

DELFT UNIVERSITY OF TECHNOLOGY

REPORT 12-13

EVALUATION MUMIE - ONLINE MATH EDUCATION
AEROSPACE ENGINEERING AND COMPUTER SCIENCE 2011-2012

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ISSN 1389-6520

Reports of the Delft Institute of Applied Mathematics

Delft 2012

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1 Introduction

This report gives an overview of the development and experiences of using MUMIE [3] at TU Delft during the academic year 2011-2012. After the success of the pilot in 2009-2010 at the Linear Algebra (LA) course for Aerospace Engineering (AE) [4], development continued to cover the entire contents of the course in 2010-2011, also with good results [5].

The main focus of the academic year 2011-2012 have been the following points, which are based on the conclusions from last years report:

- Solve the main problems students experience when working with MUMIE.
- Add contents for sections that are still not covered in the MUMIE course.
- Remove inconsistencies that are still present in the current MUMIE course.
- Add exercises to MUMIE that are comparable to exam questions so students get a better idea of what is expected from them.
- Extend the usage of MUMIE to the LA course for Computer Science (CS).

More information about the points mentioned above can be found in Section 2. This is followed by a summary of the feedback from the students who used MUMIE, together with the results from the corresponding LA exam in Section 3. Section 4 and 5 contain the conclusions that can be drawn from results and feedback given by the students together with a summary of points that should be addressed in future work.

2 Further development of MUMIE at TU Delft

This section will give an outline of the further development of MUMIE for the LA course for 2011-2012. In Section 2.1 the changes that have been introduced in MUMIE 3.0 will be discussed. Section 2.2 presents the improvements to the existing course. In Section 2.3 details about the integration of MUMIE in the CS programme will be presented and finally in Section 2.4 the submission of the EU proposal will be covered.

2.1 The arrival of MUMIE 3.0

In June 2011 version 3.0 of MUMIE got released. Most of the changes are aimed at the developers and meant to improve the internal structure of MUMIE in order to make the creation of courses more flexible and logical. With the release of MUMIE 3.0 there also came an updated version of the authoring tool MIAU [2] to accommodate the changes.

For the students the biggest advantage of the new version is that MUMIE is now compatible with all the major browser distributions (Chrome, Firefox, Internet Explorer, Safari and Opera). This is a feature that has been requested by a lot of students in the previous years but due to technical difficulties could not be implemented until now.

2.2 Improving the existing MUMIE course

There are still numerous points on which the current MUMIE course can be improved. Besides the browser compatibility complaint, students also had difficulty keeping track of which homework exercises they had completed / saved and which not. Up until last year the only way to find out which exercises had been saved, was to visit each exercise and load the corresponding applet. To solve this problem a progress indicator was added for every exercise, which makes it possible to view the progress of completed exercises without having load the exercise itself. Additionally, when an exercise is selected, a check-box is provided at the side of every subtask indicating whether a solution is saved or not. With this new feature, the student has a much better overview of exercises that have been saved.

2.3 Integrating MUMIE in the Computer Science programme

Because of the good results that were obtained from using MUMIE at the AE programme it has been decided to also integrate MUMIE in the LA course for CS. Since there is a large overlap in the topics discussed in AE and CS, most of the contents from AE could be used in CS with minimal modifications. Only in the second part of the course, some topics that are covered in AE are not covered in CS, and vice versa. The following list of topics is covered in the CS course but still not available in MUMIE:

- Complex eigenvalues
- Discrete dynamical systems

- Markov chains

The content that was still missing has been left out of the MUMIE course. More work has to be done to implement the sections in MUMIE that are still missing in the CS course.

The organisation around MUMIE has been set-up in a similar way, as done for AE. The biggest difference being, that course consists out of two parts. Where the first part is given in the third quarter and the second part in the fourth quarter, each with a different exam. Half a bonus point could be earned for each part as long as 70% of the homework exercises in MUMIE had successfully been completed.

2.4 The EU proposal

To extend the usage of MUMIE for mathematical courses, a collaboration between TU Berlin, KTH Stockholm, Aalto University and Integral Learning has been set-up. In November 2011, TU Delft organised a meeting for all partners in order to investigate the possibilities to collaborate and make a proposal for EU funding (ERASMUS, multilateral projects Lifelong learning and / or KA3 ICT multilateral project) to finance this collaboration [1].

Together they submitted an EU proposal for the development of bridging courses between the bachelor and master programmes, this proposal can be downloaded from the reference mentioned above. On acceptance of the proposal, funding will be provided to the collaborating parties for the development of the bridging courses. The proposal was submitted in February 2012, after which it was accepted in July 2012 with high marks (again the results can be found in the reference mentioned above). To start the collaboration, a kick-off meeting has been organised at the end of October 2012 in order to discuss the work that has to be done and set-up the roadmap for the next two years.

3 Feedback and results of using MUMIE

In this section the feedback and results from using MUMIE will be presented. In Section 3.1 a summary of the questionnaire feedback given by the AE students will be given together with a comparison from last years survey. Because the questionnaire was not handed out at the end of the CS course there is no feedback available from the CS students. Section 3.2 covers the analysis of the exam grades, comparing the students who participated in MUMIE with students who did not participate. This section covers the exam grades for both AE and CS.

3.1 Feedback from AE students using MUMIE

At the end of the Linear Algebra course for AE, students had to fill in a survey regarding the usage of MUMIE. Through this survey it is possible for the developers to see how the students experience the usage of MUMIE as an addition to the course. The survey consists of 16 pre-defined multiple choice questions, with an opportunity to leave feedback at the end the survey. The results of the

multiple choice questions can be found in Section 3.1.1 and the results from the feedback can be found in Section 3.1.2. In total there were 228 AE students who filled in the survey.

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 (31%)
 - Bad planning (18%)
 - Did not understand the exercise(s) (17%)
 - Problems filling in the exercise(s) (11%)
 - Problems with the timeframe(s) (9%)
- 60% of the students thought the difficulty of the applets in the lecture part were just right. Another 26% thought these applets were moderately easy. These applets consist of demo and training exercises in order to help the student understand certain concepts.
- 54% of the students thought the difficulty of the homework exercises that were to be handed in at specified deadlines was just right. Another 25% thought they were moderately difficult.
- 50% of the students thought the applets were (very) helpful to understand the course material. Another 25% thought they were moderately helpful.
- 53% of the students agreed that the applets in MUMIE motivated them to learn the course. Another 27% was not sure if the applets motivated them.
- 65% of the students thought the MUMIE program was (moderately) helpful for doing the exercises from Lay.
- 71% of the students thought the MUMIE program was (well) structured.
- 82% of the students (strongly) agreed there was enough documentation to get them started with MUMIE.
- 85% of the students (strongly) agreed there were no problems with the requirements to use MUMIE.
- 61% of the students (strongly) agreed they had no problems with entering solutions in the MUMIE applets, however 25% (strongly) disagreed.

- 73% of the students (strongly) agreed that it was clear which homework exercises had been done / saved.
- 74% of the students would (strongly) recommend to use the MUMIE program for the Linear Algebra course. Another 18% of the students is not sure if they would recommend the MUMIE program, 7% would not recommend it and 1% declares MUMIE unfit.

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 will be mentioned together with the amount of comments that fall under that category. To see all individual entries see Appendix A.2.

Contents / exercises not in-line with the course (17 entries)

Some of the contents / exercises are quite different from the book / exam and are therefore experienced as not so useful.

Helpful for learning the course (15 entries)

Participating in the MUMIE course stimulates students to work on the LA course on a weekly basis.

Unclear structure / improve user-friendliness (13 entries)

The design of MUMIE is experienced as complicated / confusing. Therefore working with MUMIE is sometimes experienced as tedious and difficult to understand.

(Too) many bugs (11 entries)

Students experience too much problems / bugs when using MUMIE, this is mainly due to applets that not load or work correctly.

Problems filling in / saving exercises (10 entries)

It is not always clear how to fill in an answer. Also, answers are not always saved correctly.

Exercises too difficult (6 entries)

The latter part of the MUMIE course contains exercises that are experienced as too difficult. This may be also due to the fact that they are not always in-line with the contents of the course.

Positive about the bonuspoint (2 entries)

Problems reviewing supplied answers to exercises (2 entries)

Untranslated text (2 entries)

There are still some parts of MUMIE that have output contents in German.

Other (14 entries)

Various comments that do not fall in the other categories.

3.1.3 Comparison with survey results from previous year

When the results of the multiple-choice questions are compared with the results from previous year the outcome is fairly similar. The largest difference can be found in the question if it was clear for the students which homework exercises have been done / saved. In the previous year 45% of the students (strongly) agreed with this question whereas this year 73% of the students (strongly) agreed with the question, an increase of nearly 30%. This increase can be addressed to the progress indicator that was added to the homework exercises.

This year 82% of the students (strongly) agreed there was enough documentation to get them started with MUMIE compared to 60% last year. The reason for this 20% increase is uncertain, since the documentation remained the same for both years. Perhaps the addition of the new MUMIE features made it easier to understand using MUMIE without using the documentation.

On the question if students had no problems with the requirements to use MUMIE there is an increase of 10%, with 85% (strongly) agreeing this year compared to 75% last year. A logical explanation for this increase is the arrival of MUMIE 3.0 which is accessible with all the commonly used browsers as opposed to Firefox only.

The amount of students (strongly) agreeing they had no problems with entering solutions in the MUMIE applets decreased by 10%, from 70% to 60%. This outcome is somewhat strange because an input helper was added to the more complicated applets in order to reduce this problem. However, probably due to some inconsistencies that arose due to MUMIE 3.0 which weren't thoroughly checked, students probably encountered more problems with their solution in the MUMIE applets.

Finally there is a decrease of 8% in students who would (strongly) recommend the MUMIE program to be used for the LA course. Again this can probably be explained by the inconsistencies that have slipped in with the update to MUMIE 3.0 causing more problems for the students than needed.

When the results from the comments are compared to the comments from last year there is a change in problems that students address. The top three of categorised comments (only including problematic areas) for last year where; 1) Not clear what homework exercises are saved, 2) Workload problems with timeframes from second part, and 3) Problems with the requirements. Whereas the top 3 of categorised comments for this year are the following; 1) Contents / exercises not in-line with the course, 2) Unclear structure / improve user-friendliness, and 3) (Too) many bugs. From this comparison it seems that students are now addressing problems more related to the content of MUMIE and inconsistencies that are still present in the current MUMIE course. Most of these problems can be resolved by thoroughly going through the MUMIE course in order to remove the bugs and inconsistencies.

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 exam grades from AE for the students who participated in MUMIE are compared to the students who

did not participate. In Section 3.2.2 the exam grades from CS for the students who participated in MUMIE are compared to the students who did not participate.

3.2.1 The exam grades for Aerospace Engineering

Here the exam grades for the AE students who participated in MUMIE are compared against the students who did not participate in MUMIE. Participation is defined in two different ways, in Figure 1 and Table 1, all students that received a bonuspoint (either 0.5 or 1.0) with MUMIE have been defined as participating, whereas in in Figure 2 and Table 2, all students that completed at least one of the MUMIE exercises, have been defined as participating.

In order for AE students to earn a bonuspoint they had to acquire a MUMIE score of 60% or higher. Furthermore, calculation on the LA grades has been done on the actual exam grade where the bonuspoint has not been included (unless explicitly stated). As a final note, the amount of students belonging to each group is indicated by the number in brackets mentioned in the figures.

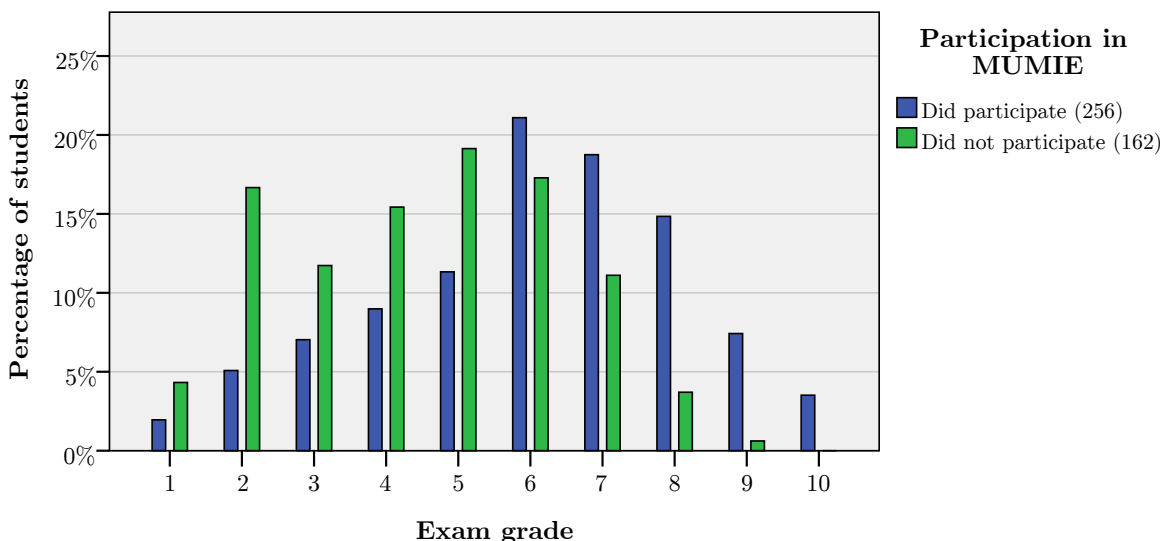


Figure 1: A comparison of the LA grades from AE, for the students that participated in MUMIE against the students that did not. The percentage for each group has been normalised. Participating in MUMIE is defined as follows, only the students that registered for MUMIE and received 0.5 or more bonuspoint belong to the *MUMIE* group.

	No MUMIE	MUMIE excl. bonus	incl. bonus
Percentage passed	31%	64%	73%
Average LA grade	4.46	6.02	6.85

Table 1: The percentage of students passed, and the average LA grade for the two groups, belonging to the data of Figure 1.

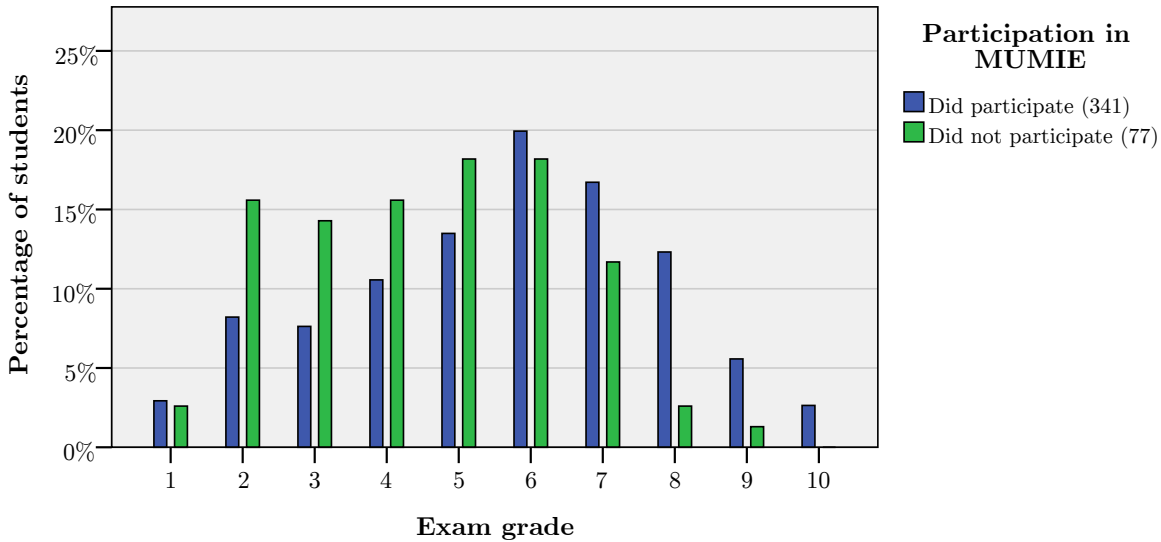


Figure 2: A comparison of the LA grades from AE, for the students that participated in MUMIE against the students that did not. The percentage for each group has been normalised. Participating in MUMIE is defined as follows, every student that registered for MUMIE and completed at least of one the MUMIE exercises belongs to the *MUMIE* group.

	No MUMIE	MUMIE excl. bonus	incl. bonus
Percentage passed	34%	55%	62%
Average LA grade	4.51	5.62	6.24

Table 2: The percentage of students passed, and the average LA grade for the two groups, belonging to the data of Figure 2.

3.2.2 The exam grades from Computer Science

For CS, the exam is separated in two different parts, each with a different exam. The grades for part 1 can be found in Figure 3 and Table 3, and the grades for part 2 can be found in Figure 4 and Table 4. For these figures, participation is only defined for students who received a bonuspoint (0.5 in this case) in MUMIE.

In order for CS students to earn a bonuspoint they had to acquire a MUMIE score of 70% or higher. Half a bonuspoint could be earned for each part, resulting in a maximum of 1 point. Again, calculation has been done on the actual exam grade where the bonuspoint was not added (unless explicitly stated). And again, the amount of students belonging to each group is indicated by the number in brackets mentioned in the figures.

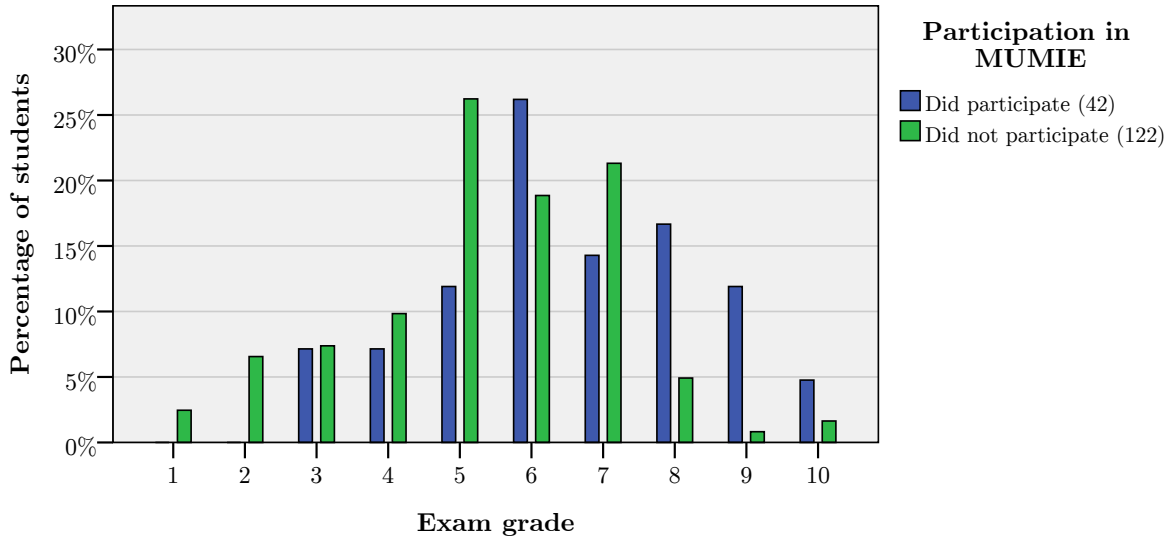


Figure 3: A comparison of the LA part 1 grades from CS, for the students that participated in MUMIE against the students that did not. The percentage for each group has been normalised. Participating in MUMIE is defined as follows, only the students that registered for MUMIE and received the bonuspoint belong to the *MUMIE* group.

	No MUMIE	MUMIE excl. bonus	incl. bonus
Percentage passed	48%	74%	79%
Average LA grade	5.04	6.31	6.81

Table 3: The percentage of students passed, and the average LA grade for the two groups, belonging to the data of Figure 3.

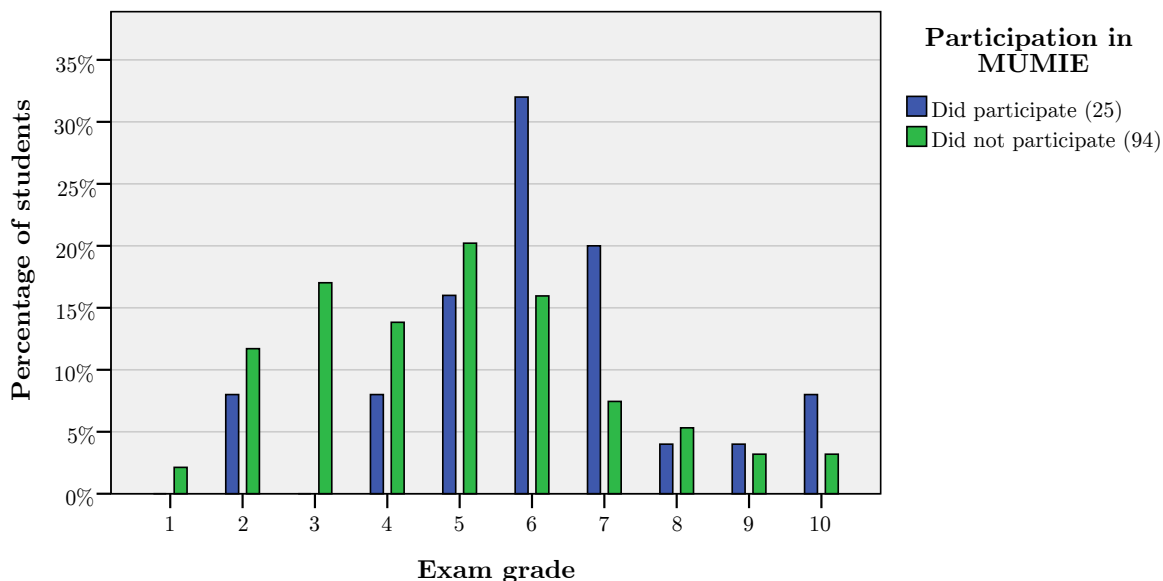


Figure 4: A comparison of the LA part 2 grades from CS, for the students that participated in MUMIE against the students that did not. The percentage for each group has been normalised. Participating in MUMIE is defined as follows, only the students that registered for MUMIE and received the bonuspoint belong to the *MUMIE* group.

	No MUMIE	MUMIE excl. bonus	incl. bonus
Percentage passed	35%	68%	76%
Average LA grade	4.59	5.74	6.24

Table 4: The percentage of students passed, and the average LA grade for the two groups, belonging to the data of Figure 4.

4 Conclusions

This section will cover the conclusion that can be made from using MUMIE during 2011-2012. In Section 4.1, a closer look will be taken at the grades that have been analysed in the previous section, followed by the conclusions regarding the overall MUMIE experience in Section 4.2.

4.1 Exam grades

From the analysis of the exam grades in Section 3.2 it can be seen that there are relatively more higher scores for the group that participated in MUMIE, both for AE as for CS. This difference can also be seen when the averages for both groups are compared.

So the general conclusion that can be drawn from the exam results is that participating in MUMIE benefits the student in getting a higher grade for the exam. Having said that, there are several

possibilities why the MUMIE group scores higher. Students participating in MUMIE are stimulated to frequently spend time studying the material and not wait until last moment, this will probably be the main reason for the difference in grades. Also, students in MUMIE might have gained some extra insight into the mathematical concepts from using the Applets in MUMIE. Another possibility is that students who participate in MUMIE are willing to put extra effort in the course in order to pass it and are therefore more motivated to study the course. However, whatever the reason for the increased exam grade for the MUMIE group is, students actively participating in MUMIE in general score a higher grade compared to students who do not participate. This is both the case for AE as for CS where the grades are fairly similar to each other.

When Figure 1 and Figure 2 are compared, no major difference can be found for the difference in classifying “active participation” in MUMIE. The average difference becomes slightly less large, changing from 1.5 to 1.0, but there still is a clear distinction in the grades for the two different groups.

Finally, there is one remarkable difference between the active participation between AE and CS. For AE more than half of the students have actively participated in MUMIE (256 against 162), whereas for CS there was less participation in MUMIE (42 against 122 for the first part and 25 against 92 for the second part). The reason behind this difference is not clear.

4.2 Overall experience of MUMIE

Even though the results for this year are again positive, there is still room for improvement. Most complaints from the students are regarding the content of MUMIE. The contents and exercises are not always in-line with the course and this should be improved. Also the students are still experiencing too much problems and bugs when using MUMIE. Part of these problems can be addressed by thoroughly “walking” through the course again and make changes where necessary.

Some of the problems however seem to be due to the implementation of the Java Applets within MUMIE. Solving these problems will be a lot harder, however, the MUMIE team in Berlin is currently reworking the output of the applets into more modern standards using HTML 5 and Javascript as output instead of Java. This does not only improve the accessibility and user-friendliness of MUMIE but also makes it possible to access MUMIE by smart phone or tablet.

5 Future work

Work for next academic year will mainly focus on the following points:

- Thoroughly checking the current LA course in order to remove bugs and inconsistencies.
- The development of new exercises and material for the LA course.
- Start the development of new courses for MUMIE in collaboration with the other universities that are part of the EU proposal.

Acknowledgments

We thank 3TU.AMI Applied Mathematics Institute for partly funding this research.

A Survey results

A.1 Multiple choice questions

Here you can find the multiple choice results of the survey. The caption below every bar chart are the questions that were asked. Each bar chart shows the results from this years survey (2011 - 2012, with a response of 228 students) and last years survey (2010 - 2011, with a response of 331 students).

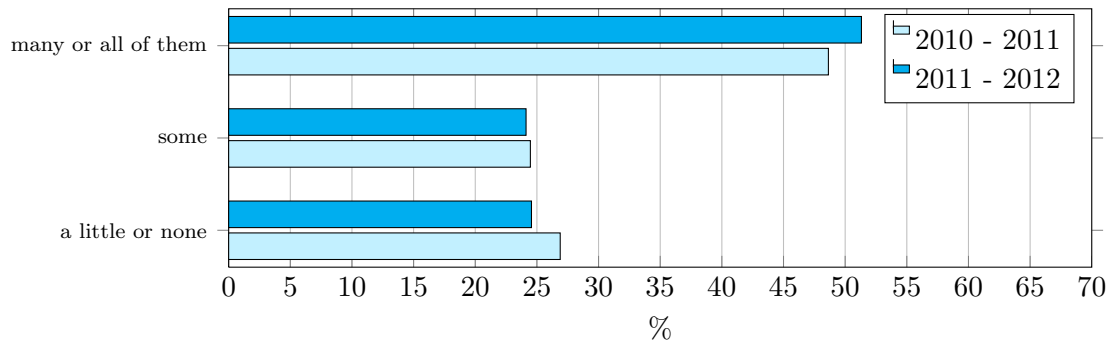


Figure 5: How often did you attend the classroom lectures for this course?

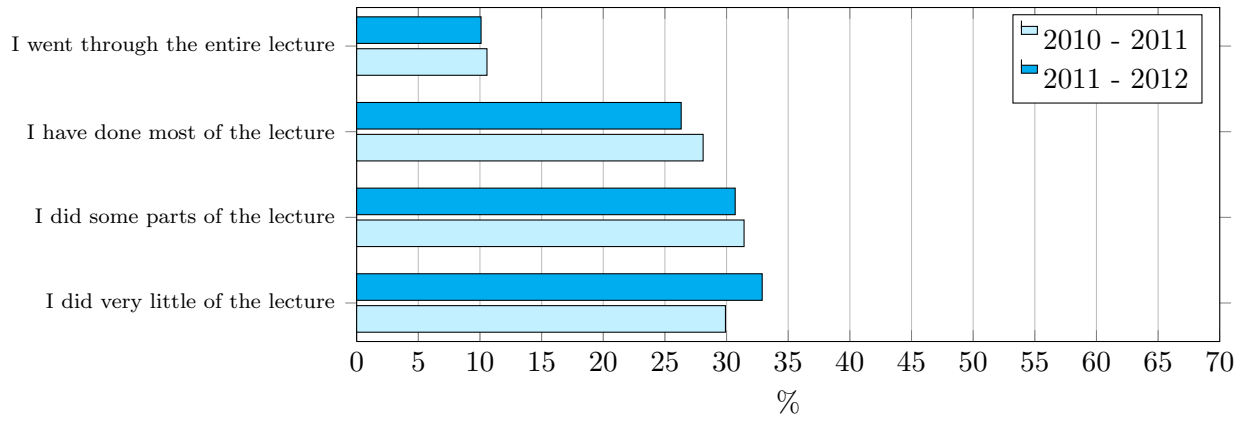


Figure 6: How extensively did you go through the Lecture part of MUMIE?

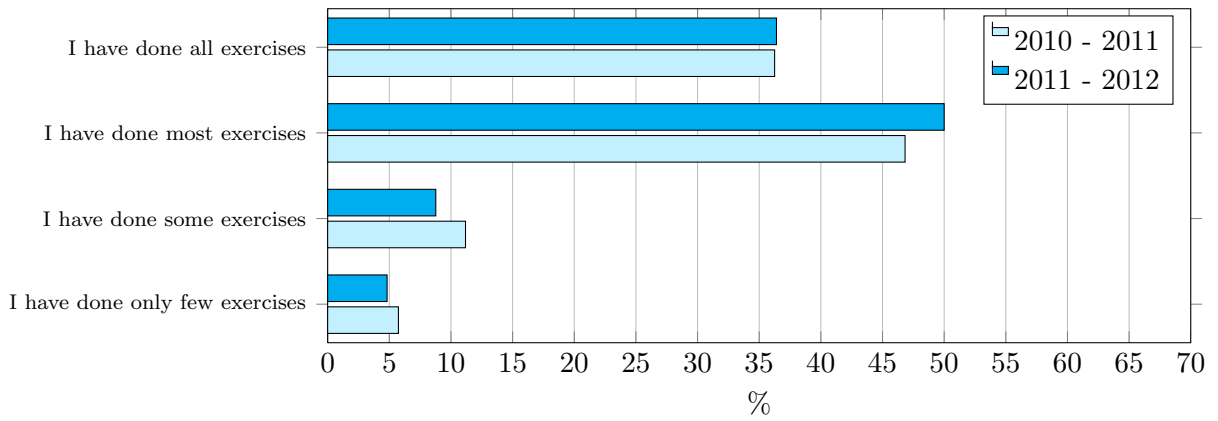


Figure 7: How extensively did you go through the Homework exercises of MUMIE?

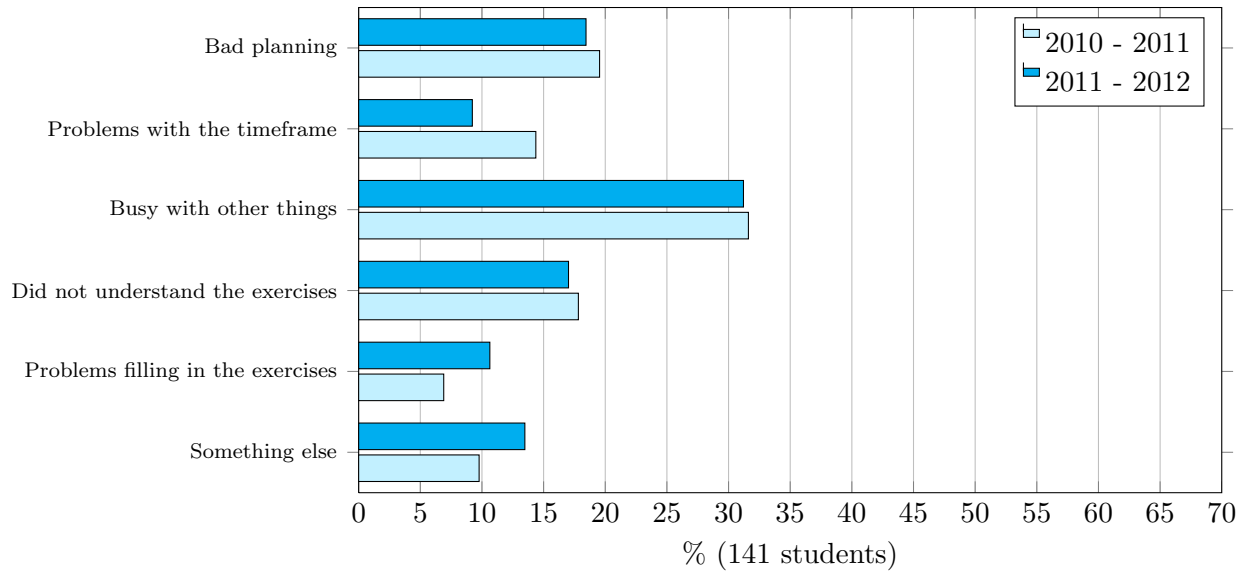


Figure 8: If you have only done few (or none) of the exercises please indicate the reason(s)

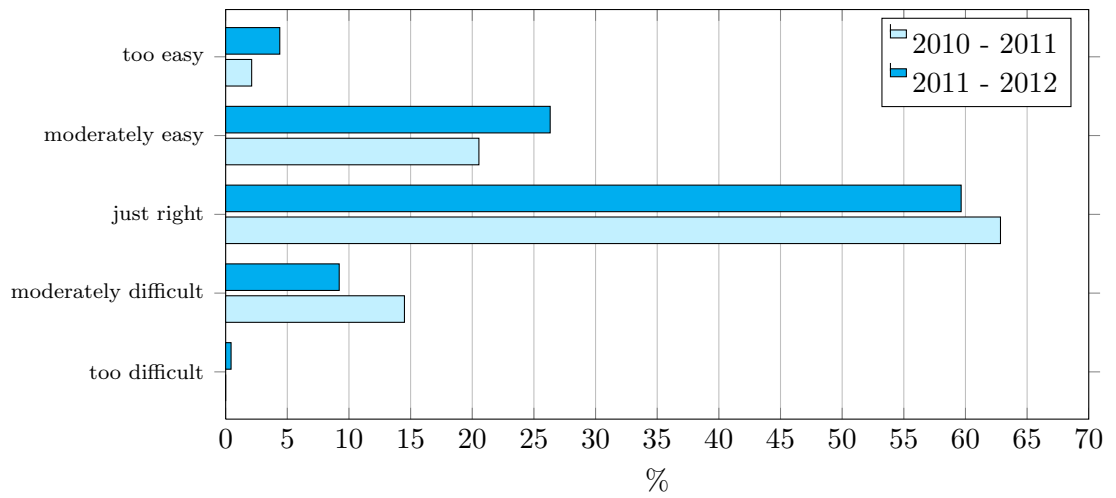


Figure 9: The difficulty of the applets in the Lecture part was?

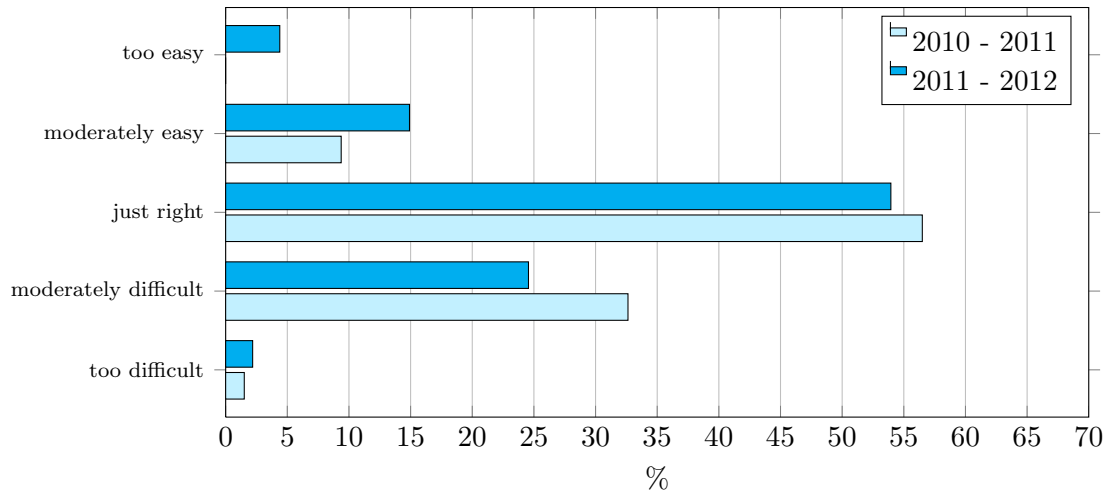


Figure 10: The difficulty of the Homework exercises to be sent in was?

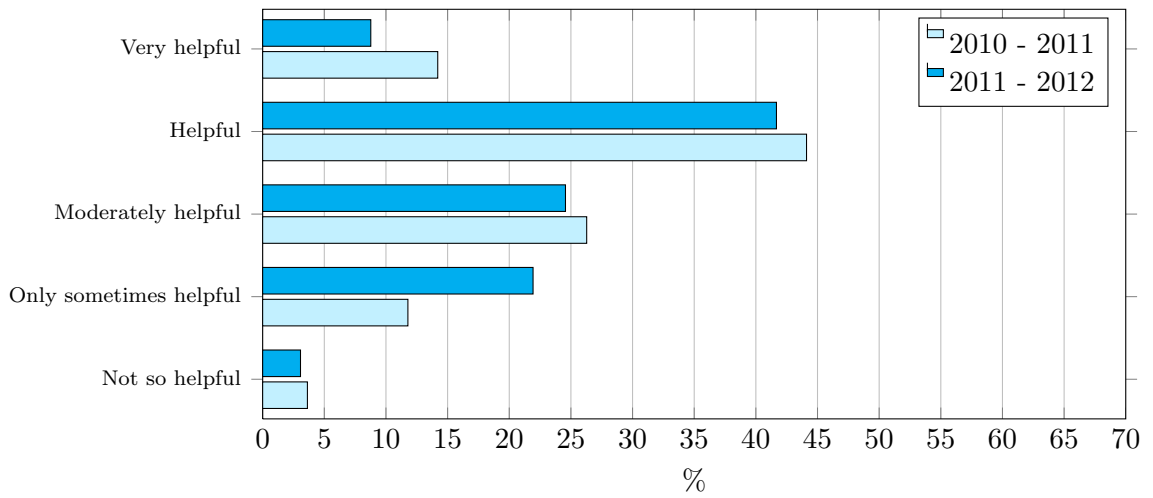


Figure 11: Did the applets help you to understand the course material?

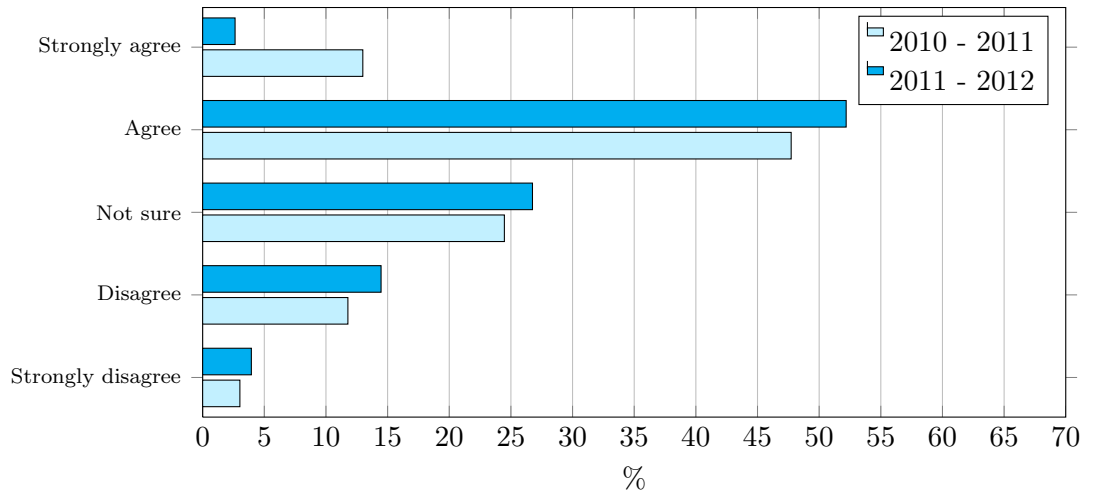


Figure 12: The applets motivated me to learn the course?

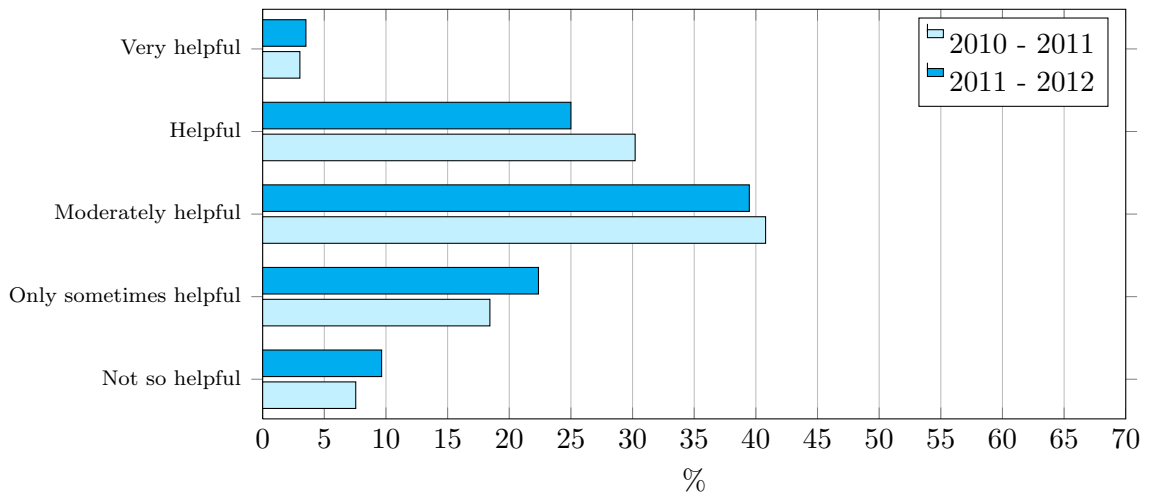


Figure 13: Did the MUMIE program help you with the exercises in Lay as prescribed by the Study Guide?

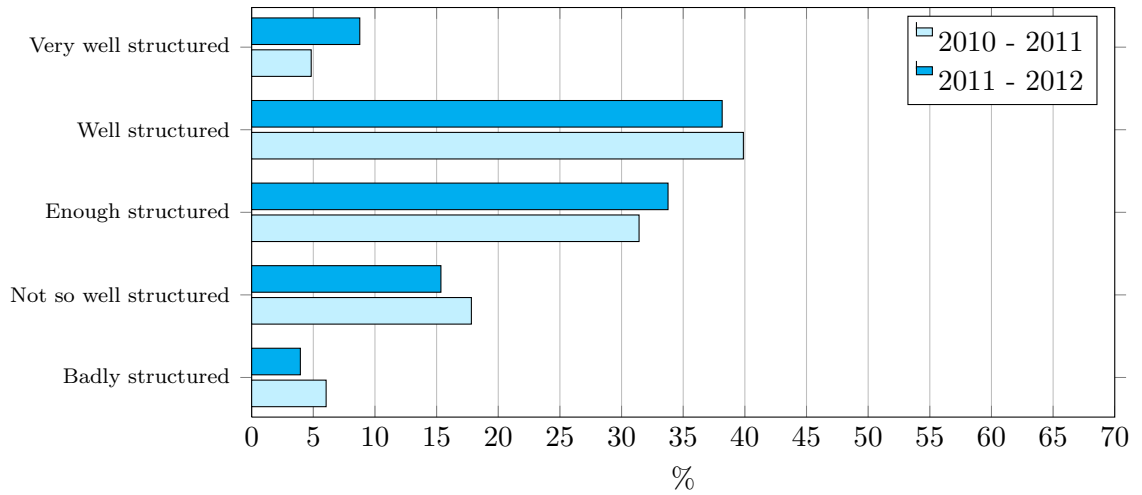


Figure 14: What do you think of the overall structure of the MUMIE program?

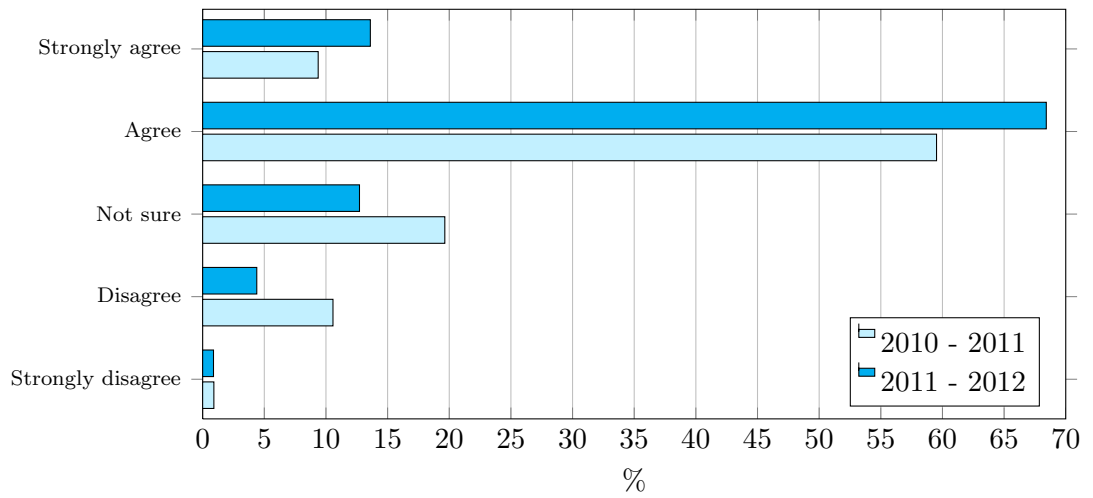


Figure 15: There was enough documentation to help me start with MUMIE?

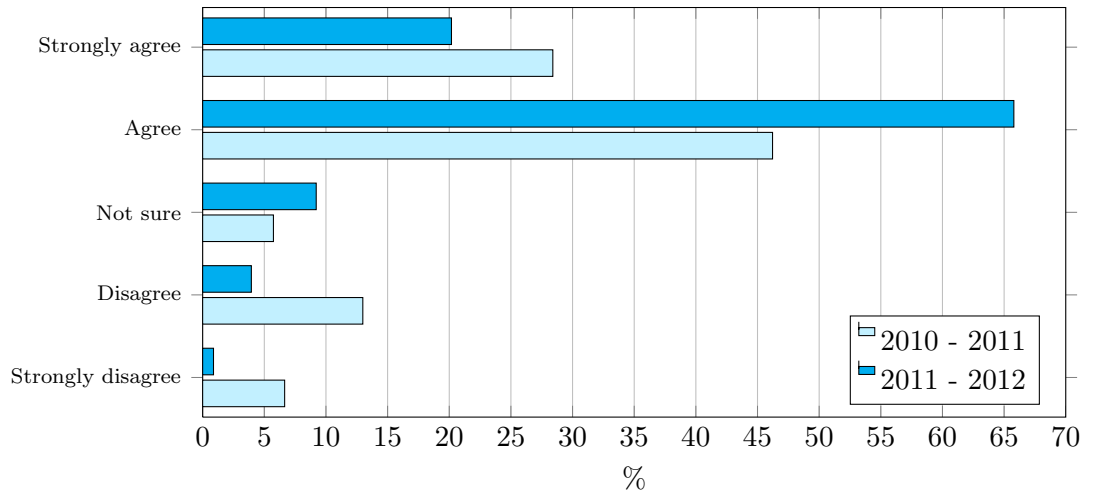


Figure 16: The requirements to use MUMIE (i.e. Firefox and Java) were no problem for me?

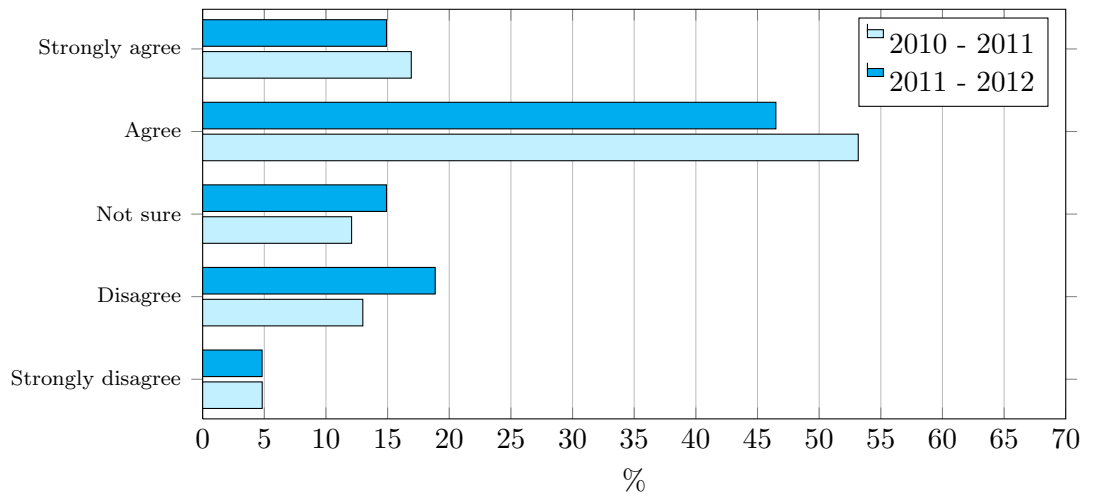


Figure 17: I had no problems with entering my solution in the applets?

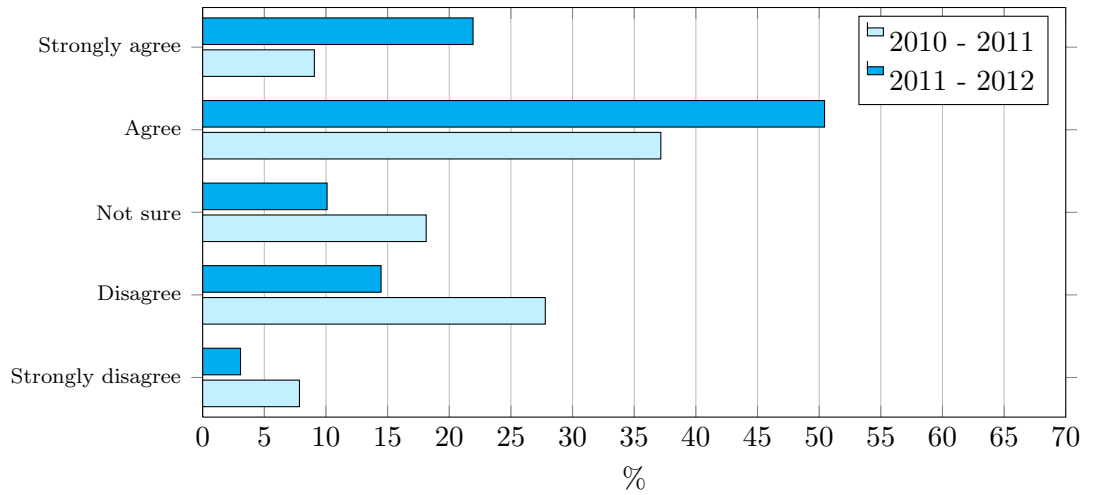


Figure 18: It was clear which Homework exercises I had done / saved?

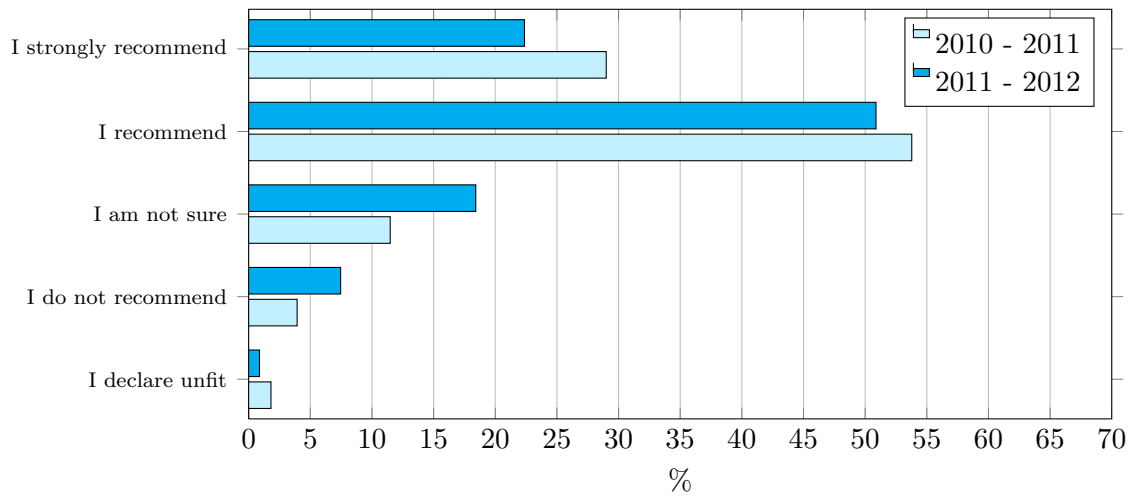


Figure 19: Do you recommend the MUMIE program for the Linear Algebra course wi1403lr?

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. The categorisation types are sorted by amount of items contained in the group.

Contents / exercises not in-line with the course (17 entries)

The material covered by mumie was sometimes ahead of our lectures which makes it difficult because you had to figure out how to do it on your own.

there can be more overlap between the lectures and the mumie program

Persoonlijk vind ik dat het meer synchroon met het boek kon lopen, en meer voorbereidend voor het tentamen kon zijn.

Level of excersises was very different per week. Excersises were totally different from book and exam exercises (partly due to different notation).

the exercises in mumie are quite different from the sort of questions you get on the exam as far as i can remember.

Should match more to the classroom sessions and the exercises in the book. Some topics weren't even fully worked out in the classroom, but asked in mumie.

Even though the assignments were sometimes helpful, I have to admit that they could have been closer to the Lay book.

By making the assignments more closely resemble the difficulty of the final exam they provide more accurate feedback to the student whether or not he/she still has to work a lot on a certain subject.

The problems itself weren't really covered in lecture. The examples sometimes were completely unrelated to the problems given.

What I found unfortunate, is that the exercises didn't resemble the questions on the exam. I found them rather different then what I practised.

The exercises were clear but a bit easy compared to the book and the exam.

Some of the exercise did not really fit the course material and were therefore useless and also not always solvebale

The exercises were sometimes too easy and sometimes a bit annoying. But overall ok.

On the other hand, MUMIE was sometimes also very confusing and in this way demotivating because the exercises were presented more difficult than they actually were.

some of the questions were unclear. for example the first question of the last sub-part (part B).

I only didn't make the last few exercises, because I didn't understand them. What appeared to be the problem, was that there was a vector 13 what had to be $\begin{bmatrix} 1 & 3 \end{bmatrix}$ (or something like that). This was fixed when I returned to see the answers. For question number two: I joined all of the lectures of the first quarter, but almost none of the second. I found home-studying a better solution for this course.

Some of the exercises had nothing to do with the material covered in the lectures.

Helpful for learning the course (15 entries)

At some moments MUMIE was very helpfull, especially the example exercises, because in my opinion the book misses a few helpfull examples.

mumie is goooodddd

However, it was a nice way of reviewing the course material, so it was at least partly useful.

However it did help sometimes.

In general, the program was good.

I think MUMIE is helpful to get insight in the built-up of linear algebra, and that the homework exercises stimulated me to do some work every week for LA.

Besides that MUMIE is a well structured way to get a understanding of linear algebra, a helpful addition.

I think MUMIE could also be very helpful for the other WI courses, Calculus I and II.

The exercises were very easy once you worked through the theory, but MUMIE helped me to do this theoretical part. Calculus is a course I postpone to much, and without MUMIE, I would have done the same with Linear Algebra.

Most of the mumie problems could be solved using matlab or by looking up the question on the internet. Off course, mumie forces students to do linear algebra on a more regular basis and for this course especially it is necessary to keep up with the study material.

MUMIE is a good way to keep up with the Linear Algebra course while getting a reward for good work.

MUMIE is a good way to keep up with material.

The MUMIE program works very well and stimulates to do homework.

I think it's a good system as it helps students to keep up to date with the required level of knowledge during the course

thank you for the learning experience!

Unclear structure / improve user-friendliness (13 entries)

The overall structure of the mumie lay-out is not very clear for a first-time user.

MUMIE works alright, the only thing I didn't find so good about it is the layout and structure of MUMIE. It can be a bit unclear at times how it works.

The overall user friendliness of the programme could be improved, particularly the layout of the site

The lay out should be better!!

Very complicated / confusing design with the course outline at the left - never sure what was already done, where I was, how to get to the higher level etc.

Improve user interface.

However, the MUMIE program itself is not always very clear. It took me some weeks to figure out that, besides the homework exercises, there actually was a lecture as well within MUMIE.

However the structuring of the site is not really user friendly. Selecting the exercise and clicking 'edit', waiting for it to load etc is not really handy. Secondly, after saving an exercise one has to reload the assignment to be able to edit the next exercise and to see the updated progress on that part.

Better lay-out for the MUMIE website

The MUMIE process was sometimes tedious and difficult to understand due to unclear notation.

Sometimes, the questions are not structured properly. So, it is hard to know what is actually expected from us.

I also thought the structure was a bit obscure, making it more clear what exercises are due when shouldn't be that hard.

sometimes it was not quite clear in what form the answer should be given, furthermore in some exercises you had to select some vectors, i.e. vectors that are linearly independent, before selecting the exercise itself, I think it is better to be able to select those vectors in the applet itself, because it was not obvious which ones you had chosen until you clicked on the exercise, for the rest mummie worked just fine with me

(Too) many bugs (*11 entries*)

I hope MUMIE works better next year.

Try to avoid mistakes in the exercises. There was a question in one of the last sections we did that had an error in in. A vector had not been correctly entered, so it was unclear exactly what was asked of us.

On one occasion, my results for a single exercise were not saved, somehow.

The platform requires a lot of (technical) improvements.

Though there were some difficulties with the applets, the support of MUMIE was swift and really helpful.

The MUMIE program often seemed to crash on my browser (Firefox), and the applet took a long time to load before being usable. I think that if the bugs are worked out better and the system is smoothed to run faster the system would already be greatly improved.

Possibly update the entire software to more modern standards, it seems as if the MUMIE program was produced in the 90's.

make sure the program works for everyone and everytime, because it didn't this course

Problems with mac while entering the solutions in the applet!

Really buggy sometimes, did not save my answers or crashed. Did not really like it.

I strongly suggest to change to another system not using these java applets, the often do not load properly (in my case..).

Problems filling in / saving exercises (*10 entries*)

When filling in some answers the option for extra input (easy way to do superscript, subscript and square roots) was not available, if this was always available it would help with writing down the answers.

Clear information needed how to fill in the applets

Improve the clarity of the questions and the manner in which the answers have to be inserted.

The applet was very poorly done, it was hard to figure out how to edit problems with multiple parts.

There were however mishaps when trying to fill in the answers multiple times and often, I had problems with saving my answers too.

The last answer wasn't saved for me.

It wasn't always clear to me if I finished a exercise. That way I missed 2 exercises. Luckily it wasn't that much of a problem to me, since I made that up with other exercises.

For some students saving did not work well. Answers that seemed to be accepted on one computer turned out gone the next day. This issue should definitely be resolved.

Besides, the save button did not always save my work.

Sometimes it is really unclear what the input should be like, concerning notation. More examples of how to give input could be given. Also, all the layout of the website is really unclear. It did not really help me understanding the material, since feedback is only given after the submission date.

Exercises too difficult (*6 entries*)

Also, the final exercises were quite difficult. Too difficult almost.

Ook de toename van de moeilijkheidsgraad kon geleidelijker. Dat geldt overigens voor het hele Linear Algebra cursus.

I indicated that the exercises were too difficult. The first exercises however I found too easy. The exercises were not always clear enough (especially at the end)

Exercises varied from way too easy (especially in the beginning of the course) to way too hard (especially in the end of the course); some of them were very confusing.

What it was that was required from the student in Part B, worksheet 16, Problem differential equations and solutions was not clear to me. It was the only part of the whole MUMIE course that I was unable to complete.

Some exercises in MUMIE seemed to difficult and some too easy. E.g. the Tensor of inertia e.g. was too difficult I think. But exercises of the first paragraphs were too easy.

Positive about the bonuspoint (*2 entries*)

Heel goed dat er een bonuspuntmogelijkheid is.

The bonus point should be given in a similar way then in calculus I and II.

Problems reviewing supplied answers to exercises (*2 entries*)

Make the layout easier to check your results. Now it is kind of hidden.

Maybe it can be made easier to review results. Instead of having to click on each exercise and view the results, maybe all the results of a block can be published in one file.

Untranslated text (*2 entries*)

Sometimes the language of the notifications is German.

Some translations are still wrong

Other (14 entries)

I had a problem with login in just because of my laptop not automaticly adding /tudelft behind the website's adress. This unlogical mistake was the reason I couldn't make some exercises, and I just needed ONE more to fullfill the requirements for the entire BONUS point. I've sent an email but never got reply, so I really hope you guys understand my situation and I will get the bonus punt anyways. Thank you!

its a good approach to get used to the exercise but i think.. if it had more exercise with primary theoretical part it would have been beneficial to the students

Another point is that the assignments were often so easy that I did not really learn anything from it, which I assume is the purpose of the MUMIE program.

after closing the excersises, keep the score and keep them open for practice furtheron in the semester
For my mumie made me look for little tricks to quickly do the needed exercises instead of really learning the theorems. So for learning it did not really help

I really disliked the book itself. MUMIE was ok after I understood the theory, it did not help me understanding the fundamentals thought. It was more of a review of the homework for that week.

also it would be more handfull to have direct feedback and for example 3 tries per answer

The MUMIE- layout was quite elementary but sufficient.

questions could even be done with example exercises... so we did not even had to read the book to answer some of the questions.... especially in the beginning....

Also, the part that had to be submitted during the holidays was forgotten by many students. A warning here would be appropriate.

In my opinion MUMIE is only helpful only after reading through the book. Otherwise, it may confuse the user. I dont think going through the brief lectures given on MUMIE is enough to understand the topic. I think this point should be strongly emphasized as one may think about it the other way around, doing first the MUMIE and then reading and doing the homework on the book, which again, I think can be significantly more difficult.

I recommend the Linear Algebra course to use a program like Mastering Engineering (like statics, mechanics, etc) since this program is much better in use and gives a clear presentation about what has been done and what's left to be done.

I think sunday might not be the best day to close a deadline. Sometimes I was so busy celebrating the weekend that I completely forgot about MUMIE.

The MUMIE Applet was set up well, although there were some errors. A thing to include next time is correction that happens automatically instead of per part and then total.

References

- [1] TU Delft, TU Berlin, KTH Stockholm, Aalto University, and Integral Learning. Lets work together: further development of MUMIE, an e-learning tool for engineering education, November 2011. "<http://www.ewi.tudelft.nl/en/the-faculty/departments/applied-mathematics/numerical-analysis/education/mumie-online-math-education/>".
- [2] Integral Learning. MIAU - MUMIE Integrated Authoring Utilities, July 2011. "<https://www.mumie.net/platform/>".
- [3] Integral Learning. MUMIE - Online Math Education, July 2011. "<http://www.mumie.net>".
- [4] Robert van Kints. Evaluating the MUMIE pilot, May 2010. "https://www.mumie.net/wiki/lib/exe/fetch.php?media=tud:documents:phase_4_evaluation_05-2010.pdf".
- [5] C. Vuik, F. Daalderop, R. van Kints, and B. Schaap. Evaluation MUMIE online math education pilot aerospace engineering. Report 11-10, Delft University of Technology, Delft Institute of Applied Mathematics, Delft, 2011.