ($r = -0.24$; $p. < 0.01$) usefulness lab sessions

The first observation is that these are all negative correlations. Students that tend towards a surface learning approach rated the usefulness of example questions, written material, feedback of assessments, and lab session lower than students that tend towards a deep or strategic learning approach. The students who applied a surface learning approach were also less positive about the overall quality of the module and rated it as more difficult. They were also less interested in the subject matter and rated their previous knowledge of the subject matter as lower.

Close inspection of the students that applied a deep approach to learning instead of a surface or a strategic approach revealed a significant positive correlation ($r = 0.31$; $p. < 0.01$) with the usefulness of the written material specially developed for this module. The difference between students that selected the description of the strategic approach instead of the other two approaches had a significant positive correlation with:

- ($r = 0.23$; $p. < 0.05$) usability WebCT environment
- ($r = 0.29$; $p. < 0.01$) usefulness example questions mid semester test
- ($r = 0.30$; $p. < 0.01$) difficulty of the module
- ($r = 0.31$; $p. < 0.01$) previous knowledge about subject matter

Compared to students who selected one of the other two approach, students that tend towards a strategic approach rated the usability to the WebCT environment higher, found the example questions of the mid semester test more useful, rated the model less difficult. They also indicated to have more previous knowledge of the subject matter.

LEARNING OUTCOMES

The last step in the model is the learning outcomes. At the moment of the survey, students had done a mid semester test. This was a written assessment taken under examination conditions. Since the survey was anonymous students were ask to fill out the grade they had received. Table 4 presents the grades set out against their approach to learning. Although suggested in literature (e.g. Trigwell, Prosser and Waterhouse, 1999), the

survey could not reveal a significant effect ($\chi^2(10, N = 84) = 0.79$; $p. > 0.05$) for the approach to learning on the students' grade. A possible self-selection of the online survey may have caused this.

Table 4 Grade mid semester test and approach to learning

		Which grade did you receive for the mid semester test?						Total
		F	E	D	C	B	A	
What is roughly the most suitable description of your learning approach for this module?	surface	2	1	3	3	2	5	16
	deep	4	3	4	4	7	19	41
	strategic	1	2	3	6	7	8	27
Total		7	6	10	13	16	32	84

Other factors, which might influence the approach to learning applied by the students, did however correlate significant with the students' grade. Analysis of the survey revealed the following significant correlations between the students' self-reported grade and:

- ($r = 0.27$; $p. < 0.05$) usefulness of the videos
- ($r = 0.29$; $p. < 0.01$) usefulness of example mid semester questions
- ($r = 0.36$; $p. < 0.01$) usefulness of written material (modules 1-4)
- ($r = -0.23$; $p. < 0.05$) usefulness of the book: Computer Science: An overview
- ($r = 0.37$; $p. < 0.01$) difficulty of the module
- ($r = 0.24$; $p. < 0.05$) interest for the module
- ($r = 0.27$; $p. < 0.05$) previous knowledge about subject matter

In comparison to students with a low grade, students that obtain a high grade rated the usefulness of the video, the example mid semester questions, and the written material higher. This might mean that students that made an effort to study this material may understand their usefulness in helping them obtaining higher grades. A more worrying interpretation is that for students with lower grades the material was less accessible and therefore less useful. The question comes down to whether the accessibility of the material is an unacceptable barrier or should students be expected to make an effort trying to use the material. The correlation between these factors and the approach to learning as discussed earlier gives more insight what accessible means in

this case. The material was not suited for a surface learning approach, and better suited a deep and strategic approach to learning. However, I think that the learning material ought to have encouraged students to adopt a deep or strategic approach to learning.

The negative correlation between usefulness of the book 'Computer Science: An overview' and the grades is an unexpected one. The book is used in the module because it is also used in other modules. However, its usefulness is limited as it only covers a very small amount of the modules' subject matter (units 5). The correlation might be seen as an indicator that students that really studied the book understood its limited usefulness, on the other hand students who depended too much on the book ended up with a lower grade. The remaining three positive correlations between the students' grade and their interest, the module's difficulty, and their pre-knowledge are not very surprising, especially since the students' previous education was identified earlier on as having an effect on the grades (Table 2).

CONCLUSION SURVEY AND SUGGESTS FOR IMPROVEMENT

The learning material seems to have a relation with the learning outcomes and the students' approach to learning. Students that apply a deep approach to learning regarded the written material as more useful, as did the students that obtain the higher grades. It seems therefore, not so much the discussion of the subject matter in the videos and the written material needs to be changed, but rather the way it encourages students to change their approach to learning away from a surface approach and more towards a deep or a strategic approach. A possible way would be to increase students' interest in the module, since students that applied a surface approach were associated with less interest for the module. Interest and involvement are two closely related concepts (Smuling, Brants & Pilot, 1990). Students' involvement can be increased by challenging the students, and by making the subject matter more meaningful (Smuling, Brants & Pilot, 1990). At the moment, the assessments are not discussed in the lectures, but handed out in a lab session, without explicitly discussing them. Therefore it might be better to spent attention to the assessments early on in one of the lectures. It could be

more clear for the students what challenge they are facing and might help them to see the provided material as a mean to meet their challenge. This instead of the current situation where they are expected to read first and understand later the relevance of the material provided when they see the assessment.

Some students were highly critical about the lab and seminar sessions. It seems that first level students have some inappropriate expectation regarding the teacher's approach. They expect instructors to teach them and provide knowledge. However, the instructors' role is that of a coach helping students with their learning by giving them directions to solve problems. The first change therefore is to state this explicitly in the study guide and in the introduction lecture. The instructors as well should be made aware of their role, so they can explain it when students come with questions.

REFERENCES

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Appendix A

Result of student Survey of the first semester

Title	N	Frequency							Mean	SD	Median	Mode	
		-	1/a	2/b	3/c	4/d	5/e	6/f					7/g
All things considered, how would you rate the quality of the first semester of this module?	87	0	2	25	41	19	0	-	-	2.89	0.77	3.0	3
How would you rate the level of difficulty of the module in your case?	87	0	8	31	41	7	0	0	-	2.54	0.77	3.0	3
How would you rate your interest for the module?	87	0	2	10	34	29	12	0	-	3.45	0.95	3.0	3
How useless/useful did you find the lab sessions?	87	0	10	34	32	9	2	-	-	2.53	0.91	2.0	2
How useless/useful did you find the seminar sessions?	87	0	7	25	37	18	0	-	-	2.76	0.88	3.0	3
How useless/useful did you find the lectures?	87	0	0	15	33	39	0	-	-	3.28	0.74	3.0	4
Roughly what proportion of the lecture/lab/seminar sessions have you attended?	87	0	0	2	12	17	56	0	-	4.46	0.82	5.0	5
How much of the subject matter covered in the first semester did you already know?	87	0	26	20	25	11	4	1	-	2.43	1.24	2.0	1
What is your educational background?	87	0	44	15	7	15	6	-	-	2.13	1.38	1.0	1
Do you have access to a PC / laptop outside the lab sessions to work on?	87	0	0	11	76	0	-	-	-	2.87	0.33	3.0	3
Which grade did you receive for the mid semester test?	87	0	7	6	11	14	16	32	1	4.45	1.65	5.0	6
How would you rate the usability of the WebCT environment for this module?	87	0	0	2	22	29	34	0	-	4.09	0.86	4.0	5
How useless/useful did you find the WebCT discussion board of this module?	86	1	4	24	49	4	5	-	-	2.79	0.84	3.0	3
How useless/useful did you find the self-tests on WebCT?	87	0	1	9	40	34	3	-	-	3.33	0.76	3.0	3
How useless/useful did you find the videos?	86	1	6	11	30	34	5	-	-	3.24	0.99	3.0	4
How useless/useful did you find the example questions of the mid semester test?	87	0	0	11	30	45	1	-	-	3.41	0.72	4.0	4
How useless/useful did you find the written material (Modules 1-5)?	86	1	4	24	34	23	1	-	-	2.92	0.88	3.0	3
How useless/useful did you find the book "Discrete mathematics with application" by S. S. Fonn?	87	0	8	25	26	15	13	-	-	3.00	1.20	3.0	3

How useless/useful did you find the book “Computer Science: an overview” by J. Glenn Brookshear?	87	0	9	29	37	6	6	-	-	2.67	1.00	3.0	3
How useless/useful did you find the feedback form regarding the assessment of your coursework?	87	0	6	20	44	14	3	-	-	2.86	0.89	3.0	3
What is roughly the most suitable description of your learning approach for this module?	87	0	16	43	28	-	-	-	-	2.14	0.70	2.0	2

User ID	Response
1	The leaning towards learning online and via videos troubles me. The seminars and labs have been a complete waste of time, if you have teaching assistants with poor knowledge of the subject or who are just disinterested then this will affect the students learning. I have done most of my learning either from a book or from the videos, I sometimes get the feeling that I would have been better off taking an open university degree. I appreciate that this method is a cheap form of teaching, but at what cost? On a positive notes have enjoyed <name lecturer removed> lectures immensely, his enthusiasm for the subject is plain to see.
11	all the modules except module 3 was very manageable and i would like to receive any advice on how i can improve my understanding.Please
12	The lab sessions were only really helpful when we had coursework i.e the Tarski and ISETL projects otherwise they didn't really help. It would be helpful to have the lecture slides on WebCT available in PDF because not all off campus students have Microsoft Powerpoint. It would also be better if there were more help available around the time of courseworks and an assurance that the surgerys aren't at the same time as our lab sessions. Being informed on how many paper modules we were going to have would have been helpful at the start of the course so we could schedule our own deadlines. Because we didn't know many students have had to rush the last two modules.
13	i think we should get more help with modules unit 4 and 5.
14	Lab sessions and seminars are not very useful, because we come all the for only one seminar session. In the seminar when you ask about coursework and your problems. There is no or very little help available. when you ask for help you are told. "yeah this is a very difficult question". I found seminars very little helpful. All i have learned about this module so far is from lectures, videos and my own efforts. Thank you for giving us the opportunity to express our opinions.
15	Overall, I find this Module very useful in helping me to gain a deeper understanding and progress in the Computer Science course as a whole, as well as providing me with suitable knowledge for a successful career in the IT Industry. As the Computer Science course is predominantly about software developing and programming, this module in particular helps to obtain a better perception of this course and what is expected from us academically and professionally. I personally believe that Foundations in Computing is very relevant to this course and is definitely worthwhile studying it and learn the concepts taught throughout the year.

16	I enjoyed this module, however i feel we did not receive much help. I think this is due to the short amount of time. The modules (1-5) were rushed and we should have done a recap after each module.
18	overall very good, lectures were lively which made me understand more and learn quicker.
2	the labs and the lectures were helpful but i think the lectures were going bit too fast
20	none
21	The lectures were very fast paced and the workload for the module was too much. Also for the module work very little help was provided. The things that are needed improving are the delivery of module in terms of lectures and the amount of help that is provided with understanding the module topics e.g. Induction, Premises and Argument also more examples about the topics that are hard to understand.
22	The WebCT format works very well. I enjoyed the lectures and the Dutch accent! The actual level of work was just right, though I really feel the videos need updating - they're really quite 'waffly.' Even so, I think the Lecture/WebCT/Video combination worked well for me. Thanks for all your help!
23	I do find the fact that you cannot view the videos on WebCT, from home, very annoying. Why not use Windows Media Player and/or Apple Movie Player? The self tests are very beneficial but i do feel as if you could possibly put in additional module/learning unit tests, i.e. Module 1 learning unit 1a, 1b, 1c, etc. This is because i don't really feel as if a learning unit of a module is covered to its 'potential'. I am going to purchase the £39 maths book after christmas so that shouldn't be a problem.
25	I would like to use this chance to thank you all who helped us during first semester.
26	good lectures, seminars attended were of help. labs a waste of time. you don't need the text book either.
27	i liked this module for the simple fact that i gained knowledge even if i didn't get a good grade for a piece of work. i learned solidly from the moment assignments were handed out. so even if i wasn't interested in the subject matter it taught me some valuable ways of thinking and how to apply those to the rest of your course. so even if you find ISETL or Tarski to be the most banal thing in existence, think about what it's teaching you about logic and how to approach a problem. priceless.
3	a better introduction within the first few weeks would have been slightly more helpful. also, it would be much nicer if we had more time to get a deeper knowledge of the subject, as our current standard is minimal to moderate. Another suggestion i have is that it might be better to have either more detailed instructions on tarski and isetl or maybe to just avoid these projects as they only caused me confusion
30	we should have some different examples than D.Maths book, so we'll have many different type of examples to work on. i am really not happy with examination board,(I got B in mid semester test)because they did not mark my questions which i had written in front sheet of answerbook, but they have marked first four questions. (written in front sheet: 1,2,4,5) (marked first four :1,2,3,4) please do something for me : <name and student id removed>
31	A little difficult for some people (i.e. me) and quite a steep learning curve if you haven't done maths A-Level. But lots of help and support available which helped loads.
33	no

34	The lectures are excellent, although the assigned coursework should be somewhat more interesting. The relation between current lectures and current coursework is also somewhat inconsistent. Your lectures are never boring, and are probably, for this reason, the most attended.
35	No
36	.
37	it isn't very useful module and important for the final target of the course, interesting
4	i think that some of the self tests should be assessed. i also think that more examples should be available to help students about induction. i think that the lab and seminars sessions could be a lot more useful as the teachers did not help you understand the concept of the problems which you encountered.
40	Very good rate of feedback - have waited a couple of months for other marks and we received the Tarski and ISETL back within a week. Thanks! Lectures are interesting and not boring like others!
42	None
43	no comments
44	no comment
45	i find it extremely hard to keep up with the pace of the course especially as i have never studied programming before in my life. there is a lack of support and an expectation that all students know how to programme or that once explained, they will get it straight away, which is not the case especially for me. i admit that i am struggling greatly in this course.
47	no
48	No comments
49	not enough taught in depth, not everyone can understand very quickly and in seminar the teacher does not explain enough the detail and concept of work, instead we just sit and read.
51	no comments.
52	NO
53	I think that the teaching standards of the construction of programmes unit in LAB is quite poor. I do understand that students need to work independently and on their own in that matter but the Blue J book does not seem to increase my understanding of the topic. I believe the teachers should play more part in motivating students and helping them thereafter.
54	n/a
55	.

56	no comment
57	none
58	very fun
59	none
6	I think the handouts for module 1 and 2 were very useful. But module 3 was terrible. I was able to manage the isetl project by researching into the topic about induction hypothesis. But entirely module 3 was the worst. Although i have fallen behind due to personal circumstances, i know tha module 4 will be more like module 1 and 2 (thats what i have been told). I think that the asignments of pair projects shoul have been given later during the year so u then know who u should be working with or not. Best thing about doing them so ealier is that it filters with who u are not going to work with in the future tasks
60	More assistance needs to be provided in terms of working on modules, such as workshops to assist students such as myself who at times have difficulty understanding certain areas of mathematics.
61	well i understand that it is important for programming in general.i wish we had more support during the seminar and not answers like "Why don't you go and watch the video?" otherwise what is the purpose of coming.
62	The Lectures were the best, <name lecturer removed> rules ! quick, funny and to the point, best lecturer so far - very easy to understand
64	i hav e no comments. thank.
65	No comment
67	None
68	after module 3, the work is getting really hard and difficult to understand. the teacher who is teaching me is difficult to get hold of so the only real source of help is the DVD. i fear this worry will grow and escalate high as the year progresses and i may struggle even more!
69	overall the modules were great! i struggled a bit because i found everything to be moving a bit fast so at times i had not understood some topics much and the second topic would start.
70	No
72	I think it needs to be made clearer that the learning requires students to be self-motivating, as moving from Teacher-based learning environment to this module, where almost all learning has to undertaken individually, was a large step and almost no support was given.
74	no
75	I found the module material very difficult. I felt that the quality of the support offered by the seminar leader (<name instructor removed>?) was poor and there was not sufficient support offered for those having difficulty, which led to a level of despondency about the course - I am currently in the process of redoing all the modules on a full-time basis in an attemnt to improve mv knowledge. The lectures were excellent. nacked with information and the module leader was able to keen

my interest.

- 76 provide more help to students who are less fortunate than others. Thank you!
- 77 Please make the module easier to learn by given students more teaching support
- 78 I did not feel that the booklets were very useful and were not generally backed up in seminars. However I found the lectures very helpful and I thought they were presented in a lively way.
- 79 It was ok overall. Some parts of the module are hard but they can be done. The lecturer of this module is the best I have seen. The handouts take a long time to complete and there is just too much that has to be done.Thanks
- 80 the material covered is good but more effort needs to be made with examples during seminars when requested. second semester seems to have a bit more interaction involved.
- 81 the module was nice and it should have more improvements to it.
- 82 At the start of the semester I had no knowledge on discrete maths but as the module carried on I began to understand this topic.
- 85 Well! over all the course went very well but I think in seminar we had not cover the difficult and most important topics of the course. On the other hand I can say that lectures and Lobs sessions provided most of the knowledge that I needed fro this module. The handouts provided were very clear and informative. With regards
- 9 Thanks,