DELFT UNIVERSITY OF TECHNOLOGY

REPORT 11-10

Evaluation MUMIE Online Math Education
Pilot Aerospace Engeneering

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Contents

1 Introduction

In this document the Mumie pilot that took place in March 2010 for the Linear Algebra course (wi1403lr) at Aerospace Engineering will be evaluated. This pilot is the result of an interest in using an e-learning platform that can improve the level of education for first year mathematical courses at TU Delft. In order to be successful with such projects it is important that the end-users, students and teachers in this case, are willing to accept using it. With no support from this group it is very difficult to introduce such a project successfully. To get an idea of the opinion of the endusers, the pilot has been organised.

What can one expect to find in this document? At first, an overview of the current method of teaching for the Linear Algebra course will be presented together with the different phases that took place prior to the pilot. Chapter 3 will take a look at the set-up of the pilot, followed by an analysis of the feedback given by the students on the pilot in Chapter 4. In the last two chapters the conclusions and recommendations from the pilot will be presented, Chapter 5, together with the future plans and improvements in Chapter 6. This document won't go into the details of Mumie, for more information on this visit www.mumie.net, also there is a wiki for the use at TU Delft, see `https://www.mumie.net/wiki`(note: it is https instead of http) and click on the TU Delft section.

The pilot has been set up by the following people. Coordination is in hands of Kees Vuik, Fons Daalderop is the teacher, Robert van Kints and Bart Schaap are responsible for the implementation of the pilot. Furthermore usefull feedback and ideas have been given by Paul Visser. Wim Caspers helps us to have an idea what is going on at the TU Delft with respect to e-learning.

2 Introducing Mumie at TU Delft

This chapter will start with describing the current method of teaching the Linear Algebra course at Aerospace Engineering. This is followed by a summary of the three different phases the Mumie project at TU Delft has gone through from the beginning of 2009 up until the end of March 2010. For more information for each phase please read the corresponding document that can be found on the Mumie wiki `https://www.mumie.net/wiki`.

2.1 Current method of teaching the Linear Algebra course

The current Linear Algebra course at Aerospace Engineering (wi1403lr) is spread out over two terms. Each term consists of seven weeks of study. During these weeks a concept known as colstructies is used in which the student can learn the required knowledge. In a colstructie the college and instructie are merged together. This means that the student gets the material explained using examples (college) together with making exercises (instructie) all in the same lesson. All material comes from either the teacher or from the book "Linear Algebra and Its Applications" by David C. Lay, Third Edition, Pearson, Boston, 2006. In every colstructie 1 or 2 paragraphs from the book are covered.

Because of this set-up the groups of students are relatively small, a maximum of 40 students. Colstructies aren't mandatory for students, although recommended. The book is also suitable for self-study. At the end of the course there is a 3 hour exam covering all material from the course.

2.2 Phase I: Using e-learning in education

The first phase in the project was carried out by Stijn Wever. In this period he looked at the concept of e-learning in a general way, e.g. the different forms in which e-learning can be used together with their (dis)advantages, but also what form of e-learning is best suitable for the Linear Algebra course. After this, several mathematical e-learning platforms that can be used for this purpose are compared, Mumie being one of them. The phase ends with a list of most important changes needed for Mumie such that it is suitable for the introduction in Delft. For more information on this phase please take a look at the corresponding document, "Invoering Mumie ter ondersteuning van het wiskunde serviceonderwijs", *Stijn Wever*, March 2009.

2.3 Phase II: Learning to work with Mumie

This phase was carried out by Ramonda Golob and starts where the first phase ended. In May 2009 TU Berlin organised a Mumie workshop for the community that she visited. The focus of this workshop for Berlin was to show how one could work with Mumie and how you can use the tool in a 'blended learning' environment. For TU Delft it was also interesting to see how Berlin uses Mumie at their university, e.g. are there situations that

might cause problems etc. For more details on her visit to TU Berlin read the report, "Invoering Mumie ter ondersteuning van het wiskunde serviceonderwijs - Verslag van het bezoek aan Berlijn", *Ramonda Golob*, May 2009.

The other thing Ramonda looked at was how courses can be developed in Mumie. What is the internal structure of a course? What are the different elements that can be used? How can you create new content, or change existing content? All this had to be sorted out before TU Delft could start implementing their own course in Mumie. More information on this subject can be found in the following document, "The introduction of Mumie for Supporting Educational Mathematics Information about the Mumie project from Berlin", *Ramonda Golob*, June 2009.

2.4   Phase III: Implementing the pilot

In the third phase it was time to implement the Mumie pilot that would run for the Linear Algebra course at Aerospace Engineering. This phase was carried out by Robert van Kints. First of all the documentation got improved for people who have to build courses in Mumie, since only bits and pieces were available with some of those pieces in German. This documentation has been made available on the Mumie wiki, see `https://www.mumie.net/wiki` and click on the TU Delft section.

In September 2009 TU Berlin organised a community meeting with one of the key events presenting a new authoring tool, called MIAU (Mumie Integrated Authoring Utilities) that makes the creation of courses a lot more accessible for teachers. Also future plans for Mumie were discussed. The report on the workshop is the following, "Verslag van de Mumie community workshop", *Robert van Kints*, 21-22 September 2010.

The last action of this phase was implementing the pilot for the Linear Algebra course. This was done by taking the Linear Algebra course developed at TU Berlin as a base, and then adapting this course to our needs.

First of all, the material that should be in the pilot was sorted out. These parts were then taken from the Linear Algebra course used at TU Berlin. This gives two advantages, it gives an immediate structure that can be worked from and thus greatly reducing the development time. Secondly, it reduces the learning time to work with Mumie, this because not everything is documented.

Once the German course was adapted to our needs, the translation and customisation could take place. A lot of the course was in German and also the presentation and explanation of mathematical concepts had to be changed to what is common at TU Delft.

Details of the pilot can be found in Chapter 3.

3   Set-up of the pilot

This chapter will go into the details of the pilot's set-up. Question such as, who participated, what was the duration and what material was covered, will be answered. To take a look at the pilot course go to
`https://www.mumie-hosting.net/tu-delft`.

The pilot took place during March 2010 and covered 3 topics of the Linear Algebra course (wi1403lr):

1. Eigenvalues, eigenvectors and the characteristic polynomial

2. Diagonalisable matrices

3. Linear differential equations

At first the intention was to find a group of about 30 students to participate in the pilot. However, two days after announcing the pilot to the students, there were already 110 students interested to participate. This happened a lot faster than expected, so after two days the entry had to be closed to make sure the group wouldn't grow too big to handle.

In order to try and motivate the students to actively participate in the pilot and receive useful feedback, they had the ability to earn a bonus point if they met the following conditions:

- Get a score of 50% or greater for all homework exercises.

- Fill in a survey at the end of a pilot

- If needed, participate in an interview/discussion

At the end, 60 students have been (actively) filling in homework exercises in Mumie

In Mumie, every topic is separated into 3 different stages; pre-learning, lecture and homework. The lecture part consists mainly of definitions and theorems accompanied by demos and interactive training exercises, these should aid the student in learning the required knowledge. The pre-learning and homework part consist of a number of exercises that have to be done within a certain time frame. The closing dates for the time frames are as follows: the exercises for the first topic closed the 21st of March at midnight, the other two topics closed the 31st of March at midnight. Once a time frame is closed, the exercises automatically got corrected and students received a score. One of the conditions in acquiring the bonus point was getting a score of 50% or higher on the homework exercises. Because the concept of pre-learning is not used at Delft the pre-exercises were left out of the condition for getting a bonus point.

To get feedback from the students from their experiences on using Mumie an online survey has been created for the students to fill in, also one of the conditions for receiving the

bonus point. In total there are 65 students who filled in the survey. All students who have (actively) been using Mumie belong to this group.

The survey consists of 12 multiple choice questions grouped into 5 different areas, in each group there was room to give comments and/or remarks belonging to that area. This gives two different forms of data that have to be processed:

- The results of the multiple choice questions can directly be put in bar charts, this visualises the outcome in a clear way.

- All the individual comments and remarks in a group have to be organised according to similarity. The more similar comments and remarks there are, the stronger they become.

In the next chapter the outcome of the survey will be analysed. The comments and remarks of the students can be found in the appendix

4 Analysis of the results and feedback

In this chapter the results of the pilot and the feedback from the survey will be analysed. In the first paragraph the scores of the students who participated in the pilot will be compared to students who didn't participate. The second paragraph will present an overview of the feedback given in the survey.

4.1 Results

Students who participated in the exam can be divided into two groups. Students who participated in the Mumie pilot and students who didn't. The average exam scores for these groups will be compared in this section.

The exam consisted of six questions in total, the fourth question is closely related to study material that was used in the Mumie pilot (the pilot only covered a small part of the entire course).

Not only the scores for this fourth question are compared (Table 1), but also the scores for the entire exam (Table 2). The group who participated in Mumie is also separated into three groups, students getting a score of fifty or higher (required for the bonus point), students with a score between zero and fifty and students getting no score at all.

	Score > 50	0 < score < 50	Score == 0	Entire group
Used Mumie	8.07	7.31	5.85	7.27
No Mumie				5.88

Table 1: Comparing the scores of the fourth exam question (this question was closely related to the Mumie pilot), students who did use Mumie versus students who did not

	Score > 50	0 < score < 50	Score == 0	Entire group
Used Mumie	7.84	6.43	5.12	6.46
No Mumie				5.89

Table 2: Comparing the scores of the entire exam, students who did use Mumie versus students who did not

The most interesting result that can be seen is that the Mumie group scores higher at both question four and the exam, however they score relatively higher on the fourth question (about 0,7 point).

Another point is that the group of students who had a score between zero and fifty, relatively had the most benefit from using Mumie. The difference in score between the fourth question and the entire exam is the largest, 0,9 point difference (compared to 0,2 and 0,7).

Of course there are also the more obvious results, the more points students have scored in Mumie the higher there exam result is. Also the students who scored zero points on Mumie have a similar score to the students who haven't participated in the Mumie pilot.

That being said, it is pretty hard to make proper conclusions from the table above, since there are many variables involved.

4.2   Feedback

As mentioned in Section 3 the questions are ordered into 5 different groups. The outcome of every multiple choice question will be mentioned and where possible be analysed with the processed comments. The processed comments are all the comments grouped by similarity and are indicated by a bullet, the number behind the entry indicates how often this type of comment occurred.

1. **How often did students attend the classroom lectures during the pilot period?**

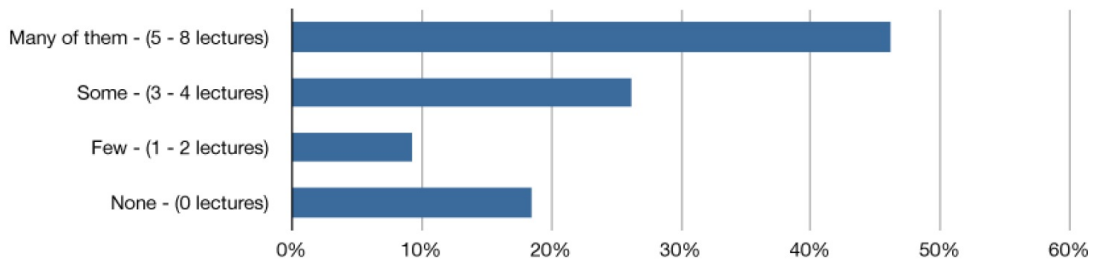   50% of the students attended most of the classroom lectures.

Illustration 1: How often did you attend the classroom lectures for this course during the pilot period? (8 lectures in total)

2. **How many of the pre-learning exercises have you done?**

30% of the students have done most or all of the pre-learning exercises. The other 70% only did some, a few or none of the pre-learning exercises.
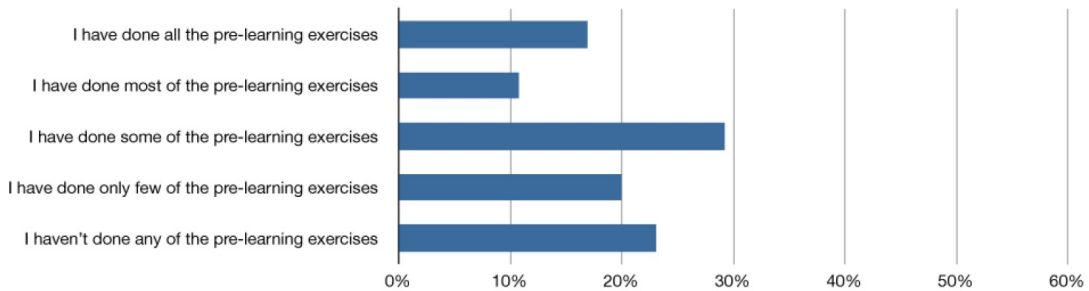

Illustration 2: With respect to the Pre-Learning

3. **How many of the demos and trainings have you done?**

About 50% of the students have done all or most of the demos and training in the lecture part. The other 50% have done only a few or none.
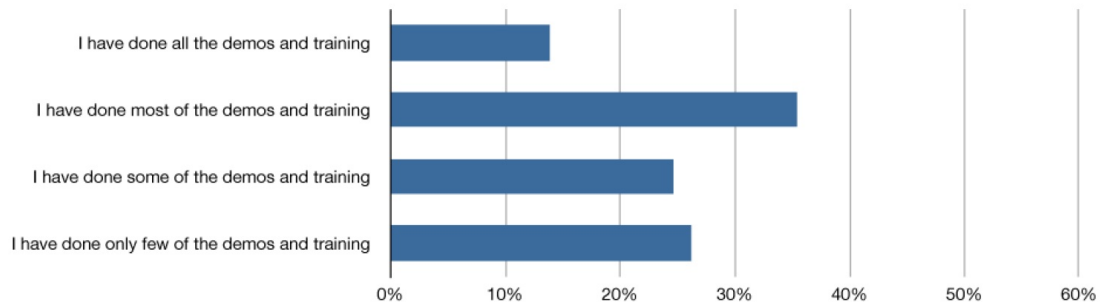

Illustration 3: With respect to the demos and training in the Lecture Part

4. **How many exercises have you made during the course?**

75% of the students have done all or most of the homework exercises. The remaining 25% have only done a few or none of the homework exercises.
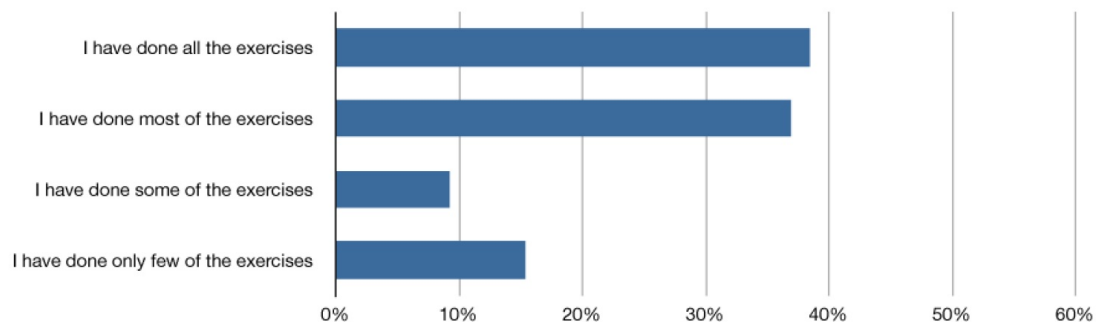

Illustration 4: With respect to the Exercises

12

Students who only did a few or none of the exercises had the room to indicate why:

- Bad planning (5x)
- Problems with the time frame (5x)
- Busy with other things (4x)
- Didn't know how to fill in the exercises (4x)
- Not understanding the exercise(s) (4x)

5. **What did you think of the difficulty of the training exercises?**

60% of the students thought the training exercises in the lecture part were just right. Another 35% thought the training exercises were moderately easy or difficult.
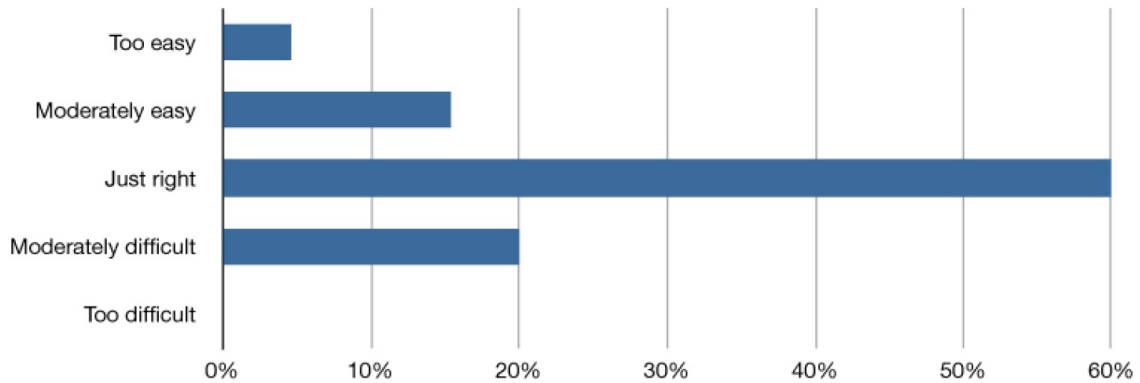
Illustration 5: The training part in the Lecture was...

6. **What did you think of the difficulty of the homework exercises?**

85% of the students thought the homework exercises were either just right or moderately difficult.
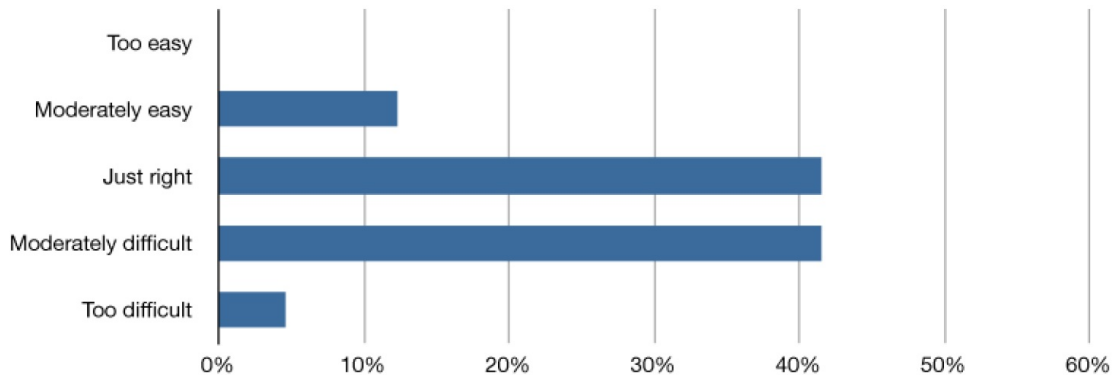
Illustration 6: The exercises to be sent in were...

7. **Did the demos and training contribute to your understanding of the Linear Algebra material?**

55% of the students thought the demos and training exercises were (very) helpful to understand the material. Another 40% thought it was only moderately or sometimes helpful.
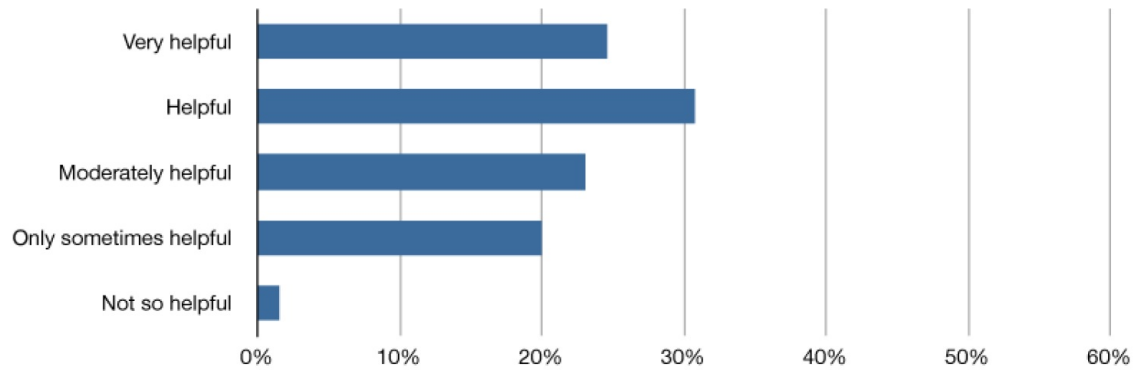
Illustration 7: Did the demos and training contribute to your understanding of the Linear Algebra material?

8. **"The demos and trainings were motivating"**

   55% of the students would (strongly) agree the demos and training were motivating. Another 35% is not sure about this.
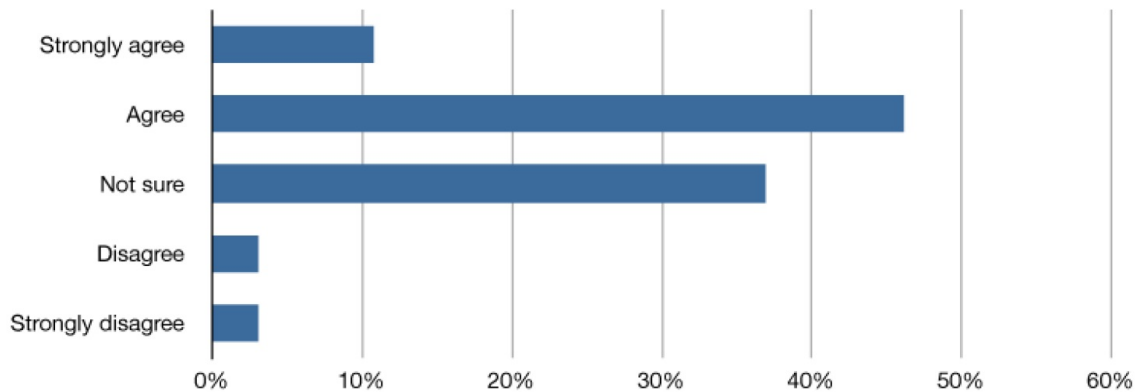
   Illustration 8: The demos and training were motivating?

   Students could comment on the previous two questions:

   - The demos and training motivate to learn the material (6x)
   - Helps to understand the theory (6x)
   - Some parts needs more explanation why choices have been made (3x)
   - Forces to study during lecture (2x)
   - Needs more feedback from corrector (2x)
   - Too abstract (2x)
   - The demo and training part are too similar to each other (2x)
   - Doesn't always follow the book (2x)
   - Demos don't correspond to exercises (2x)

9. **Did Mumie help you with the exercises in Lay as prescribed by the Study Guide of Linear Algebra?**

   30% of the students thought that Mumie helped them with the exercises in Lay. 65% of the students found Mumie only sometimes or moderately helpful.
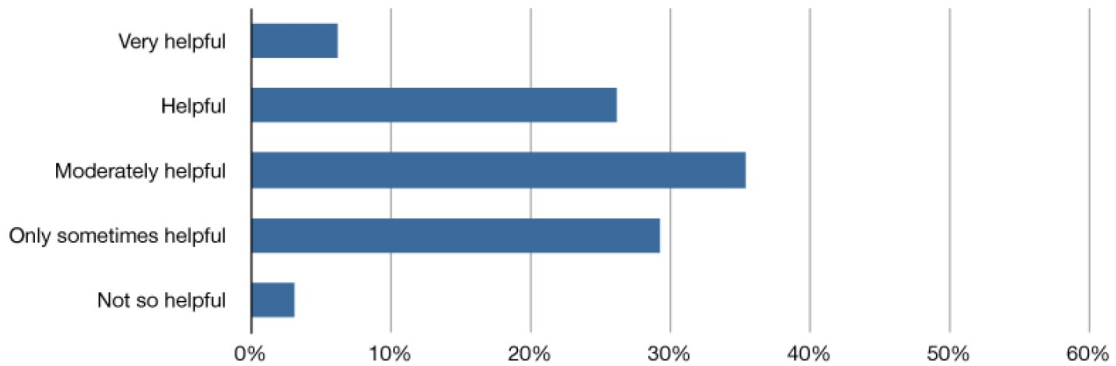
Illustration 9: Did Mumie help you with the exercises in Lay as prescribed by the Study Guide of Linear Algebra (wi1403lr)?

For this question students could leave comments again:

- Some exercises in Mumie are different from the book (5x)
- The demos and training were useful (4x)

10. **What did you think of the overall structure of Mumie?**

70% of the students thought Mumie was either well structured or enough structured. The other 30% thought it was either not so well structured or even badly structured.
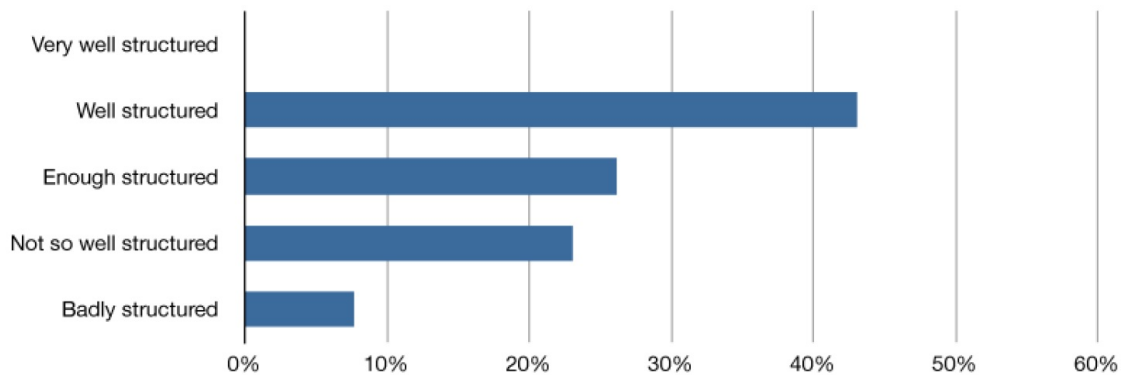
Illustration 10: What do you think of the overall structure of the Mumie program?

11. **"The Mumie-program is user-friendly"**

65% of the students agrees that Mumie is user-friendly or is not sure about this. 30% (strongly) disagrees with this.
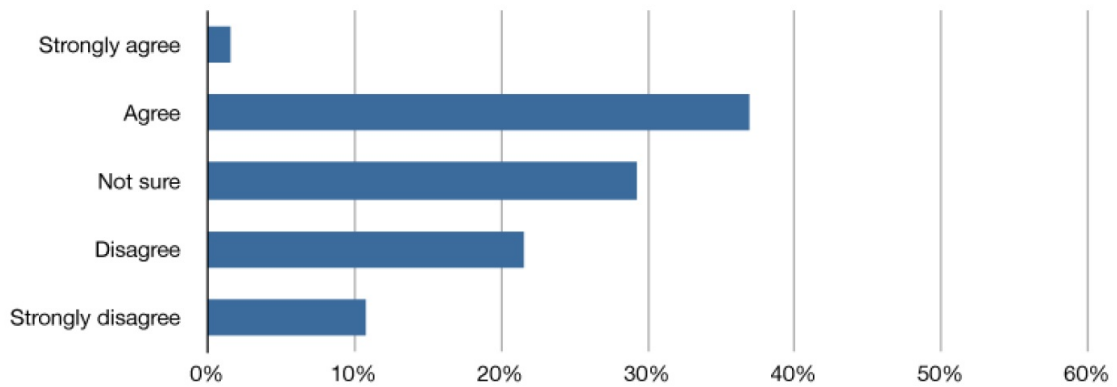
Illustration 11: The Mumie-program is user-friendly.

Again the students could comment on this topic:

- Needs a better documentation on how to use Mumie(14x)
- Firefox only, not user-friendly (5x)
- Difficult to insert math symbols (5x)
- Not clear what exercises have/havent been done and within what time frame (4x)
- Answer box not big enough (3x)
- Tree is not easy to use (2x)
- Interface sometimes confusing (2x)

12. **Do you recommend the Mumie program for the Linear Algebra course (wi1403lr)?**

70% of the students (strongly) recommends using Mumie for the course.
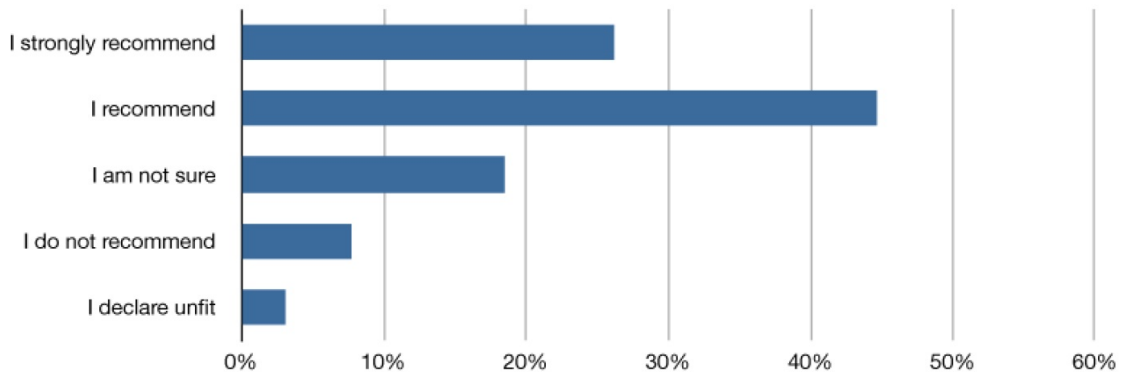
Illustration 12: Do you recommend the Mumie program for the Linear Algebra course wi1403lr?

At this last question students could also leave a comment:

- Motivates to do the course (7x)
- Motivates to learn during college period (6x)
- Useful, but needs improving (6x)
- Good to train skills (5x)
- Helps in understanding (5x)
- Book is good enough (3x)

5 Conclusion of the pilot

In this chapter a conclusion will be made regarding the successfulness of the Mumie pilot. How did the students experience it? How was it to build a Linear Algebra course for Mumie? Would it be interesting to implement Mumie for an entire course? In the first paragraph a conclusion from the student point of view will be made, followed by conclusions from the development side in the second paragraph. Improvements and recommendations will be discussed in Chapter 6.

5.1 Student conclusions

The main conclusion from the feedback is that students find Mumie usefull, around 70% of the students recommend the Mumie program for future courses. They also suggest improvements on certain points, these will be covered in the next Chapter. In the survey, the most recurring point mentioned by students is that Mumie motivates them to actively study the course. The reason for this is the interactive applets (demos and training), these make it easier to understand the material.

The introduction to Mumie should be better, this can be done by improving the documentation. Students have indicated they have some trouble getting started with Mumie. However, once they are familiar with the environment they are happy in general.

5.2 Mumie authoring team conclusions

The development of the Mumie pilot has gone pretty smooth. It has been a great advantage to use the material from Berlin as a base and work from there. This saves quite a lot of time since one doesn't have to start from scratch. The amount of time it takes to produce new content is one of the concerns. Of course for the pilot all procedures had to be learned from the beginning which takes quite a lot of time too. However once this process is optimized and everybody is familiar with the workflow this shouldn't be too much of a problem.

In the ideal situation the teacher should have control over all content. For the Mumie-TEX files this is doable, especially now it is possible to make templates for common structures in documents. The mathlets used in Mumie are a different story. Since these mathlets are completely build in Java it will be difficult for a teacher to edit or create mathlets, since it is not common for them to be able to program in Java.

In the end, creating new content from scratch will always take quite some time. In that regard it is equivalent to writing a book. Having said that, once the content has been made, it can be reused with minimal effort.

6 Future plans, improvements and recommendations

What will happen next? In the first paragraph the future plans for Mumie at TU Delft will be presented. Followed by a list of improvements and recommendations that will increase the quality and usability of Mumie.

6.1 Future plans

The future of Mumie at TU Delft depended for a great deal on the outcome of the pilot. Because the pilot has been successful, the next step can be taken. That is, implementing the complete Linear Algebra course for Aerospace Engineering in Mumie so that it can be used for the course in 2011, starting at the end of October.

At first the same approach for the pilot will be made. Take as much relevant content as possible from available courses and use this as a base. With the pilot the focus has never been adding our own content to the course. However if this is done for the complete course this will improve the integration with existing material. When talking about adding our own content, this includes both theoretical material as exercises.

6.2 Improvements and recommendations

Even though the pilot has been a success, students have brought up points that will need improving for future use. These, together with the experiences gained during the development of the pilot, will be discussed next. All points are grouped by topic and given either an **I** (improvement) or **R** (recommendation). Points given an **I** should be correct for future course and points with a **R** could be corrected.

Structure

- **I** - The way timeframes are displayed should be changed. At the moment students have to click on every exercise block (pre-learning or homework) to see when the timeframe ends. From the course overview they can only see if a block is closed or open by its color. It would be good to add an overview of all timeframes together for a selected course.

- **I** - A student can't easily see what exercises he has done or still needs to do. This could be indicated with a colour for example.

- **R** - Make it visible which blocks contain mathlets in the tree structure, for example with a little icon.

Workflow

- **I** - The field where students fill in their answer should be made bigger. At the moment it only expands in size when it looses focus.

- **R** - The insertion of math symbols should be made easier, mainly the insertion of Greek symbols such as lambda.

Documentation

I - The field with the initial learning curve for students should be reduced. This can be done in several   ways:

- Presenting an outline of the student workflow on the wiki. At the moment there is some documentation for a student, but this just describes the individual sections that are present in Mumie. This outline can be given in text, but a screencast might be interesting as well.

- Giving a small demonstration at the lecture to all students participating in the course.

Implementation of the course

- **R** - How should the pre-learning phase be implemented at TU Delft? For the pilot this part was not mandatory.

- **R** - Do we give any meaning to the tree structure? In the pilot we used the tree from TU Berlin and cut away all unnecessary blocks, however some logic can be applied to how the blocks are positioned.

- **R** - Think on how to use the bonus system for students using Mumie. For the pilot students could get a bonus point when they scored 50% or more on the homework exercises. Are there other approaches that are more effective?

- **R** - How can the procedure for creating accounts be automated. Is it an idea to make a separate website where students can create there own accounts, can blackboard be used for this purpose?

A Processed data from survey

Here you can find the processed comments and remarks made by students in the survey. All comments in a group have been grouped by their topic. This way the comments can be summarised. Behind each group there is a multiplier indicating how many comments are in the group, the higher this number the more important is the feedback.

Feedback on why exercises havent been made

Bad planning (5x)

(502125) - Tijdnood, slecht plannen van mijn kant zorgde ervoor dat ik niet alles kon invullen voor de deadlines.
(500899) - I started studying ch5 and ch7 in April, when the whole thing was over.
(497796) - I had not enough time for the last session
(497497) - It was to late that I realized that i was far behind schedule. Already when the MUMIE pilot started I was to far behind to understand te exercises. Then it was hard to catch up again. If I had made my homework from the beginning on I would have made the exercises of the pilot. - I missed the last deadline, so I was not able to complete the last block of assignments.

Problems with time frame (5x)

(497732) - The first deadline was 22 March 00:00, which I thought meant the night from 22 March to 23 March, but when I tried to do the exercise, I noticed it was closed at 21 March 23:59. This was a shame because these were exercises counting for 18 points.
(497632) - Wasn't so sure about when we were supposed to do it..and then i heard about the dead line and i didn't have time.
(497486) - The deadline for the first part was over before the end of march. I understood that we had the month march. And that the time was in the order of minutes regarding to the time to answer a question.
(497483) - I thought the first deadline was 24 hours later (it was indicated it was at 00:00, and that was the start of that day end not the end as I thought)) For the second deadline exercises, I started too late too work on the exercises, because I made first all the exercises in the book and afterwards I realised that the exercises in MUMIE itself took a lot more time than I had planned.
(497480) - The delivery date of the exercises was also unclear... i wanted to fill in my last answers for the first questions on the 22nd of march, but it already closed at noon or something like that.

Busy with other things (4x)

(497733) - I have done none of the exercises because I was too busy with other subjects. I already studied linear last year, however I couldn't take the exam because I got very ill. I became part of the new bachelors but I have also second year courses and I am very busy with the lustrum of the studentorganisation at the faculty.

(497612) - I was busy with other activities and courses, so I forgot about Mumie completely. I did check Mumie out with another student, but I never worked on it on my own.

(497482) - Too little time

(497478) - My attention was not completely turned towards my study in general, because of housing problems. I had to make priorities and other courses, like our project, were first in line.

Didn't know how fill in exercises (4x)

(497676) - Because I didn't understand how to do it. And I hadn't time to come to lectures because I am at the 2nd year.

(502760) - Because I've forgot to save all the made exercises

(497487) - While making the first exercises to be handed in I did not get the concept on how to change the question to fill in (later I read how to do it). Therefore I also failed the course. A different button for each part of a exercise would be very useful.

(497480) - The exercise system was very vague. At first i didn't understand the difference between the exercises and the training parts. I was also not sure how to submit the answers for the final exercises.

Not understanding the exercise(s) (4x)

(497730) - alleen van het laatste blok heb ik die met de vector velden niet gedaan: dat je zelf eenmatrix in moet voeren en dan de vector velden ziet veranderen. Deze begreep ik, en de anderen die ook mummie deden ook, niet.

(497509) - The first part of the exercise was not too difficult if you use the book and the demos, but the second part was too hard and difficult; even with the book and demos it was not clear how to solve the questions. The background information of the second part was only discussing the most simplest questions, not the one on the level of the real [homework] exercise.

(497496) - because in the last exercise (week 3) there were 3x3 matrices, and every time i tried to solve them, i did something wrong and ended up with a terrible insolvable problem, after which i just gave up, because i had enough of those matrices

(497495) - I've done most, but still I will answer this. The few I haven't done were just because I had no idea how to do them.

Other

(497508) - The obligated exercises where doable without the demos, training and pre-learning sessions. Because for time related reasons, I choose to do only the obligated ones.

- I did all the exercises.

(498230) - There was no advantage over reading and studying the book. The book gives even more overview over the material and provides a foresight on how much work has to be done. Secondly reading and studying from a book (i.e. paper, not a screen) works much better for me. Contribution of Mumie to your understanding of the material of the Linear Algebra course(wi1403lr) in the period of March 2010.

Motivates to try stuff (6x)

(498141) - Mumie made learning a lot more "playful" for me. It really motivated me and it was great to get out of the book and try some stuff in the demos and training.
(497757) - I found the demos and trainings very useful while studying, because the demos were clear and concise (unlike the book sometimes) and it was nice that there was a 'new training' button, so I could practice until I was done or skip a question if it was too difficult.
(497728) - with the mumie you get this problem in front of you, and with your book and some of the theory files on mumie you start digging. How does this work, why, what do you do next, what if... etc. this way you're working very intensively.
(497514) - I found the training and demos very useful to get in the right mood for the homework
(497494) - Since I was attending the lectures I knew the basic principles.
Together with the (pre-)exercises I was able to understand the material even without the actual "written down lectures". However the training exercises were really my favorite part of the whole system.
(497493) - As a preparation for the exercises, it was very motivating and helpful!

Helps to understand the theory (6x)

(497517) - It helps to understand the theory
(497496) - the training didn't always help me with the exercises. but it did help me with understanding the subject better, or sometimes at least.
(497488) - The demos were a very good tool to complete the exercises.
(497479) - MUMIE heeft mij geholpen om de leerstof beter te begrijpen. De demo's waren heel handig als je niet wist hoe een oefening moest opgelost worden en kon je ook gebruiken voor het oplossen van oefeningen uit Lay.
(497470) - Yes, they where all related to each other. I got the feeling i learned something.
(497509) - I think the book is more helpful, but that is just a personal taste. However, in particularly the demos [not all of them] made it "visually" more clear about the matter.

Sometimes needs more explanation (3x)

(497730) - ja ze waren zeer nuttig maar er mag soms wel wat meer uitleg bij waarom sommige stappen gedaan worden.
(497487) - Some of them were like the exercises to be handed in but it did not show to solve the problem. An example of this is 'Problem 1 Differential Equations and Solutions'. Here you can toy around with the functions but it does not show how to solve the/a problem, while you should learn something from the exercise.
(497478) - Minimal amount of explanation of the material was not helpful, more elaborate overview of the algorithms for example would be useful.

Forces to study during lecture (2x)

(497490) - The main advantage is that it forced me to study during the lecture weeks instead of just before the exam.

(497483) - The MUMIE project made me start in time to catch up with linear algebra, although I didn't finish it (see previous comment why).

Needs more feedback from corrector (2x) (497509) - The demos were sometimes useful, but the training was not motivating. If you filled in the answer that you calculated, you only could see whether it was correct or not. It's okay to see when you have correct answers, but if this is not the case then you will get stuck on that subject. When mistakes are made, you don't know where it went wrong. So the feedback of the training was not good. If the training had given some of computed answer of the training question, then is was perhaps a good motivation and therefore a good feedback for the student.

(497500) - The training exercises did not give you an idea of what you did wrong and what the answer should be. The program only tells you if it is completely right or wrong. It would be useful if the program would tell you for each sub-question if it is correct, so you can see if you are on the good track.

Too abstract (2x)

(497502) - Some were a little abstract
(497501) - Some were very abstract; could not draw parallels to real exam situations.

Demo and training are to similar to each other (2x)

(497649) - Some trainings were unnecessary because they were exactly the same as the demo part (in the graphic scenarios)
(497500) - a lot of overlap between the demos and training

Doesn't always follow the book (2x)

(497498) - Some of the exercises were exactly like the material asked in the book. But some were quite different. Especially the last ones where you had to construct a matrix with x0 with certain differential equations. In my opinion this was quite difficult and hard to do. As well as some exercises of part one where you had to build a matrix. Because the book gives you every time a certain matrix and you just have to do some exercises with it. This was the other way around, which made it quite difficult.
(497495) - Sometimes they were, sometimes they really helped, but sometimes they didn't help at all. For instants, I was not sure what to do in the assignment 3 when you had a directional vector y. In the demos there were only examples with x0, but I already knew how to do that...

Demos don't correspond to exercises (2x)

(498046) - The demos did not really correspond that much with the exercises.
(497972) - The demos and training were very easy compared to the exercises, so maybe the demos themselves were motivating, but when one got to the exercises one was demotivated because they sometimes differed (largely) from the demos and training

Other

(502125) - Soms was het iets te makkelijk om met de demo's achter het antwoord op je "exercise to be sent" te komen.

(497760) - there was just only one exercise I couldn't do due to not sufficient demo or training about this exercise, and it was in the third homework sheet exercises and it was question 1 about integrals in vector space. If the demos and training were more teaching, I could have done the exercise as well.

(497497) - The differential equation exercises of paragraph 5.7 Lay gave a good visualization of vector fields and the effect of the matrix on them.

(497484) - The 5th HW exercise was rather hard to understand as there were no explanations accompanying the graphing applet. I didn't really understand what the question was trying to ask.

(497477) - In the demo part of the project, you could see if you really understand the exercise

(497471) - the level of excursuses were way more difficult than the regular homework, too large matrices for example

(498230) - Responsible students study from the book for whatsoever. They hardly get more motivated by some computer projects like MUMIE. With all respect for giving it a shot, for me it was no good for motivating me. However it was not bad either so for the rest of the students it might be good.

(497486) - only the extra point was motivating. I liked the book more and understood the material with help of lectures/ self study from book.

(497732) - I think it is a shame the exercises of Mumie only covered the few last paragraphs of linear algebra.

(497482) - They were motivating in the sense that they showed me I couldn't do anything with linear algebra yet, so they motivated me to start studying hard.

(497503) - Whereas the exercises in Lay rely mostly on the understanding of the linear algebra material, I found the mumie exercises to be rather just applying the same repetitive algorithms over and over again.

Did Mumie help you with the exercises in Lay as prescribed by the Study Guide of Linear Algebra (wi1403lr)?

Some exercises are different from the book (5x)

(497972) - Some aspects were really helpful, while some other aspects did not correspond to the exercises in the book at all.

(497732) - I think the questions in the book are asked in a very different way, but still, Mumie helped a bit, of course.

(497723) - Sometimes they were different from the exercises in the book.

(497515) - The subjects from the pilot didn't really match with the exercises from Lay.

(497487) - Some exercises on Mumie were not like the exercises in the book at all. An example of this is 'Problem 1 Differential Equations and Solutions'. In the book they don't mention vector fields while they are introduced in this exercise.

Demos and training were useful (4x)

(497498) - The demos and training was more helpful than the theory and summary of the "lecture". Maybe in the future it will be a good point to add a second example to the

training. Because sometimes you do not completely understand the example and in some cases it was not possible to look it up in the book neither. So then the chance of passing the exercise is quite low.

(497494) - The material explanation in Lay is really good (so I did not really used the MUMIE explanations), the MUMIE exercises and pre-exercises were fairly helpful though (especially the direct feedback of the randomly generated training tasks).

(497490) - Mumie makes it more visual and easier to understand

(498141) - Mumie made some of the exercises in the book unnecessary, because I had already mastered them in the training and demos.

Other (497479) - Zoals hierboven reeds gezegd, dit was handig voor de oefingen uit Lay beter te begrijpen.

(502125) - Door mumie te doen, snapte ik het hoofdstuk over eigenwaarden veel sneller.

(498230) - The level is equal. The only way it is going to substantially help someone is that you actually practice more by doing the Mumie-exercises first.

(498046) - As I did the exercises in Lay first, I skipped most of the demos in Mumie.

(497760) - since the pre-learning exercises were similar to homework in terms of the content of the questions and the solution method,it helped me quite a lot.

(497730) - Bij sommige opdrachten had je de theorie niet hoeven lezen... je kon gewoon naar het voorbeeld kijken en het zelfde doen.. dat is niet zo handig want dan ga je niet meer kijken waarom je iets moet doen, of hoe het nou precies in elkaar zit.

(497649) - The procedure of finding the eigenvectors wasn't explained at all. Part 2 of the last problem wasn't explained either, just a formula but not the procedure how to get the right matrix. In that exercise the demo was useless.

(497503) - Not really, as stated above I find the exercises in Lay (combined with for example the cramster website) to be more useful in the learning process.

(497485) - A good step by step approach of a problem.

(497493) - Making exercises is always something that improves your knowledge.

(497470) - Yes, now i had the opportunity to check my knowledge on the subject with the training before i started the exercises.

(497514) - The MUMIE project only contained practical problems, and not as much theory as in Lay. I did not mind because it helped me understand the general principles of for example eigenvectors.

Structure and user-friendliness of the Mumie program

Needs a better introduction (wiki) (14x)

(498141) - The program is well structured, but it takes quite a while to figure out this structure. I can imagine it is hard for some people, it certainly was for me in the beginning. An explanation about the structure (clearer than the one on the wiki page) would help.

(497757) - In the beginning it was quite hard to figure out what to do, because there were different squares and colors and I didn't really know how to fill in answers. There was not a lot of text explaining the structure of the Mumie program. Sometimes I tried to look something up in the Help or the Mumie-wiki when I had a problem but it usually wasn't

very clear, because there was very little information for the users, and a lot for people who were scripting with mumie.

(497728) - even though there is this link to the wikipedia site explaining a lot, the site doesn't give you a good 'overview' in my opinion. for everything you want to see, you have to click a couple of times before you've found it

(497637) - It also took me some minutes to find the exercises (you had to click on the green block).

(497517) - The structure of how the program is build is not clear at the beginning. I think that is something very important, because if at he beginning the structure of such a program is not clear the motivation for going further decreases.

(497515) - It took a while before I understood how everything worked.

(497514) - The structure of the webpage is quite unclear, once you get the poppup, its allright

(497503) - The mumie structure was extremely unclear to me, I did not understand what we were required to do before my teacher explained it.

(497498) - In the beginning, when just starting Mumie, I couldn't find the exercises (the right blocks) and that was not really well indicated. After that I fully understood the Mumie-program, because it works actually very simple.

(497495) - I think it's not perfect, some things were because of how you guys structured it, some were cause of the program itself, in my opinion. An important thing was that it was not 100% clear which ones we HAD to fill in, and which ones were optional. A document at the start including the following would be nice for next time: - Explanation of all things, what are the prelearning exercises, the demos, the training and the homework exercises

(497488) - It took some time before I completely understood the Mumie-website, but after all it was very good structured.

(497486) - It was easy to get around after some minutes.

(497483) - Sometimes it is not clear what to do,

(497479) - Als je eenmaal weet hoe het werkt, is MUMIE zeer gebruiksvriendelijk. In het begin kon ik er maar weinig aan uit, maar uiteindelijk is het beter en beter gaan gaan (zeker na de uitleg van Dhr Daalderop).

Firefox only not user-friendly (5x)

(497760) - it would be better if the software were able to function on google chrome as well.

(497757) - Also, the fact that mumie only worked on firefox was a real disadvantage when I was not at home and didn't have my laptop with me.

(497637) - requiring Firefox isn't user-friendly

(497508) - Only the fact that you have to use Firefox is a (very small) disadvantage.

(497498) - I had to install Firefox as well, but that didn't take much time

Difficult to insert maths symbols (5x)
(497502) - inserting values such as lambda and exponential function were a little difficult.
(497501) - Mathematical symbols and exponents are difficult to insert in the equations.

(497496) - the wiki isn't that clear, and lambda could be put more in the exercises as, this is how you write a lambda.

(497494) - no convenient lambda-character insertion possibility (copy paste impossible) for a characteristic equation.

(497483) - how to enter answers was not always clear. For example I did not know how to enter $e^($x) which apparently was exp(x)

Not clear what/when exercises have been/have to be done (4x)

(497495) - Also, something that would be very nice at the start would be a list like this: Assignment Deadline 1 xx-xx-2010 2 xx-xx-2010 3 xx-xx-2010 Off course you can see this separately, but... When I saw the deadline of the 2nd one, I thought oh the 3rd one will probably be a week after or so, but the night of the deadline I found out that the 3rd assignment was also due that wednesday night...

(497494) - no list-like overview over things that have to be done (and already have been solved), etc.

(497480) - As said before, not clear how to hand in exercises for grading and grading period.

(497477) - in the beginning I had some difficulties with finding the exercises which had to handed in.

Answer box not big enough (3x)

(497502) - the spaces to insert answers were not big enough

(497494) - a small 1-by-1 character sized textbox for a whole equation

(497473) - Certain things should still be improved, such as the size of some answer boxes, etc.

Tree is not easy to use (2x)

(498239) - The tree was not that easy to use, there were too many different blocks.

(497509) - The overall structure was good, but the background information that is provide in the "Lecture boxes" were not adding practical knowledge for the [homework]exercise. Only the demos demonstrated a better picture of the matter, but the boxes indicated with 'M' , 'D', 'T' or 'Al' were not always to the point or didn't provided useful information.

Interface sometimes confusing (2x)

(497649) - Could be better structured, not so many sub folders and bigger buttons.

(497637) - The interface was sometimes confusing, and it was difficult to move from demo's to exercises and vice versa.

Other

(498046) - Could be easier to understand and more user friendly.

(497723) - The program is nice to work with. Especially the demos and the graph plotting were good. These gave me a picture of what I was actually doing!

(497972) - It is user friendly, but it 'crashed' relatively often

(497633) - The first deadline was due to 00:00 on a monday, but it closed half an hour too early. This resulted in me not being able to fill in my all my answers and consequently

only get a 40% pass for the main part of the exercises, I just made it above 50% on the total exercises (including the pre-learning exercises)

(497493) - Thanks to the 'tree-system'.

(497490) - Relatively easy to use and solve exercises.

(497487) - It is very easy to go in a loop while working on Mumie while searching for something. Furthermore the deadline for the exercises to be handed in could be on a better day of the week. A deadline on a Friday is much more natural than on a Wednesday.

(497482) - The applet structure, the interface and the many steps needed to be able to enter an answer are not exactly user-friendly in my opinion.

(497478) - Browsing the structure was unnatural and applets were too simplistic.

(497732) - The 'next problem' button in the program did not work (maybe because of my computer instead of the program), so I continually had to go back to the home page. General questions.

Motivates to do the course (7x)

(498141) - The mumie program certainly is a great addition too the course. It is motivating and makes making exercises much easier and more fun than the book.

(497728) - the mumie program, really makes you sit down and deal with the problems. this way you really get sucked in to the subject

(497514) - I really enjoyed the mummie project, especially since the exercises match the exam material well.

(497490) - Its an effective way to study

(497488) - I think it would encourage students to study the theory of linear algebra

(497479) - Het is goed om een beter inzicht te krijgen in de Lineaire algebra cursus. Je gaat wat dieper nadenken over problemen en op zoek naar handige oplossingen.

(497477) - It's very helpful for the student to study lineair algebra with some help from the mumie project

Motivates to learn during college period (6x)

(502125) - Net als COZ bij bijvoorbeeld het vak Statics (AE1103) motiveert Mumie je om in de college weken aan het vak te werken. Ook al heb ik het bonuspunt waarschijnlijk niet gehaald, heeft Mumie er wel voor gezorgd dat ik zeer waarschijnlijk het tentamen wel heb gehaald.

(497730) - Strongly recommend, Want dan houd je het bij. ik ken genoeg mensen die pas in de witte week beginnen... terwijl lin alg gewoon een vak is dat je moet bijhouden.

(497500) - useful to practice during the lecture period.

(497498) - I strongly recommend the Mumie program for the Linear Algebra course. Because especially doing the demos and trainings will give you a good overview of what you're actually doing multiplying and calculating all matrices and vectors. That is a really strong point of the program. And off course by doing the exercises you are forced to study the book and think about the material. This is always a good thing! And many people need this to not just begin with studying just a week before the exam. The theory and the

lectures of the Mumie program was okay, but not very spectacular. The definitions were already published in the book and no further examples were given by the theory.

(497487) - If it would be upgraded it would be a very good program and idea to use for the Linear Algebra course wi1403lr. It will stimulate people to go to the lectures and do their homework because during the classes there would be only 6 people of the 30 showing up. A good advice would be to look at the on-line exercises of AE1103 'Statics' because they had a better structure and the site was more user-friendly.

(497486) - The part that is best is probably that one has a deadline a week before the exam.

Needs improving (6x)

(497649) - It helped me a lot with the eigenvectors but there should be more exercises, it's pretty easy for a whole bonus point compared to calculus II. It would be better to structure the whole program like COZ; submit and receive the answer if it's right or wrong at once and maybe even more than one try.

(497637) - The course was too short, if it becomes part of Lineair Algebra it should be bigger, and all material should be part of the exams.

(497633) - Deadlines shouldn't close too early and the structure of Mumie could be better. With the structure I mostly mean the menu on the left, which to me doesn't work in a 'natural' way. I don't like the buttons at the bottom to browse through.

(497521) - Een goed initiatief. Het moet wel veel beter uitgewerkt worden en is (zeker op het eerste gezicht) vrij onduidelijk met die bomen (trees) e.d..

(497517) - You have to spend time for it but you learn and that is the most important.

(497495) - There can be made some improvements, but overall I think that the program can really be useful.

Good to train skills (5x)

(498141) - Especially the demo, training, exercise structure and the possibility to generate as many training questions as wanted are really good.

(497972) - It is good to train your skills using MUMIE

(497508) - Certainly the obligated (homework) exercises in MUMIE where very useful to understand the course material.

(497502) - It is good practice and should be done every week to help students understand the principles of linear algebra.

(497494) - This strongly depends on the purpose. As a COZ-like "requirement" (eg. like AE1103, AE1202) the system is definitely too "unfinished". With the general opportunity of gaining a bonus point it would be too easy (since those kinds of exercises could too easily just be calculated by MatLab etc). However it is a nice tool to practice your skills (with the direct feedback tasks, (which are unnecessarily not accessible anymore (why?)).

Helps in understanding (5x)

(497760) - I think it was very helpful in terms of understanding the last subjects of this course. it could be better to include all other subjects of linear algebra course in order to have a better grasp of other subjects as well.

(497757) - The theory, demos, trainings and exercises were really useful to study linear algebra, because the theory was explained more clearly and simple than in the book or during lectures and the demos and exercises were interactive, which was a real advantage over the book. With the applets its easier to visualize matrices and it's possible to practice what you want until you've completely understood it.

(497497) - Particularly nice is the possibility to change all kinds of values and watch the effect of that on the matrix transformation. Or on the differential equation with vector field.

(497496) - helps you visualize lineair algebra. which is at least for me, quite useful since i couldn't do that very well.

(497484) - I feel that by tell us to learn ourselves, we learn faster, and the demos allowed us to test if our theories were correct before entering the answer itself for the HW exercises. In fact, I feel that this method of teaching should be extended to other courses as well(b.v.b. Statics, Mechanics of Materials). I feel that the bonus point for this activity was very attractive and motivating, and it really makes me feel that my effort for this exercise was worth it.

Book is good enough (3x)

(498230) - Might only hold for me as (I think myself) being a responsible student taking care of his own business.

(497732) - I think the book provides enough exercises to study.

(497509) - I can not recommend this to the students, because this pilot requires a lot of time and the obtained knowledge is not directly striking the exam matter. The time that I have put in this pilot I could better use it for the book and the exam exercises. What I strongly do recommend is that it is much better to attend the lecture of the teacher and just read the book. It will help you to understand Linear Algebra ten times better than any other kind of practical teaching system. I wish I could attend the teacher's lectures, but as a second year student I couldn't match my second years time table with the class lectures, so that was a little bit pitiful.

Other

(497757) - Compared to other exercise programs used for other courses though, it was sometimes annoying that you had to wait for the results of the exercises and that you only had one attempt.

(497732) - Also, the most difficult part of linear algebra is in my opinion the true/false questions, which are not asked in mumie.

(497723) - I'm not sure people will make these exercises when it's not mandatory. For us it was a good stimulans that we could get a bonuspoint. When there will be some mandatory in the mumie program it will help people to actually understand linear algebra better.

(497503) - I did not feel that I learned anything using the mumie program. The exercises did not cover the chronology of the classes and the deadlines were rather poorly chosen.

(497501) - It should be made a fortnightly exercise; like COZ for the Statics, Mechanics and Dynamics courses.

(497480) - Absolutely not user friendly, badly structured and counterintuitive!
(497470) - I recommend this program to the others.
(xxxxxx)- the project was too extended, and took too much time. If I new this in advance, I wouldn't have started the Mumie
(498046) - It is always good to practice but doing all the exercises in Lay would probably have the same effect.

Other remarks and comments

Mistakes

(502125) - Bij sommige demo's werden foute antwoorden goedgekeurd bij het zoeken naar eigenvalues en bijbehorende eigenvectoren: Bij "Example Tensor of inertia. Diagonalization" bijvoorbeeld, heb je vaak 2 verschillende eigenvalues en 2 verschillende bijhorende eigenvectoren. Je kon echter de vectoren bij de verkeerde values invoeren, en die werden dan toch goedgekeurd. Het kwam zelfs voor dat je 2 keer dezelfde eigenvector kon invoeren bij 2 verschillende eigenvalues, wat goedgekeurd werd.
(497972) - I don't think it is a bad idea to incorporate MUMIE in next year's course, but some exercises need to be reviewed.
(497628) - Some of the exercises were not feed in rightly with respect to the numbers. For example: X22 meant $X2^2$ or 41 meant position vector [4 ; 1]. This can be confusing and should be taken care of.
(497479) - DE getallen waren niet altijd even 'rekenvriendelijk'.

Recommendation

(498141) - In case the program would be included in the course I would recommend a possibility too check your answers to the homework exercises immediately and retry the question in case the first answer was wrong.
(497517) - Try to make it available for all the internet browsers (chrome, explorer,...) that makes it a lot easier. I personally had to download firefox for this, and after installing I had problems to work with mummie because of java. I fixed it but I hope that for another time it will be better.
(497503) - This kind of system would be more of a use in exercise-bound courses such as calculus (opposed to the more theoretical linear algebra course).
(497480) - Just use the Coz systems used by mechanics of materials and statics, those were really intuitive and user friendly, unlike this mumie version.
(497473) - In all, this was a very good opportunity that helped with some understanding of the material. It still has some bugs, but I'm sure that will corrected in the next versions. I'd suggest placing a report button in the different sections so that when there is a bug it is possible for students to quickly report it.

Deadline

(500899) - Deadline should have been extended until the day before the exam.
(497498) - The only that seems to me a little bit strange is the limited places and the early deadline (just one day after sending the email about it). Because of that a lot of

students didn't even know about the Mumie pilot before the deadline. My opinion is that when we are dealing with getting bonuspoints, the system should be open for all students. In case you need more information, please contact me! Kind regards, Elise Tramper e.m.tramper@student.tudelft.nl

(497474) - I was really looking forward to the MUMIE Pilot Course, but I wasn't able to complete the course for the simple reason that for the first 2 deadlines (22nd march and 1st april) I was locked out of the webpage, so I could not access the assignments so that I could enter my answers. This was very frustrating. The material however, was very useful, and helped a lot in learning for the Linear Algebra course, although in places, content could have been better explained. Hopefully the MUMIE Course is improved so that it isn't as frustrating for students in the future.

Other

(498230) - Thank you for the opportunity of helping you out. I wish you good luck on implementing the results in practice.

(502125) - is Mumie toch erg handig voor mij gebleken. Ik denk ook dat voor bijvoorbeeld volgend jaar, een dergelijk systeem voor alle studenten zal worden geapprecieerd.

(498046) - In general a good idea especially for people that are rather lazy. But as I said before doing all the recommended exercises in Lay would have the same result.

(497612) - I was sadly enough unable to do the exercises and I only have myself to blame for that. For what it's worth though, what I saw of the Mumie exercises was very encouraging and the set-up is good. Maybe an extra email or two would've helped, but again, it's just me own fault.

(497514) - I think Mumie will prepare students better for the exam. Lay misses examples, where MUMIE has many. Thank you for having me participate.

(497509) - I want to thank sir Van Kints and sir Daalderop for their quick response to my mails regarding the mumie pilot problems and for their helpful advices. This is most important part of every test: the service and the willingness to help, which reassure the students when they are dealing with problems. They both were helpful and therefore prevented stressful situations.

(497494) - Two parts I totally liked about MUMIE are on the one hand the real time visualizations of matrix transformations, which gave a wonderful view into how vectors behave in R2 and what happens if they lie in eigenspaces. On the other hand there were randomly generated training exercises on all topics (with the possibility of immediate error-checking). This was one of the features I liked best, because you could directly see wether of not you understood the solving method for a particular problem.

(497487) - To learn more from Mumie a number of trails to solve an exercise (especially if there is a mandatory percentage to have correct) should be introduced. An example of this: 3 trails where you get 25% off for every next trial you have to use. A good feature of Mumie is that you get to see your answer and the answer it should have been. With this feature you can find your mistake and learn from it.

(497485) - THis project gave me a good view on the difficult topics of the course. It helped me understanding and learning linear algebra. While i'm studying for the exam now, i

often go back to the 'mumie examples' for training difficult exercises with demo's etc. - the program itself works quite nice =)

(497732) - I think it is a good initiative to give students the change to earn bonus point.