

DELFT UNIVERSITY OF TECHNOLOGY

REPORT 11-16

EVALUATION MUMIE - ONLINE MATH EDUCATION
AEROSPACE ENGINEERING 2010-2011

KEES VUIK, FONS DAALDEROP,
ROBERT VAN KINTS, TOM BAKSTEEN AND BART SCHAAP

ISSN 1389-6520

Reports of the Delft Institute of Applied Mathematics

Delft 2011

Copyright © 2011 by Delft Institute of Applied Mathematics, Delft, The Netherlands.

No part of the Journal may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission from Delft Institute of Applied Mathematics, Delft University of Technology, The Netherlands.

Contents

1	Introduction	4
2	Progress of MUMIE at TU Delft	5
2.1	Content development for Linear Algebra	5
2.2	Using MUMIE at Aerospace Engineering	5
2.3	Using MUMIE at Computer Science	6
2.4	The goal of using Mumie for Linear Algebra	7
3	Results of using MUMIE in 2010/2011	8
3.1	Survey	8
3.1.1	Summary of the response to the multiple choice questions	8
3.1.2	Summary of the comments	9
3.1.3	Comparison with survey results from the pilot	10
3.2	Analysing the exam grades	10
3.2.1	Comparing Mumie group vs non Mumie group	11
3.2.2	Comparing VWO grade with LA grade	12
4	Conclusions and Future work	15
4.1	Conclusions	15
4.2	Future work	15
A	Survey results	18
A.1	Multiple choice questions	18
A.2	Categorised comments/remarks/suggestions	26

1 Introduction

This report gives an overview of the development and experiences of using Mumie [1] at TU Delft during the academic year 2010-2011. Mumie is an e-learning platform that can be used for mathematical courses and acquired the interest of TU Delft at the beginning of 2009 in order to be used in their first years mathematical courses, in particular Linear Algebra . To see if Mumie could be successfully used at TU Delft, a pilot experiment was held under Aerospace Engineering students for a small part of the LA course. The outcome of this pilot was good, around 70% of the students recommended to use Mumie for the course, so further development of Mumie at TU Delft continued and is discussed in this report. Earlier reports on the development of Mumie at TU Delft can be found at the Mumie wiki [2].

Section 2 gives an update on the progress that has been made since the pilot. In Section 3 there is an overview of the student survey and grades for 2010/2011. Finally, in Section 4 conclusions are drawn from the survey results and student grades, together with a discussion and points of improvement for the future.

Throughout this report some terms will be used that you might not be familiar with:

AE	the study Aerospace Engineering at TU Delft
LA	the Linear Algebra course at TU Delft
CS	the Computer Science course at TU Delft
VWO	this is highest level in the Dutch high school system

2 Progress of MUMIE at TU Delft

Information about the progress of using Mumie at TU Delft can be found in this section. As mentioned in the introduction the outcome of the pilot was positive, so further development is continued. Since the pilot only contained a small part of the LA course, the next step was to implement the entire course material in Mumie. More details on this can be found in Section 2.1. How the Mumie course was used at LA for Aerospace Engineering can be found in Section 2.2. Also an attempt was made to use Mumie at LA for Computer Science, details about this can be found in Section 2.3. Finally, Section 2.4 covers what the goal of Mumie is when using it in the Linear Algebra course.

2.1 Content development for Linear Algebra

The content that was used for the pilot only consists of a small part of the LA course. The next step was to add all the remaining material for the LA course to Mumie. During the content development for the pilot it became clear that the theory used in Mumie at TU Berlin differed too much to be used as a base for our course. Instead the study guide for the LA course of Aerospace Engineering was used as a guide to develop the course for Mumie. The study guide roughly covers the following sections:

- Linear Equations in Linear Algebra
- Matrix Algebra
- Determinants
- Eigenvalues and Eigenvectors
- Orthogonality and Least Squares
- Symmetric Matrices and Quadratic Forms

Although the theory used in Mumie at TU Berlin was not suitable for us, we were able to use most of the available applets and exercises that belonged to a particular topic as a base. For every topic the relevant applets and exercises were copied from the TU Berlin content package and adapted to our needs. This way the LA course for Mumie at TU Delft could be developed quicker than when starting from scratch.

Three topics are not available from the TU Berlin content package for LA, these are Least-Squares Problems, Symmetric matrices and Quadratic Forms. Because of time restrictions it was not possible to implement applets and exercises for these topics in our Mumie course. However these topics should be added to the course for next academic year 2011/2012.

2.2 Using MUMIE at Aerospace Engineering

Early 2010 Mumie was introduced as a pilot at the LA course (WI1403LR) for the Aerospace Engineering program. Because of its success the next step was to use Mumie in the entire LA course for the academic year 2010/2011.

The set-up of the course was as follows;

- The course is given over the second and third quarter in the form of colstructies¹.
- Every week a specific topic is covered as specified in the study guide.
- There is a single exam at the end of the third quarter.
- A score of 6 or higher is needed to pass the course.

Mumie was introduced in similar way as was done for the pilot:

- Participation is voluntary.
- Everybody can participate if they like, no limit to the amount of students is set as was done in the pilot.
- Students can work with Mumie either at home or at the university, at their own pace in their own time.
- The content in Mumie follows the theory as given in the study guide.
- Every two or three weeks homework exercises have to be completed and are corrected automatically.
- Half a bonus point can be earned in every quarter if the score for all exercises together is above 60%, resulting in either 0, 0.5 or 1 extra bonus point at the end of the course. This bonus point can only be used for the exam in April, not for the re-sit.
- One of the Mumie exercises is also present in the exam.

During the course period there were around 400 students, from the total of about 520 students, who registered to use Mumie, of which about 300-350 actually handed in (some) homework exercises at the deadlines. For feedback or problems concerning Mumie, students could contact Robert van Kints, the person involved in maintaining Mumie at TU Delft. The advantage of this is that there is no extra workload for the teacher.

2.3 Using MUMIE at Computer Science

Making the Mumie course available for other study programs (other than AE) can be done easily in Mumie. Because the study guide for Computer Science, WI1200TI, (CS) is very similar to that of AE and attempt was made to introduce Mumie for CS as well. Overall the set-up for the course is the same as in AE, however there are some differences:

- The course is given over the 3rd and 4th quarter.
- An exam is given at the end of each quarter, the two exams together make up the final mark.
- Students can work on Matlab exercises in order to gain a bonus point. Because of this, no bonus point could be given for using Mumie.

¹A colstructie is a combination of a lecture and instruction in one

During the first half of the course, only 8 students registered to use Mumie. However none of them had done any of the homework exercises that were to be handed in at the given deadlines. Because of this low attendance it was decided not to use Mumie for the second part of the course.

Two possible causes might explain why the participation was so disappointing at CS:

- Students of CS could not earn a bonus point when using Mumie. This could have been a major factor in order to motivate the students to use Mumie in the first place.
- Mumie was only introduced at the end of the second week due to time problems.

The reason for this low attendance for using Mumie at Computer Science is hard to find out and may depend on other factors as well. Next year another attempt will be made and some changes in the introduction will have to be made, what these changes are is not clear at the time of writing.

2.4 The goal of using Mumie for Linear Algebra

The content in Mumie gives an overview of definitions and theorems structured by topic. It focuses on concepts and straightforward applications of these definitions and theorems and where possible provides visualisations and training exercises for the student to work with. Because students often have problems with mathematics or underestimate its complexity they do not actively participate in the course and start preparation for the exam too late. By working with time slots wherein students have to hand in a set of homework exercises, we would like to motivate the student to keep track of the learning material and get more actively involved in the course.

The level of the homework exercises that have to be handed in periodically is relatively simple and not comparable to the level of the exam. As long as students are aware of this, it should not form a big problem. The positive side of this approach is that students do not get demotivated early in the course because of the complexity of the material. For the course next year, example exam questions will be added to Mumie so that the student is well aware of the level of the exam. These exam questions should be solved with pen and paper and are not automatically corrected by Mumie.

The focus of Mumie is not to give elaborate feedback on solutions provided by the student. In the training exercises, feedback is often only given in the form of correct or wrong. The same is done for the homework exercises, except that a correct solution is also provided once the deadline has passed and the provided answer is incorrect. Of course, having more elaborate feedback would be a nice feature, however implementing this is a very time consuming job. Since Mumie is an additional tool for the student to learn the course, he still has the opportunity to get extra feedback from the teacher during the classroom lectures when certain concepts are not understood.

Furthermore, the teacher can also use the outcome of the homework exercises to adapt his lectures in the future. If it appears that a lot of students fail on a particular topic this can be an indication that students have difficulty understanding it and may need more explanation in lectures.

3 Results of using MUMIE in 2010/2011

The Aerospace Engineering students participating in Mumie filled in a survey at the end of the course, the results of this survey can be found in Section 3.1. We will also look at the grades the students got for their exam. This can be found in Section 3.2.

3.1 Survey

The survey that the students had to fill in at the end of the course mainly consisted out of multiple choice questions. The students have the opportunity to leave any comments / remarks / suggestions at the end of the survey. Because this was the first time Mumie was used on a large scale at TU Delft, feedback from the student was very important for us in order to improve the material for next year(s). For this reason it was mandatory for the students to fill in the questionnaire in order to gain the bonus point. In total 331 students filled in the questionnaire. In this section an overview of the most important results from this survey are given. The actual data from the survey can be found in Appendix A.

3.1.1 Summary of the response to the multiple choice questions

The complete list of results from the multiple choice questions can be found in Appendix A.1, here only a brief overview of these results is presented:

- 50% of the students attended most or all of the classroom lectures.
- 40% of the students went through most or all of the Lectures from Mumie, these contain the theory and applets with demo and training exercises.
- 80% of the students have done most or all of the homework exercises. The most important reasons for only doing a few of the exercises is:
 - Busy with other things (32%)
 - Bad planning (20%)
 - Did not understand the exercise (17%)
 - Problems with the timeframes (15%)
- 63% of the students thinks the difficulty of the applets in the Lecture part is just right, these applets consist of demo and training exercises in order to help the student understand certain concepts.
- 55% of the students thinks the difficulty of the Homework exercises that were to be handed in at specified deadlines is just right. 33% thinks they are moderately difficult.
- 60% of the students indicate that the applets are (very) helpful to understand the course material.
- 60% of the students (strongly) agrees that the applets motivates them to learn the course.

- 70% of the students thinks the Mumie program is (moderately) helpful for doing the exercises from the book used in the course.
- 70% of the students indicated that Mumie is well structured, or at least enough structured.
- 60% of the students agreed there is enough documentation to help them start with Mumie.
- 70% of the students has no problem entering there solution into the applets.
- 45% of the students (strongly) agrees that it is clear which Homework exercises are done and saved. However 35% (strongly) disagreed with this point.
- 82% of the students (strongly) recommends Mumie for the Linear Algebra course wil403lr, 12% is not sure and the remaining 6% (strongly) dislikes it.

3.1.2 Summary of the comments

In order to summarise the comments the students provided at the end of the survey they have been categorised. In this section only the categories, with a small explanation, are mentioned together with the number of comments that belong to that category. To see all individual entries see Appendix A.2.

Not clear what homework exercises are saved (30 entries)

Students can not easily see if an exercise has been completed and saved.

Positive remarks (29 entries)

Students leaving a positive remark as comment.

Workload problems with last timeframes (24 entries)

The last part of the Mumie course is experienced as too much work, especially in comparison with the first part of the course.

Problems with the requirements (20 entries)

The fact that Mumie only works with Firefox is a problem for some students, they requested it to work on all browsers.

Problems with the structure of Mumie (13 entries)

The structure of Mumie and navigation through it is unclear.

Problems with the timeframes (11 entries)

The dates of some timeframes was a problem for students. Also there was confusion about the announcement of the timeframes, the ones mentioned in Blackboard being different from the ones in Mumie.

Problems with input into Applets (10 entries)

Students experience problems to insert their solution into the Applets.

Bad translation to English (10 entries)

In a number of places there is still text written in German, especially in the feedback.

Some weak / strange exercises (6 entries)

Students think some exercises are a bit strange and not discussed in the book or classroom lectures.

Demo part inconsistent / not sufficient in regards to the exercise (5 entries)

For some exercises the demo part of an applet is experienced to be inconsistent or insufficient with respect to the related homework exercise.

More feedback in applets (4 entries)

Students indicate they want more feedback from the Applets on what they have done wrong.

Logged out too quickly from Mumie (3 entries)

On homework exercises that require more time to solve, some students get logged out from their account due to inactivity.

Various (29 entries)

This last category exists of entries that are hard to categorise.

3.1.3 Comparison with survey results from the pilot

A large number of the questions presented in the pilot questionnaire remained the same for the survey of this years course. Because of this, a comparison between the two surveys can be made. Overall, the results for the two surveys are very similar, however two differences can be found:

- On the question about the difficulty of the Homework exercises, 40% of the students from the pilot labeled them as just right and 40% as moderately difficult. The results of this years survey show that 55% of the students labeled them as just right and 30% as moderately difficult. A possible explanation of this difference is that the material from the pilot only covered the more difficult parts of the course, whereas this years course also covered more easier exercises.
- The recommendation for using Mumie at the LA course has increased by 10%, this year 80% of the students (strongly) recommends to use Mumie for the course. An explanation could be that because Mumie now covers the entire course and active use of Mumie will stimulate the student to keep track of the material because exercises have to handed in at several deadlines. Because the pilot only covered a small part this impact will be less.

3.2 Analysing the exam grades

In this section an analysis of the grades for the LA exam is presented. In Section 3.2.1 the emphasis will be on comparing the group that participated in Mumie against the group that did not participate. In Section 3.2.2, the VWO maths grades will be compared against the LA grades.

3.2.1 Comparing Mumie group vs non Mumie group

First the LA grades for the group that participated in Mumie will be compared to the group that did not participate. This result can be found in Figure 1.

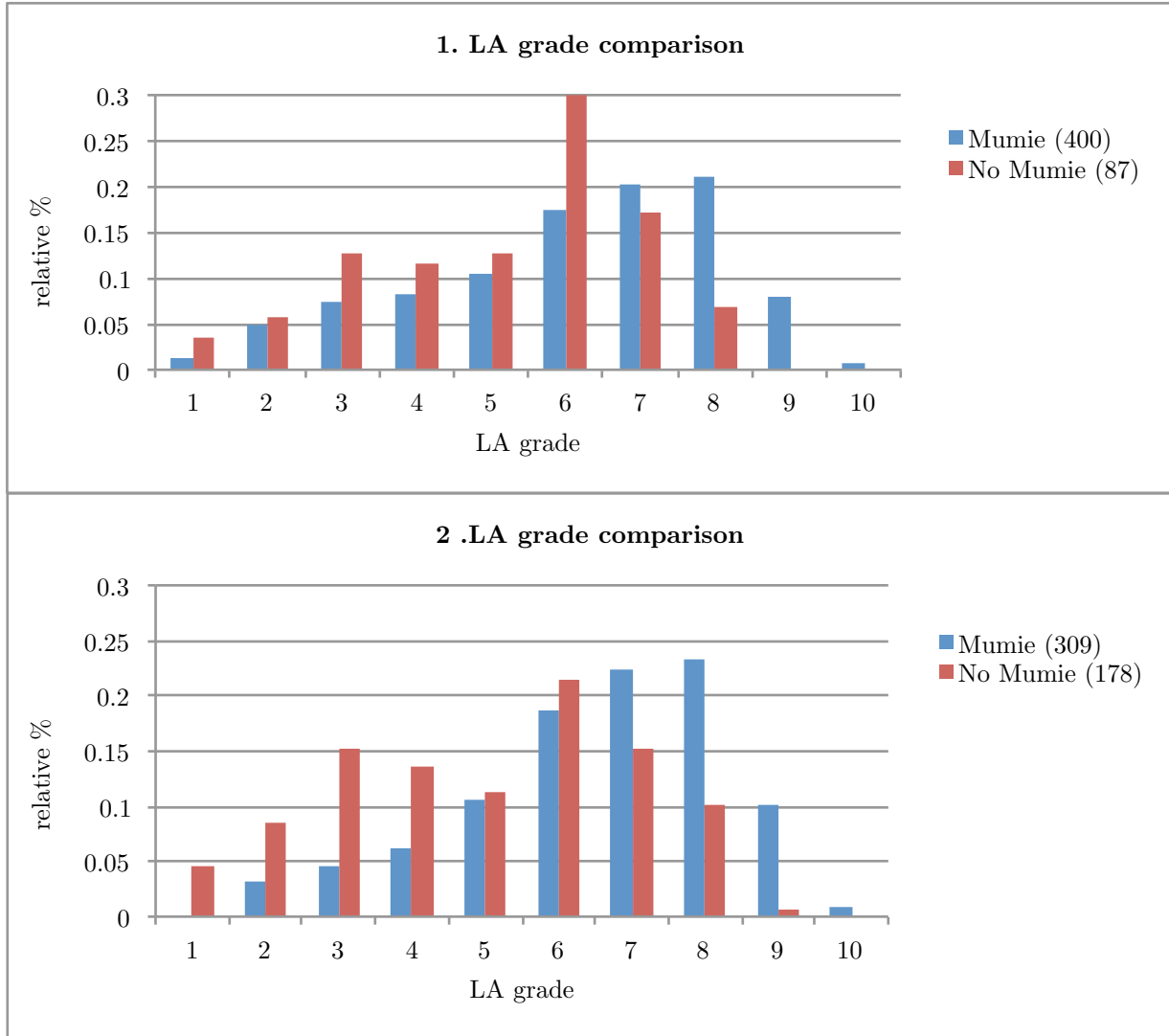


Figure 1: A comparison of the LA grades for the group that participated in Mumie against the group that did not. Each group has been normalised. Participating in Mumie is defined as follows, for 1. (the top graph) every student that registered for Mumie belongs to to the *Mumie* group. For 2. (the bottom graph) only the students that registered for Mumie and received 0.5 or more bonuspoint belong to the *Mumie* group. The number in brackets behind the labels indicate the amount of students in that group. Calculation on the LA grades has been done on the actual exam grade where the bonuspoint has not been included.

For (1): *Mumie* avg LA grade = 6.14 and *No Mumie* avg LA grade = 5.17

For (2): *Mumie* avg LA grade = 6.53 and *No Mumie* avg LA grade = 4.97

From Figure 1 it can be seen that there are relatively more higher scores (getting a grade of 7 or higher) for the group that participated in Mumie. When the average LA grade for both groups are compared, the group using Mumie also scores higher.

From these results it appears that participating in Mumie benefits the student in getting a higher grade for the exam. Of course there are lots of variables that should be taken into account. For example, one could say that once a student is participating in Mumie, his motivation to pass the course will be higher since he is willing to put extra work in it. This also becomes apparent when graph (1) and (2) are compared, a more active use of Mumie seems to increase the average grade.

3.2.2 Comparing VWO grade with LA grade

Next the LA grades will be compared to the mathematics grade the students got for their VWO exam. The result of this can be found in Figure 3 and Figure 2.

The reason for making a comparison between the LA results and VWO maths results is to see if students that have a relatively low VWO maths grade gain extra benefit by using Mumie, compared to students that have a higher VWO maths grade or to students that did not use Mumie. Because the VWO results of students that did not go to high school in the Netherlands are not available, the groups are smaller than in the previous section.

When looking at the results in Figure 2 the same conclusion can be made as in Section 3.2.1. That is, the group participating in Mumie scores relatively higher marks than the group that did not participate. However this result appears the same for all the different VWO grades (except for the histogram with VWO grade 5 but this may be due to the small group size for this case). So no extra conclusions can be drawn from this.

If the average LA result is calculated for every VWO grade, see Figure 3, again the same conclusion can be made. Students participating in Mumie on average seem to perform better at the LA exam than the group that did not participate. Another important observation from Figure 3, the bottom graph, is that for most VWO categories (except VWO grade 5 and 9) an active participation in Mumie is the difference between a pass or a fail for the LA exam. Interestingly, the students that have a 6 for the VWO maths exam perform on average slightly higher on the LA exam than the students that have a 7 for there VWO maths exam.

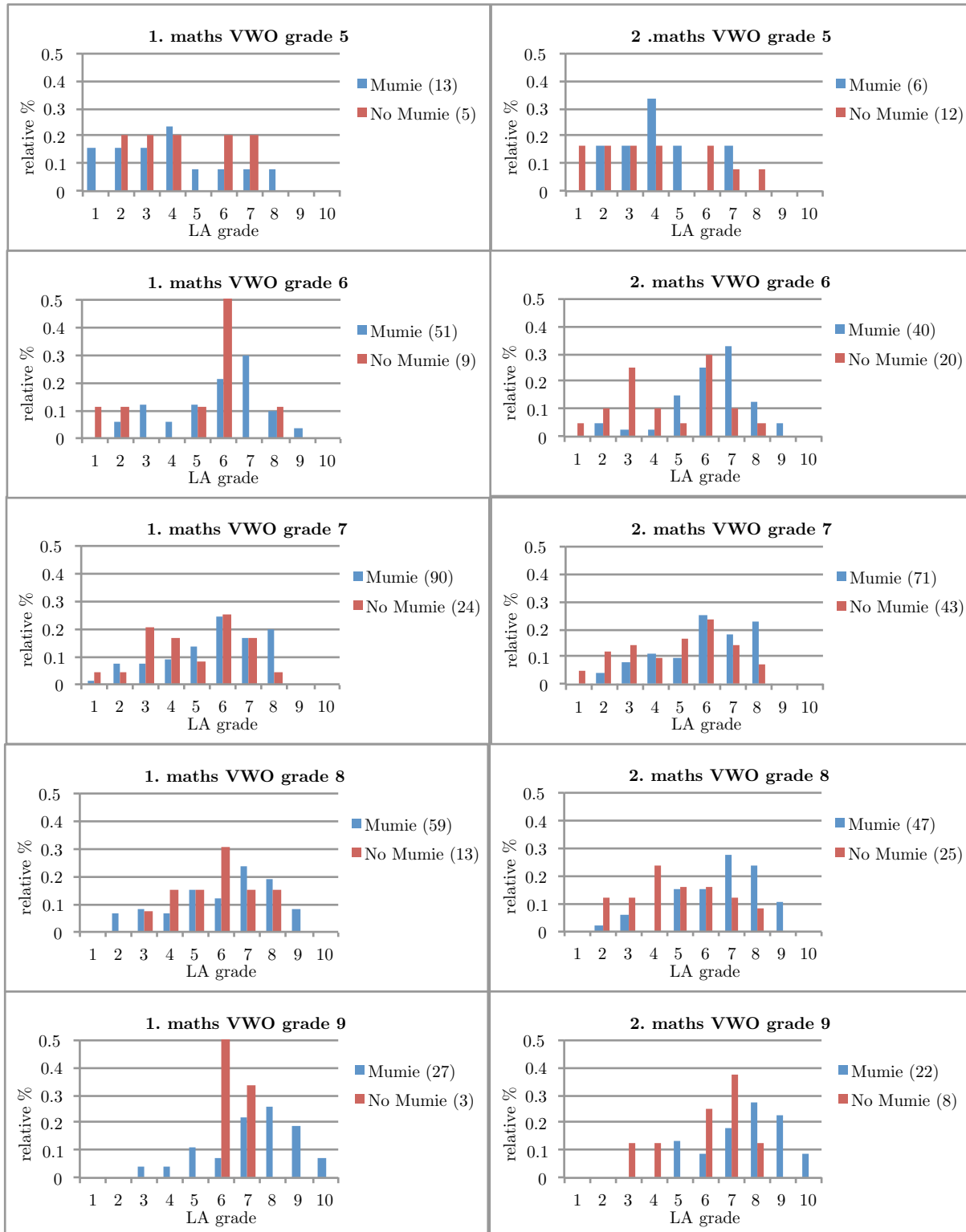


Figure 2: Comparing the VWO maths grade against the LA grades. Each group has been normalised. The grouping has been done similar to Figure 3. Note that in graph *1. maths VWO grade 6* and *1. maths VWO grade 9* the value has been cut. Calculation on the LA grades has been done on the actual exam grade where the bonuspoint has not been included.

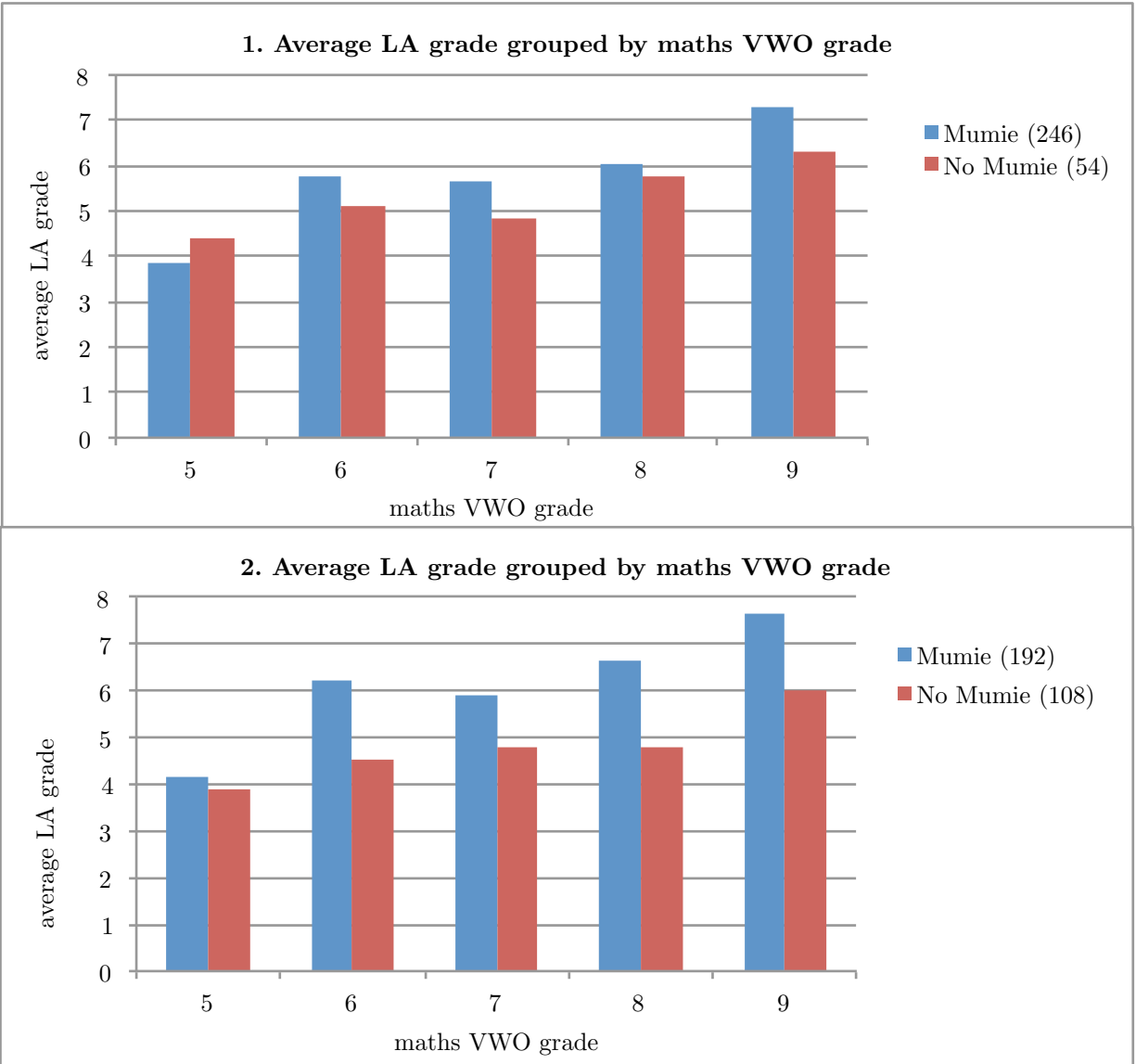


Figure 3: The average LA result compared to the VWO maths exam result. The group that participated in Mumie is defined as follows, for (1, the top graph) every student that registered for Mumie belongs to the *Mumie* group. For (2, the bottom graph) only the students that registered for Mumie and received 0.5 or more bonuspoint belong to the *Mumie* group. The number in brackets behind the labels indicate the amount of students in that group. Calculation on the LA grades has been done on the actual exam grade where the bonuspoint has not been included.

4 Conclusions and Future work

The main conclusions from using Mumie at the LA course will be presented in Section 4.1, followed by future work that has to be done in Section 4.2.

4.1 Conclusions

The most important outcome from the survey is that 82% of the students (strongly) recommends to use Mumie in the Linear Algebra course. From the analysis of the grades it can also be seen that participating in Mumie improves the LA grade, on average it can even mean the difference between a pass or a fail on the final LA exam for a large number of students. So in general it can be concluded that Mumie is a useful tool to be used at the LA course.

Of course, one should keep in mind that some students still prefer to learn from the book and there is nothing wrong with this. It is not the aim of Mumie to replace the current learning methods, but to give extra options for the student to learn the needed material. Also the way Mumie has been set-up can provide guidance for a student to keep on track with the material as presented in the study guide. This way the student will be more prepared when the time has come to learn for the exam.

Having said that, Mumie still has problems that have to be solved. The three problems the students indicate most frequently are;

- not clear what homework exercises are saved,
- workload problems with last timeframes,
- problems with the requirements.

Either these points have already been solved or can be easily solved by next year. Currently, TU Berlin is busy implementing an easier overview of completed and saved exercises, therefore solving the first mentioned problem. With the introduction of Mumie 3.0 which will be used for next years course, Mumie should be accessible with all major browsers, i.e. Firefox 3.6, Internet Explorer 9, Chrome 11, Safari 5 and Opera 11, solving the third mentioned problem. Finally the workload of the last timeframes can also be improved since all content is already available this year so a proper distribution can be set-up beforehand. This was not possible during the previous course since the content was still being developed while the course was running.

Finally it has been a disappointed that Mumie was barely used at the Computer Science program. Probably an important cause of this is that students are not motivated by the bonus point they could earn by using Mumie.

4.2 Future work

There is still quite some work that should be done to improve the Linear Algebra course in Mumie.

- There are 3 topics currently missing in the course: Least-Squares Problems, Symmetric matrices and Quadratic Forms. These topics should be added to the course for next year.
- With the introduction of Mumie 3.0 it is possible to display courses in different ways. Research should be done on what is the best way to visualise the course in order to improve the structure. Related to this problem of unclear structure, the documentation should be made up-to-date and improved.
- Apparently there is still some feedback displayed in German. A closer look at the applets should be made such that everything is in English.
- The input helper that was developed last year should be added to all applets. This way students have multiple ways of entering their solution, via keyboard and via the Applet. This resolves the problems that students have when entering their solution.
- The entire course should be walked through thoroughly in order to remove any inconsistencies, add lacking information and to get an idea how the workload can be better distributed.
- Exam-like questions, that have to be solved with pen and paper are available. If these are added at the end of each quarter in Mumie, the student will get an idea of the eventual level he should have acquired. Even though Mumie cannot correct these questions it would still be good to have everything in one place. Moreover, the student can check himself since answer sheets with explanations are also available.

Acknowledgments

The authors would like to thank Vincent Brugemann for providing details on the VWO maths grades of the students.

A Survey results

A.1 Multiple choice questions

Below you can find the multiple choice results of the survey. In total 331 students filled in the survey. The caption below every bar chart are the questions that were asked.

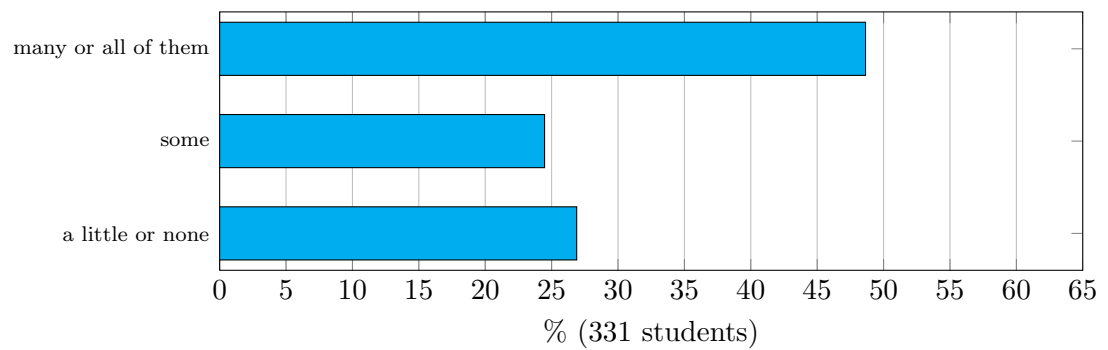


Figure 4: How often did you attend the classroom lectures for this course?

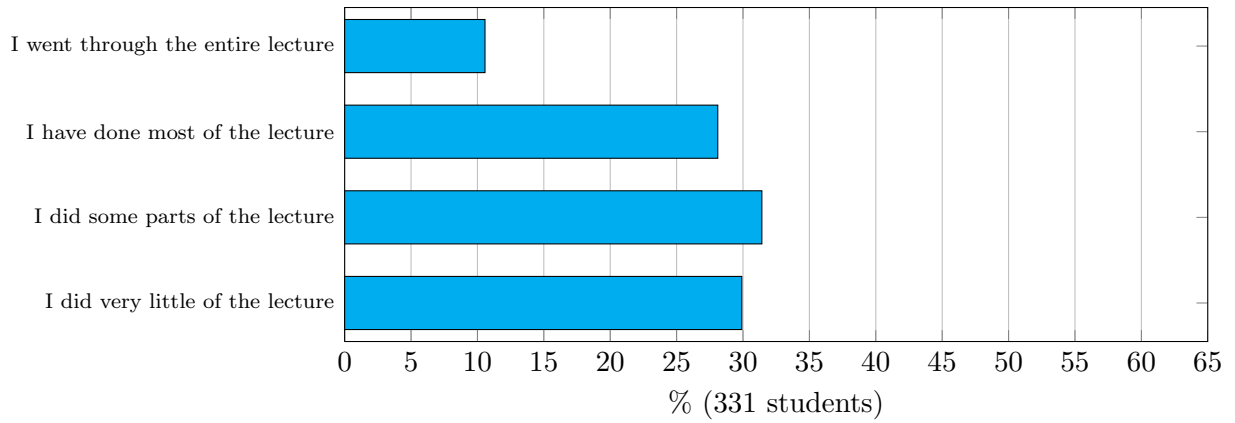


Figure 5: How extensively did you go through the Lecture part of Mumie?

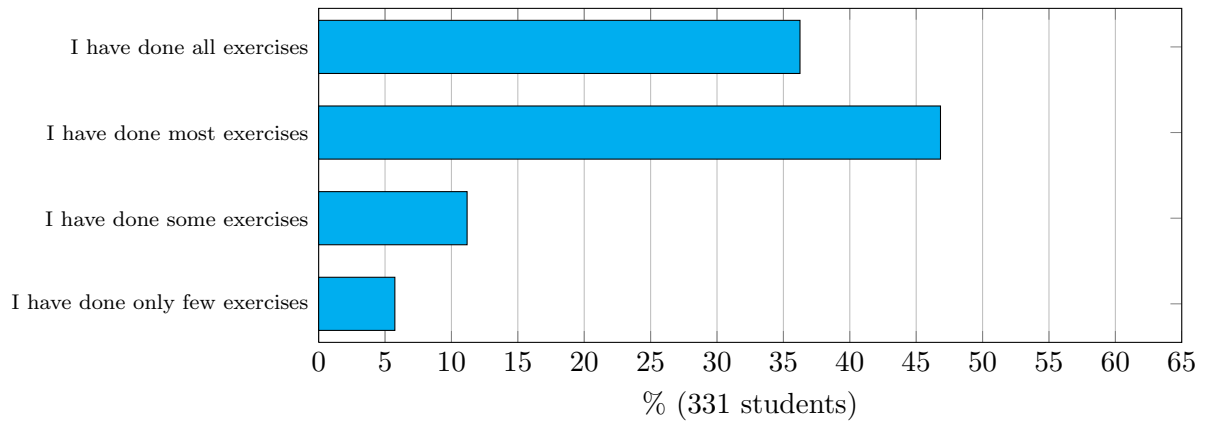


Figure 6: How extensively did you go through the Homework exercises of Mumie?

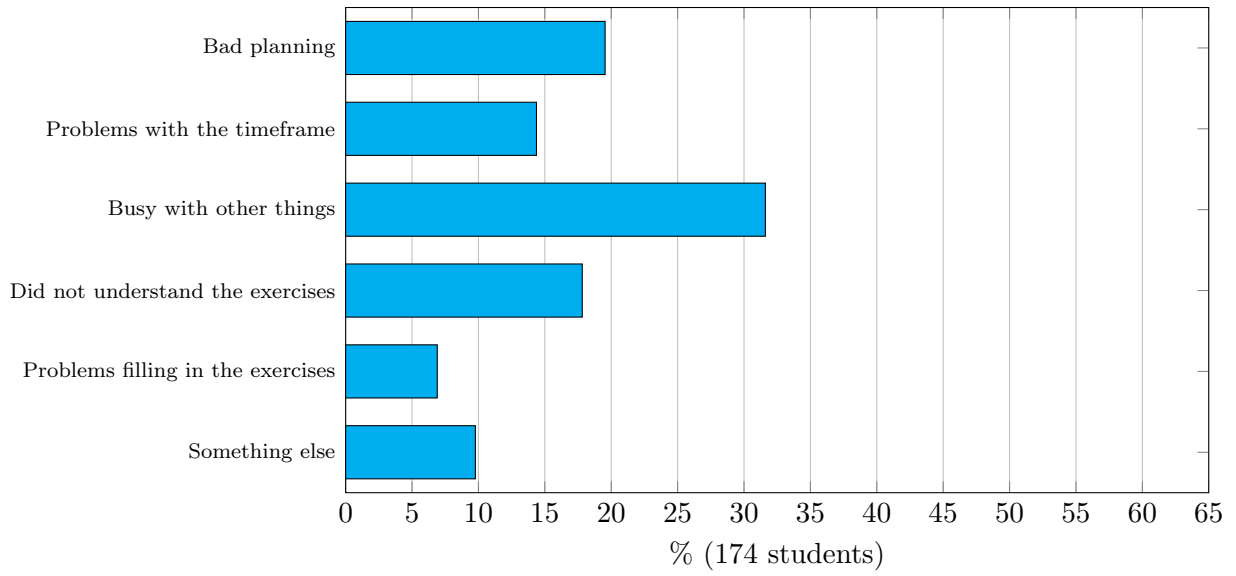


Figure 7: If you have only done few (or none) of the exercises please indicate the reason(s)

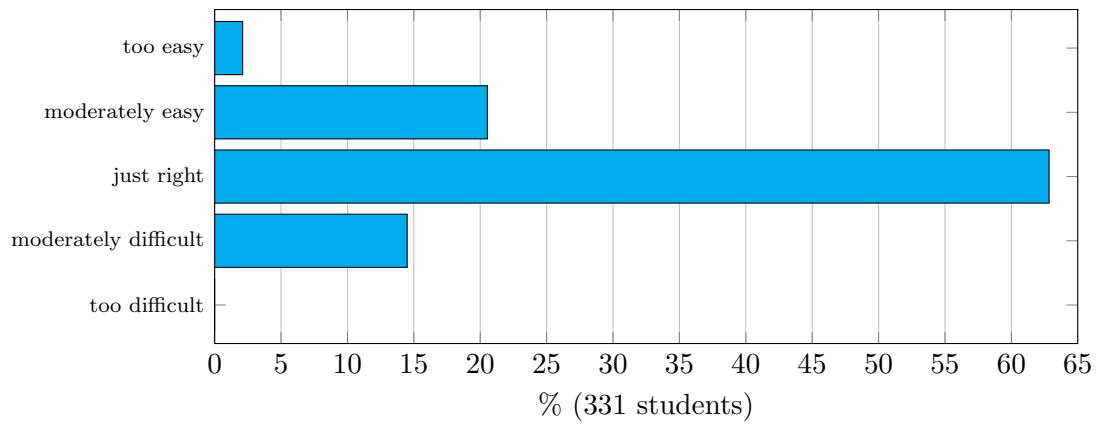


Figure 8: The difficulty of the applets in the Lecture part was?

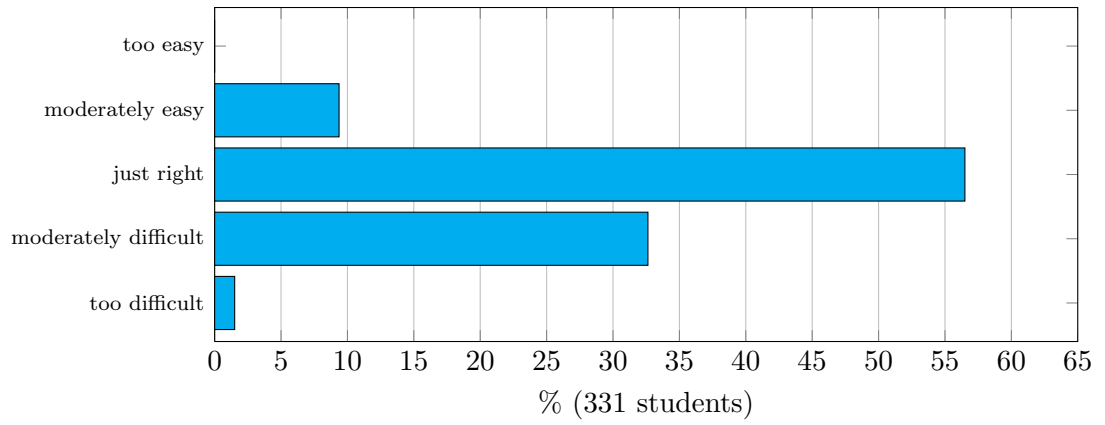


Figure 9: The difficulty of the Homework exercises to be sent in was?

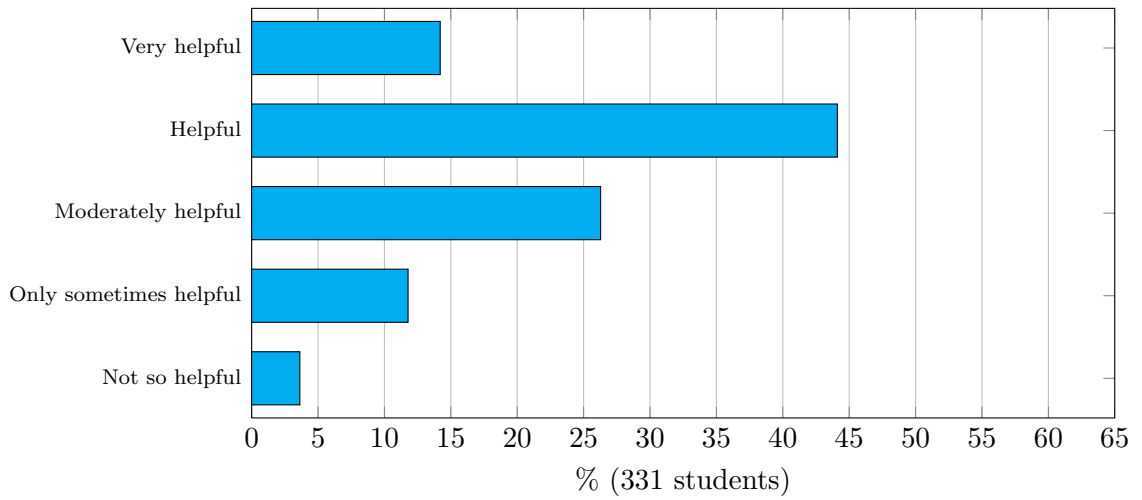


Figure 10: Did the applets help you to understand the course material?

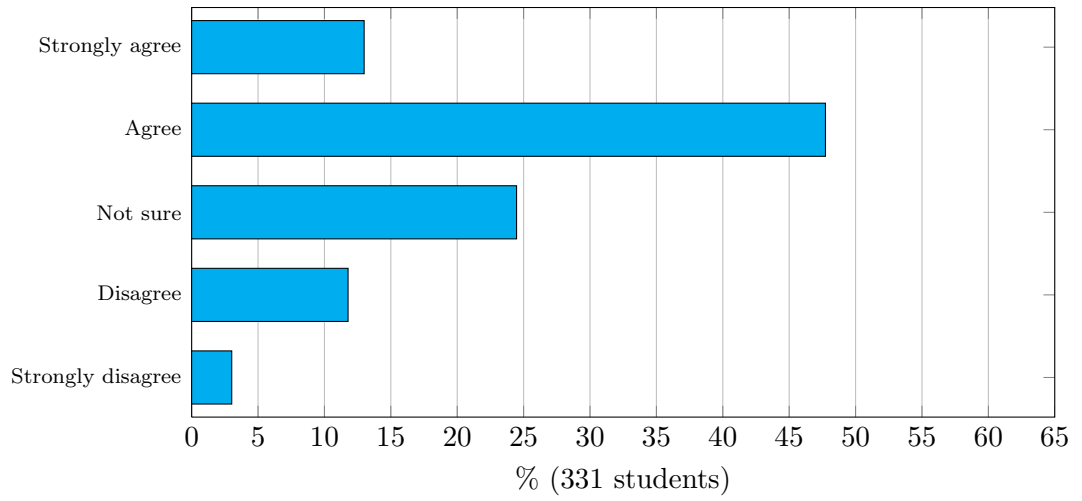


Figure 11: The applets motivated me to learn the course?

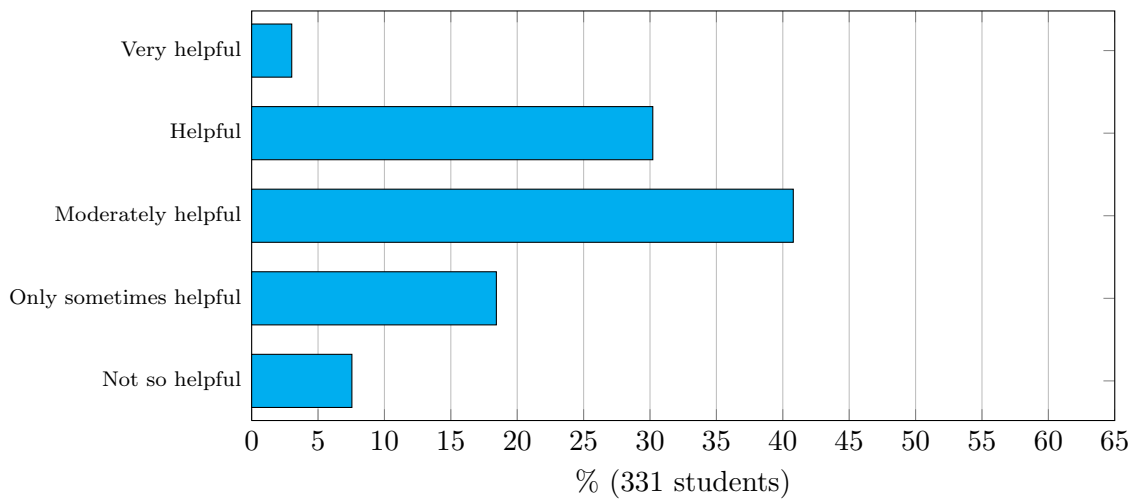


Figure 12: Did the Mumie program help you with the exercises in Lay as prescribed by the Study Guide?

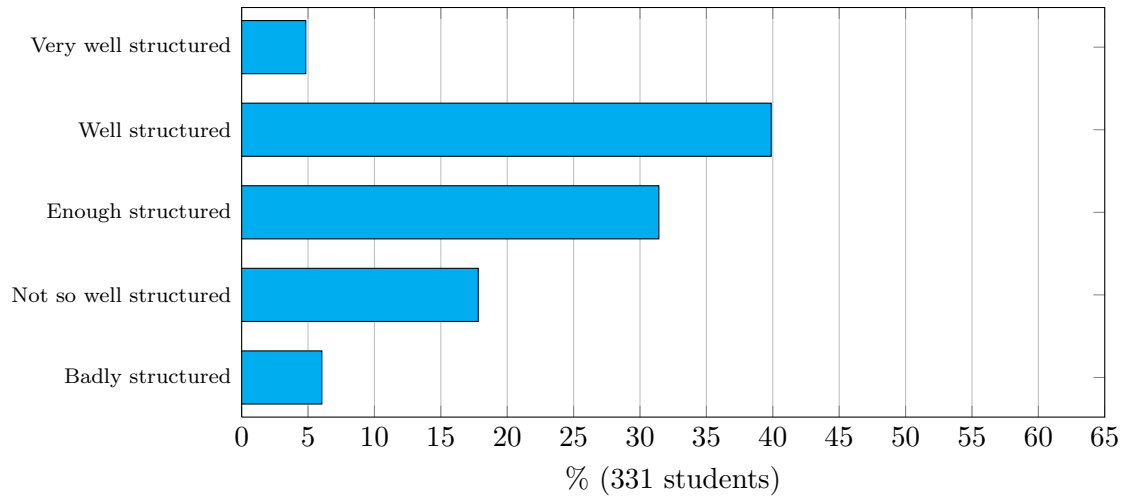


Figure 13: What do you think of the overall structure of the Mumie program?

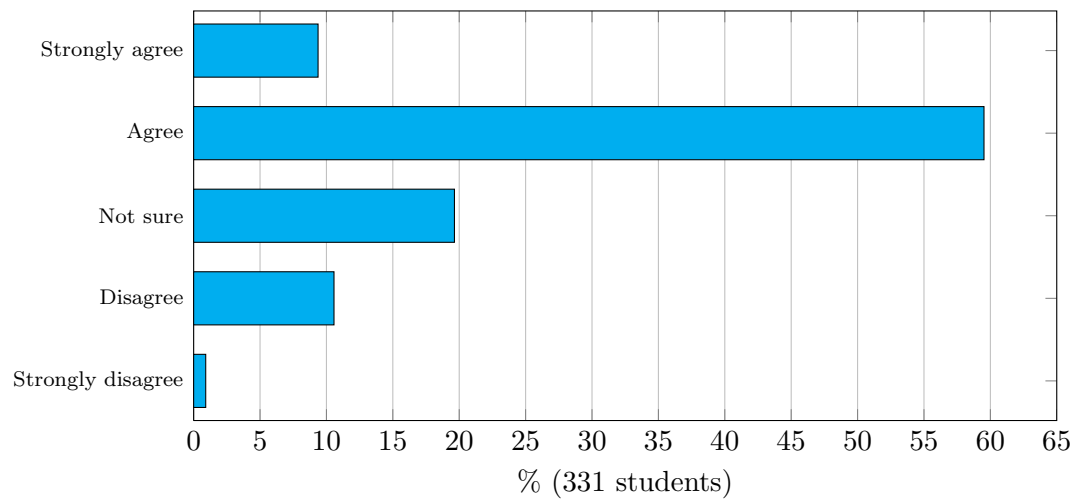


Figure 14: There was enough documentation to help me start with Mumie?

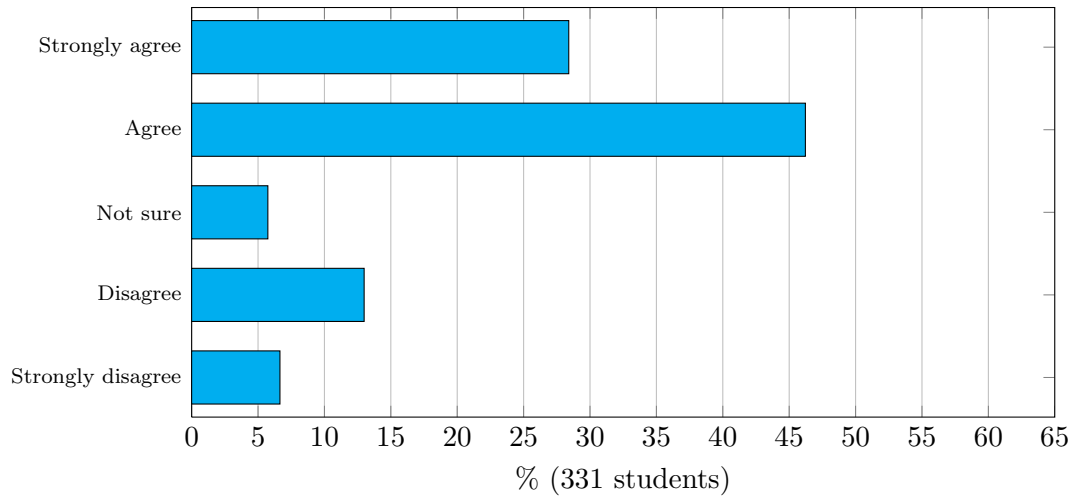


Figure 15: The requirements to use Mumie (i.e. Firefox and Java) were no problem for me?

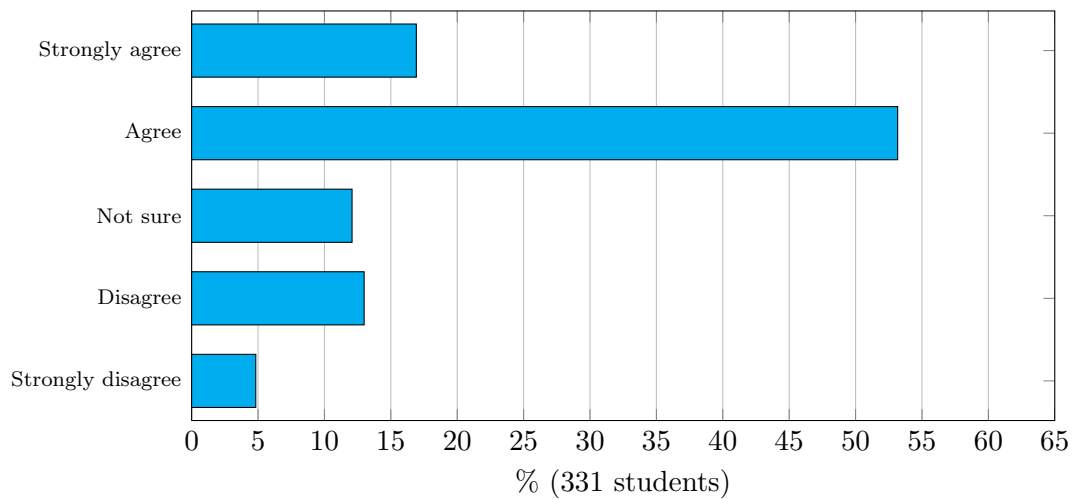


Figure 16: I had no problems with entering my solution in the applets?

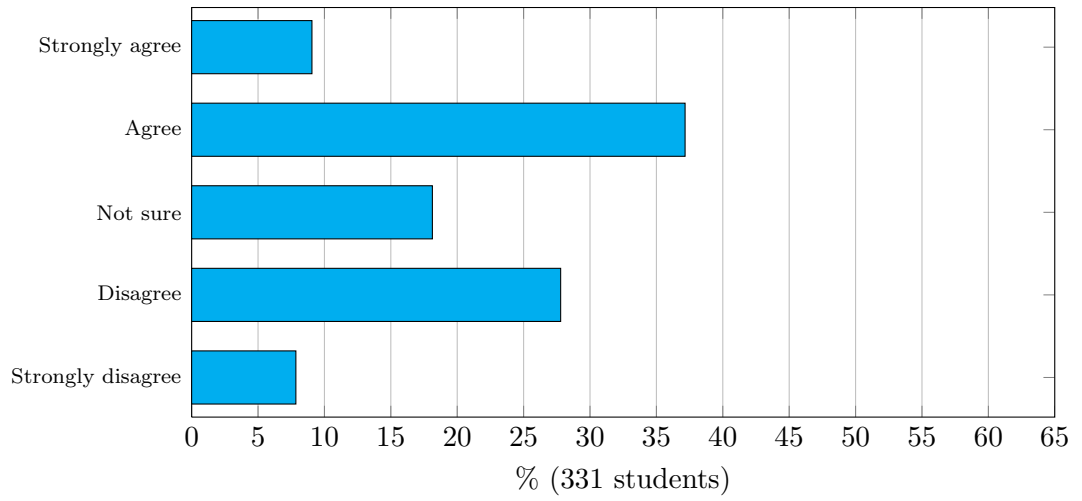


Figure 17: It was clear which Homework exercises I had done / saved?

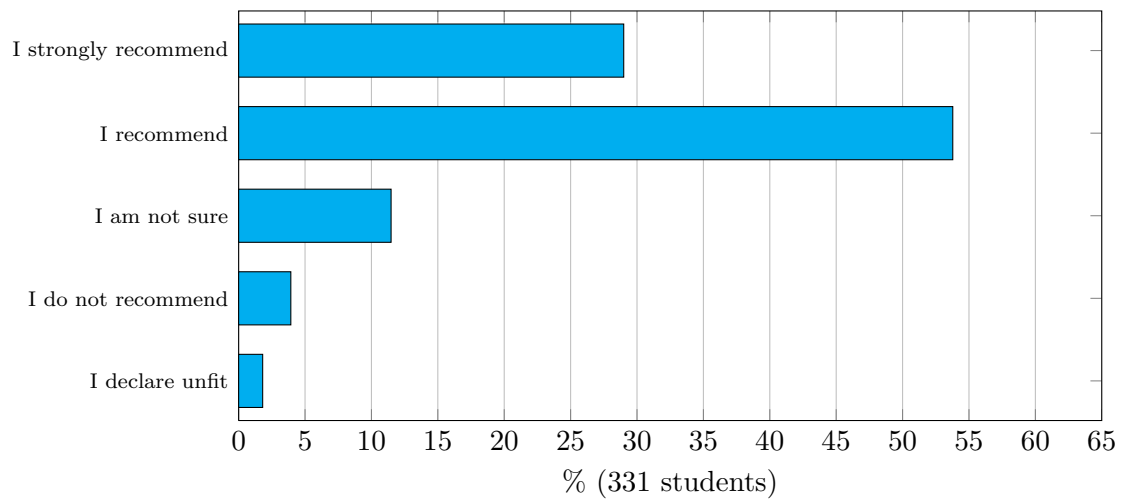


Figure 18: Do you recommend the Mumie program for the Linear Algebra course wi1403lr?

A.2 Categorized comments/remarks/suggestions

In order to make the comments the students made a bit more comprehensible they have already been categorised into groups. The result can be found below, the top row of the table indicates the categorisation type.

Bad translation to English (*10 entries*)

Mummy is usefull, but sometimes the text/question is translated very bad from german to english!
The applets sometimes had parts of the text in German although I had the language settings set to English which might be a problem for students who are not versed in German.
Some feedback on answers was in German language. It would be nice for next year to have it all in English!
Also the applet sometimes switches to german.
Lots of messages appear in German, for example.
German messages keep popping up at random
Sometimes Mumie shows a window with something written in German language and it is kind of confusing.
Sometimes Mumie did not work well. One time I tried filling in an answer and an error occured and it gave specifications of the errors in german, which was not really convenient at that time.
The english in the exercises was sometimes so bad that I didn't understand it.
1- Please write every thing in English not German(sometimes I got errors in German!!)

(Workload) problems with last timeframes (24 entries)

De laatste mummie vragen waren een stuk moeilijker dan vragen daarvoor. Bij de laatste paar vragen waren de voorbeelden ook vaak niet duidelijk en kon je ze niet gebruiken voor het oplossen van de som, dit was echter alleen bij de laatste van toepassing de voorbeelden daarvoor waren wel duidelijk.

The last set of exercises regarding eigenvectors and eigenvalues was way to difficult to be an MUMIE assignment. You should evenly spread the last exercises, or provide some which are less difficult, since I spend multiples hours on the last exercises.

The only exception has been the last part, which all of a sudden seemed to be much more difficult (constructing a matrix for a certain trajectory had never been discussed. In the end even this part proved doable however.

Block 1 was very easy. Questions like size of a matrix etc. are really not question-worthy,... but actually just basic knowledge. Block 2 required more effort and was therefore also bonuspoint-worthy.

De oefeningen van de laatste week waren veel moeilijker (en veel meer werk) dan degene van de weken ervoor.

It would also be nice to have every time the same workload. Now we had twice or even three times as much workload in the last week, so I couldn't start studying for the approaching examinations.

Maybe, the workload should be distributed. The last exercises, where in a week full of deadlines, plus this time a lot of calculations where required and therefore really hard to manage, whereas some mummie-exercises where doable in 10 minutes, without any preparation.

Also, the last exercise block was very large, with almost half of the points for the 2nd part.

Further the last part of the second block was a lot of work. Would have been better if this was split up in two parts and was not really the same level of difficulty with the rest of the MUMMIE parts.

in the beginning the homework exercises were (too) easy and in the end they were (too) difficult

Nearly all mummie excersizes where not very dificult and it was not extremely much work, and then all of a sudden the last part was much more complicated and there were many excersizes in it. I had quite a stressful week the last lecture week to finish al deadlines, encluding mummie. After all mummie was reopened this week, but i already finished it with a lot of stress last week. I was not very pleased by this.

the exercises become more difficult at the end, maybe you should keep the level of difficulty the same.

the last blok of exercises was far more work then the otherones.

The last four blocks of the program where very abstract to the point that our lectures had no real idea how to solve the problems. Thus the mummie exercises should be more in line with the actual material learnt in the classroom.

The first part of the MUMMIE exercises were very easy, but the last exercises I found very challenging. I think the difference in difficulty is too large.

(Workload) problems with last timeframes (continued)

The last assignment of MUMIE had a lot more questions than the previous assignments and the questions were a lot more difficult.

The first part was really easy, but the last part was much more difficult. In my opinion the exercises were much more difficult in the second quarter.

The level and required time were also not well distributed.

The first quarter questions were quite easy, the second quarter questions came in waves, especially the last 4 exercises took very much time. At the end of a period that's not a good idea because of other courses exams at the same time. Another advice: Open all the exercises from the start, and just close them separately. Much better for your own planning.

The last quarter was too much in one go, and too difficult.

The first period mumie was way too easy, the second part was more difficult. The second part was also not spread out enough.

The first mumie assignments were quite easy. The last mumie assignment, however, was a lot more difficult. But I learned more from the last mumie assignment, so I think that's a good thing.

Sometimes too much exercises

The first quarter was very easy compared to the last quarter. The last quarter taught me more about linear algebra.

Problems with the structure of Mumie (13 entries)

The tree showing the lectures and homework could be structured a little better.

Integrate the Java-applet in the website itself. The pop-up window it has now can be a nuisance.

A better explanation of the exercises while in the applet would be nice. Sometimes they ask some W1 or W2 and you dont know what to really fill in.(last week exercise of part 2)

The idea of mummie is very good, but the structure wasn't clear. I recommand to take a look at the COZ exercises of statics, because those had a very clear interface!

The mumie interface was very unclear. It could have been made a lot more simple if the menu's had had a clear layout. That was the biggest disadvantage of mumie.

The reset button in the applet is at the exact same location as the save/apply button in some Windows applications. This caused some confusion because I tended to automatically press the reset button once I was done, which meant that I thought I saved the exercises, while in reality I reset it.

It would also be nice if the tutorials would also be about the more advanced questions of the program, and not just the basic stuff that can be found in the book. It's a real pain when the tutorial teaches you how to do one thing and the question requires something completely different...

In the beginning it was very confusing to me where the exercises were in MUMIE, it would be an improvement if they could be found more easily.

put the reset button somewhere else, I sometimes tapped it while in mind I thought I hit the submit/save button.

Sometimes the connection between visualizations and mathematical work wasn't clear. I understand it's there to help grasp a theoretical concept, but it was never made immediately clear. Also, the fact that you'd have to click the question then enter the applet seemed a bit overcomplicated. The whole system was rather unintuitive, granted we all figured it out, but I believe the entire system could be constructed more efficiently. Selecting a specific problem had too much clicking, first here, then there, it was like you had to dig really deep to find something.

The structure of the site could be improved with better navigation to exercises and lectures ..

good course but the structure is a bit hazy...

sometimes training wasnt compareable with exercises

Problems with the timeframes (*11 entries*)

the deadlines were confusing.

Mummie is te vaak niet up to date met de leerstof waar we op dat moment bezig zijn, dit maakt het soms erg verwarrend. Het zou fijn zijn als deze dezelfde tijdlijn volgen

Also the mumie deadline in the witte week wasn't very welcome.

Closing the timeframe at 10AM is very unlogical, 11:59PM would make more sense. (Maybe on thursday?) Sometimes I had a hard time placing my cursor in the right place to fill in an answer.

It would be nice if the big parts weren't allways in the white week, this took a lot of time while i had to study other courses.

Furthermore, there was one deadline right before the holiday in february, which was worth 50% of the points for the second quarter. Due to a ski vacation I, and quite a few fellow students with me, missed this deadline, instantly losing us the half point for this quarter.

The sessions closed at 10 o'clock in the morning, I think it's better if you let it close at midnight.

Please be more precise in the communication of the deadline of the exercise blocks. The dates on BlackBoard were very often not the same as in the scheme of Mumie.

Also when I started I thought only question 1 was for the deadline, it appeared that also 2 and 3 ended after the first deadline.

It would also be nice if there were more Mumie deadlines, and fewer exercises per deadline. For example, every week.

Please, for the next year, do not put 4 assignments for the last two weeks of the third quarter. I think a lot of people failed mummie because of these four assignments

Not clear what homework exercises are saved (30 entries)

Also an overview of finished and not-finished homework would be helpful.

In the results tab, it says n.c. if you only have opened it. You don't know if you completed the question.

I would recommend some kind of mark for problems that you have already saved, now you can check this through clicking on the problem and see if you have already filled in something.

It would be handy if you were able to see which exercises you already made/saved, else you have to check every time where you are.

My suggestion is that it should be visible in the main tree to see if a part is completely done, that is, to see if all the problems are edited

It would be helpful to have an overview of how much of the homework has already been edited or a symbol for each subtask that says if something has been edited or not. This way, students can be sure they did not forget any of the subtasks.

Sometimes the applet can be a bit unclear about saving, not always clear if it is actually saved.

When I saved an applet, this was not good to see when I came back an other time. So sometimes I had to check if I already had done that exercise.

And an indicator for saved exerises would be helpful, as mumie didn't properly safe my answer in an exercise, such that I didn't score a proper grade in that exercise.

It was not clear which assignments i had saved and which not.

Zien of de opgaves daadwerkelijk zijn opgeslagen zou handig zijn.

would be helpful if there is a indication next to the exercise, saying: saved or not saved/not done yet

I would be nice to have a overview of your answered questions, so you can see if you forget some exercises.

Saving an exercise didn't always work correctly the first time round, causing me to have to enter an exercise multiple times.

The exercises done were all rather easy up until the last deadline, where the difficulty slope took a harsh increase.

A clear way to see which exercises have been saved and which still need to be done.

However, my biggest complaint is the non-existent overview of submitted solutions. You can go to the results page, but that will n.c. (not corrected) on any exercise that's been partially made. So, there's no clear overview telling me whether or not I did finish all exercises. I think this actually dropped my score on the first two mumie blocks.

sometimes the answers dissapeard,

With regards to saving the assignment, it would be very helpful if it just showed right away that an exercise was saved/completed. Now you have to go to results to see if you edited a question and that will also show as edited if you have done only part a of a question and not b/c/d etc.

Sometimes it doesn't recognize it when you click to save your answer.

You've got absolutely no clue which questions you already completed and which ones you didn't,

Maybe it's a good idea to give a survey of you answers to check them all at ones.

It is not clear on the homepage which of the open exercises are filled in and which are not.

Not clear what homework exercises are saved (continued)

2. It might be handy to see if subquestions are saved. Now only the main question is shown, which leaves it unclear if all the subquestions are saved correctly.

Also it was not always clear my assignment was saved correctly, this resulted in not edited results what was sometimes pretty frustrating.

It is very inconvenient that you can not see which excersised you already completed. It would be nice if, at the end of my homework, I could look at an overview to make sure that I submitted everything

Never sure if I saved an exercise or not...

a better lay-out showing with exercises you already did and with one you still have to do.

A suggestion is a way to see which questions you have saved

Would be nice if the answers auto-saved when the applet was closed.

More feedback wanted in Applets (*4 entries*)

More feedback in the Training part would be very useful.

And many times the Check button didn't work (in the practise mode). When I clicked on it, he did nothing.

Another drawback is that you don't know what you did wrong in the exercises you have made, so you cannot reflect on your own work.

Only looking at an answer is not enough in complex problems. When solving a problem, it is common to do several steps in order to get to the result. When there is an error in these steps and you fill in the answer, you will get no points. This not only destroys your confidence, it also gives you no feed back at all on why it is false. I understand that building in a feature that checks for each possible error (made in calculations) is impossible, therefore I strongly suggest to not use such a system in present shape any more. Humans are better in checking work...

Problems with the requirements (20 entries)

Using firefox for the mummy program is quite hindering.

It would be handy if you can do mumie with other internet browsers.

Maybe it is helpfull that your able to run Mumie with other websbrowsers like internet Explorer or Google chrome

Make it compatible with more webbrowser, not just firefox.

Also, i had to youse firefox to view the problems, and chrome to complete the applets. The applets wouldnt work in firefox, even if other java applets work fine, and the questions wouldnt render right in chrome.

It would also be nice, but not really necessary, to support other browsers like google chrome.

Let Mummie compatible with Google Chrome and/or Internet Explorer.

Finally, as a freelance web designer/developer myself, browser-incompatibility is something of the past decade, not something that users should have to worry about when using such an application in this time of day.

The fact that use of FireFox is necessary is quite annoying, should you somehow be able to have it work in other browsers (especially Google Chrome, since that is what pretty much everyone at the TU Delft uses these days), that would be a great improvement.

Support for other browsers would be nice. IE since it has the largest market share of all the browsers and google chrome because at least 50% of the students at TU Delft seems to use it...

that it only works with firefox isn't very user-friendly.

Make Mumie compatible with Internet Explore or better yet, Google Chrome

I has got a problem with Mumie. I've Download Firefox, i've download the plug-in but it wouldn't work. I've ask at some people but they couldn't help me. So I hope that it will be possible to give them back by hand on paper.

I HATE the fact that mumie uses Java. It is very unreliable. Sometimes when i saved my answers, they weren't actually saved and i found out AFTER the answers were graded.

I use Google Chrome all the time on my mac. I did not like the fact that I had to download and install Firefox just to be able to do the mumie exercises.

1. It would be nice if Mumie could also work with Safari. Every time I started up Mumie, I first had to download firefox again. (I wasn't the only one with a macbook and this problem.)

In the future, make it compatible with other browsers.

Also the firefox requirement is not correct, on a mac with firefox the sites are not well displayed. It should be have a windows requirement too.

The only minus I can mention is the fact that the mumie only works for fire-fox. For people using chrome that means that fire fox needs to be installed, which is not too favourable, as it is quite annoying installing fire fox only for that one purpose. Otherwise it is a very good programme!!!

It would be nice if MUMIE also worked in other browsers, e.g. Google Chrome, or simply all of them, since chrome for example can also load java

Problems with input in Applets (*10 entries*)

Also filling in my solution in the applets was a problem (sometimes)

Normally entering a solution in Mummie was not a problem. But sometimes it was very hard to find out how to fill in some solutions.

Meer duidelijkheid hoe je precies waarden invult

Sometimes the applets took as wrong solutions that had a different fraction as an answer, but the result of the fraction was the same as the correct fraction result. Mummie has trouble with identifying the same answer written in different ways.

The only comment that I have is that some exercises were difficult to enter the solution. For some of the questions I knew the answer, but I didn't know how to enter the solution.

soms vallen bij de invuloefening de tekens weg. Dan is er bijvoorbeeld geen lambda teken meer en dan moet je het zelf schrijven wat lastig is omdat mummie het maar op 1 manier herkent.

there were some errors in exercises, and programming e.g. -0 or round off errors which were quite annoying.

Only problems at the beginning to find out how to fill in the solutions,

It was not clear which way to fill in answers (like a basis etc.).

Also, negative 0 values occur sometimes

Demo part inconsistent/not sufficient in regards to the exercise (5 entries)

Sometimes the information given was not enough to understand the exercises (on the last deadline for instance). A few lines of extra information would be helpful. I don't want to go through 100 pages of linear to find the correct way to solve a question.

Not all the demo exercises were consistent with the to do exercises. That made it hard sometimes to understand the exercises because I learn by studying examples.

Mumie sometimes wasn't clear, as in showing how to calculate something, but not explaining how to do the calculation step by step. For instance, the explanation didn't show how the eigenvector was calculated. It just said that ... was the eigenvector, and continued with the calculation. It has never been clear to me how to calculate certain things, like P or the eigenvector. Furthermore, I do know how to solve problems, but once I get a question, I don't know what I need to do. I did all the exercises in the beginning, and always needed to look up the beginning of the answer, just to know what they wanted. To me it wasn't clear. I am practicing old exams now, and with 2/3 of the questions I don't know what I need to do, until I see the very first step of the solution. I never encountered these problems with Mumie, since it already had the global solution, only to be filled in by me. I passed Mumie without help from others, which means that I do get Linear Algebra (or Mumie), but don't get the questions. Conclusion: Mumie learned me how to solve certain questions, but never learned me how to solve what kind of question

sometimes the demo part of an exercise isn't entirely clear.

sometimes there was too few theory to help with questions.

Logged out to quickly from Mumie (*3 entries*)

Sometimes when I had to do a difficult calculation, MUMIE automatically logged out because the time was over. So I had to login again before submitting my answer.

you're logged off way to quick.

The fact that your connection timed out was also annoying, you'd work on a problem for a long time, then you'd submit only to find out that you had been logged out.

Some weak/strange exercises (6 entries)

The last exercises were a bit weird

Sometimes the questions asked on mumie differed to much(in special the last weeks) from what we had actually learned in the lectures

The exercises should be more related to the material given in class, because some of the exercises were quite weird, specially the last ones.

Some exercises were vague (especially in the last part with symmetric matrices) you can use some examples which look more like the exercises.

2- Some of questions were so weak, for example in one of them there were 4 Yes/No question, it was like this: 1) Dimension of the Col of A is 1, 2)Dimension of the Col of A is 2 and etc. but this question could be as one multiple question not 4 Yes/No questions. And some other questions like this. 3- And some of the were not clear. By all these problems, it is a useful method to follow course during lectures.

Inconsistencies were present between applets and the questions as they were wwritten on the question page. For example, variables changin, in one case from S in the question to D in the applet.

Various (29 entries)

just make it a little bit more comprehensible

It was a little bit unclear which exercise was selected

More time at the begin of the course with more information/example of mummie

accountsettings should be able to be modified: change of password and username e.g.: I entered my netid instead of studynumber as username and could not change this

More connection with the classroom lectures would've been appreciated by me. That would probably have reminded me of and motivated me for mumie more. For example, something similar was used with the Statics course (COZ), and there I was much more involved with it. But I have to say it also was bad planning on my side.

Mumie could very well be quite a powerful tool for studying. However, the way it was carried out this year, it leaves a lot to wish for. Explanations, definitions, theorems, all proved to be quite ambiguous or hard to understand. I had to constantly access different learning sites which had a clearer explanation of the topic (visit the linear algebra playlist at www.khanacademy.org to see how easy and engaging it can be).

Sometimes the applets didn't load correctly.

I would recommend to make the applet exercises more similar to the exam problems

It might be a good idea to create Mumie exercises that are more 'exam-like'. Because the questions that were now in Mumie, although very helpful in the learning process are not directly the questions that are asked every year on the exam. Another detail is that people that have successfully finished Mumie, may still fail for their exam because they didn't know what they did on Mumie. It is namely possible to do they exercises by only looking at what is done in the examples given with the assignment.

Also, when you have two or more applets opened at the same time (for instance, an exercise and a lecture demo), the input fields of the applets stop working properly: no matter what you write, it will revert back to the original values that were in the field. Maybe this only happened since I installed Firefox 4.

Furthermore, while the Java-environment might have some advantages (with respect to the matrix-algebra part, and checking the answers), waiting for the applets to load is annoying.

make it a little bit more difficult, especially the exercises with the calculation of reducing a matrix to echelon form.

The options and possibilities of Mumie should be pointed out more clearly in the lectures of the course. A better interconnection between course and Mumie (e.g. solving some applet problems in class or learning by its Lecture Part) might be beneficial (so to say: less book (very non-illustrating Theorem-learning), more Mumie (illustrative))

Sometimes in Mumie there were exercises which was not treated in the lectures/book.

It would be nicer to directly see if you answered a question right. The questions could also be a bit harder that way

It was unclear if (after finishing an exercise) I did it right or wrong. So I did not know if I was doing the right thing. Sometimes I didn't know if I understood the materials or not.

Various (continued)

The major benefit of Mumie (and any kind of mandatory exercises), is that it stimulates you to make your homework and keep up with the learning material by giving bonus points for your exam. The bonus point was the main reason to do the Mumie exercises correctly and on time.

Also there was no link with the lectures. It was mentioned in the beginning but it would be helpful if the instructor could mention deadlines and say about which topics the next mumie exercise is. Also the topics were out of sync at the end by about two weeks.

I don't like MUMIE at all. It was really unclear what to do, when to do it, where to fill stuff in and whether you had already done assignments or not. Also, I was informed that you had to have a minimum of 40 percent right every single time. Because of the horrible user interface of Mumie I had less than 40 percent and thought Mumie would have no use for me anymore. The first assignments were really easy so I do not believe I made that many mistakes. I believe I am not the only one who did not like the Mumie program. Also, our teacher did not know anything about it and was thus unable to answer most of our questions about Mumie.

MUMMIE IS KIND OF USELESS, I WOULD CERTAINLY PREFER A TEST AFTER THE FIRST QUARTER IN ORDER TO MAKE STUDENTS REVISE THE MATERIAL AND GIVE THEM A FAIR CHANCE TO EARN THE BONUS MARK. JUST LIKE IT IS BEING DONE IN CALCULUS I AND II COURSES. TEACHER IS VERY HELPFUL AND EXTREMELY GOOD IN EXPLAINING THE MATERIAL, BUT HE SPENDS A LOT OF TIME REPEATING THE SAME THING OVER AND OVER AND OVER AGAIN WHICH WASTES A LOT OF TIME AND BORED ME (AND A LOT OF OTHER STUDENTS) OUT OF HIS CLASSES FOR THE ENTIRE QUARTER. ALSO ENTERING THEORY MATERIAL IN MATHEMATICS IS KIND OF ODD, AS THROUGHOUT MY SCHOOLING MATH WAS MATH, MAINLY CALCULATIONS AND SOLVING PRACTICAL PROBLEMS, NOT MEMORIZING THEOREMS AND RULES.

Sometimes it is a little bit too easy to complete the exercises because people can use the linear algebra toolkit from the internet.

Only a few of the exercises were really helpful. I learned way much more in the classroom lectures (and I've been to all of them except one). The questions weren't always clear and there were some technical problems. In general, the explanation in Mumie was from a different perspective than the book and the classroom lectures, which made the questions hard to understand.

Ask the designers of the COZ program Statics for advice, their lay-out and user friendliness is way more better than MUMIE's.

The idea is good but the program itself is very bad. The interface is all wrong so I recommend using another program next year. But the idea of COZ exercises is good.

It might be nicer to not have the tasks in a root way, but like a list of text immediately showing which exercise is which.

Multiple demos would be better than the usual single example.

It would be better to use the same program as is used for Statics

I didn't understand many questions, this made it sometimes very difficult to make Mumie. You only get points from the answer, and not the calculation. If there is a small mistake in the calculation, you get zero points. That's hard.

More training exercises/examples would be nice

Positive remarks (29 entries)

In general, I have a very good opinion about MUMIE and strongly recommend it to others.

Overall Mumie has been a very good program to use. Though relatively easy compared to exercises in Lay, Mumie offered a good step-up to the real problems in Lay.

I am a second year student so I did not attend any of the lectures, I found out about mumie through others. I am sure it is an improvement to the course, if we had this in my first year I would probably have passed the course. Not only due to the bonus point but also due to the motivation to study weekly.

Otherwise I really liked Mumie!

Mumie is een heel interessante tool om bezig te blijven met de stof. Zonder Mumie zou dit waarschijnlijk veel minder het geval zijn...

I think that this program was very useful because it did not let the students fall behind. When there was homework due, the material had to be read and understood in order to fill in the answers to the exercises. Now, that I am reviewing for the exam, i don't have too many things that are hard for me.

Very helpful tool to train your Algebra skills.

Furthermore was Mumie a good motivator to actually do Linear Algebra.

overall mumie was very helpfull.

For the rest it was very helpful! :)

All in all, it's possible to improve the state in which mumie is right now, because even though it wasn't half as useful for us this year, it can be invaluable for students in the following years.

Just to be clear: I think Mumie is a useful tool to study linear algebra, and the mandatory character fits me well.

For me, the main purpose of Mumie was giving me a reason to keep up with the study planner provided via Blackboard.

Very well structured online application which couldn't be stopped. Handy to make exercises. I almost never make exercises and with mummie I was "forced" to do so, and it was very very good, it helped me understanding the course!

On the whole I can however say that Mumie has had a positive influence on my learning curve! So I would definitely recommend the Mumie program for the Linear Algebra Course of next year.

Thank you for this opportunity!

To conclude on a more positive note: as mentioned above, the program helped me keep up with the lecture material and, in that sense, was a success.

IS is motivating because you want the bonus point, then you want to know for sure that you enter in the right answers, then you first try excercises in the book and before you know it you start to really understand Linear Algebra, especially in the end when the subject becomes more build-up, and after filling in the last piece of mumie you are wel prepared for the last learning session for the exam

They should use a system like this with more courses!

Mumie was very helpful in understanding linear algebra and of course the bonus point keeps you motivated.

Positive remarks (continued)

But the program really helped me with understanding the theory and how to solve the exercises with examples. Very usefull!!

An extra bonuspoint always motivates a student to keep up with the lectures, even when he doesn't attend each one of them physically

Good way to learn this course and makes sure that you keep doing something the whole period. The steps example → training → exercise are very helpful!

Mumie is one of the greatest ways in which a computer program can help a student learn a course that I have experienced. All the different concepts of the course are explained clearly step-by-step and constantly tested with exercises to make sure they are properly understood.

I would recommend the mumie program for the linear algebra course, because this is a good way if stimulating students to regularly do excersises and thus become skilled with the topics. But... The mumie program as it is, is probably to easy to really learn a lot from it, so increasing the level off difficulty would be recommend.

I did like the Demo-Training-Exercise system.

Overall it is a good program and should stay in this course.

Mumie is a very useful program which broadens my understanding about linear algebra and I really recommend it to be used in next generations.

This is an effective manner to keep the students focussed on the course.

References

- [1] Integral Learning. MUMIE - Online Math Education, July 2011. "<http://www.mumie.net>".
- [2] Robert van Kints. Documents relevant to MUMIE, May 2010. "<https://www.mumie.net/wiki/doku.php?id=tud:documents:index>".