



## Stichting NIOC en de NIOC kennisbank

Stichting NIOC ([www.nioc.nl](http://www.nioc.nl)) stelt zich conform zijn statuten tot doel: het realiseren van congressen over informatica onderwijs en voorts al hetgeen met een en ander rechtstreeks of zijdelings verband houdt of daartoe bevorderlijk kan zijn, alles in de ruimste zin des woords.

De stichting NIOC neemt de archivering van de resultaten van de congressen voor zijn rekening. De website [www.nioc.nl](http://www.nioc.nl) ontsluit onder "Eerdere congressen" de gearchiveerde websites van eerdere congressen. De vele afzonderlijke congresbijdragen zijn opgenomen in een kennisbank die via dezelfde website onder "NIOC kennisbank" ontsloten wordt.

Op dit moment bevat de NIOC kennisbank alle bijdragen, incl. die van het laatste congres (NIOC2025, gehouden op donderdag 27 maart 2025 jl. en georganiseerd door Hogeschool Windesheim). Bij elkaar zo'n 1500 bijdragen!

We roepen je op, na het lezen van het document dat door jou is gedownload, de auteur(s) feedback te geven. Dit kan door je te registreren als gebruiker van de NIOC kennisbank. Na registratie krijg je bericht hoe in te loggen op de NIOC kennisbank.

Het eerstvolgende NIOC vindt plaats in 2027 en wordt dan georganiseerd door HAN University of Applied Sciences. Zodra daarover meer informatie beschikbaar is, is deze hier te vinden.

Wil je op de hoogte blijven van de ontwikkeling rond Stichting NIOC en de NIOC kennisbank, schrijf je dan in op de nieuwsbrief via

[www.nioc.nl/nioc-kennisbank/aanmelden-nieuwsbrief](http://www.nioc.nl/nioc-kennisbank/aanmelden-nieuwsbrief)

Reacties over de NIOC kennisbank en de inhoud daarvan kun je richten aan de beheerder:

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Vermeld bij reacties jouw naam en telefoonnummer voor nader contact.

## MUMIE, een internationaal wiskundig E-learning pakket en platform

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### *Samenvatting*

MUMIE is een web-based leeromgeving gespecialiseerd in wiskunde. Leren met MUMIE betekent dat studenten actief bezig zijn met het exploreren en ontdekken van concepten, feiten en toepassingen. De voorbeelden, de interactieve visualisaties en oefenmodules verdiepen het begrip van studenten van abstracte concepten, methodes en algoritmes. MUMIE is ontwikkeld in 2000 door de TU Berlin. Verschillende andere universiteiten zijn aangehaakt zoals de RWTH Aachen, ETH Zurich en de TU Delft.

Iedereen kan MUMIE gratis gebruiken met de verplichting om alle resultaten, aanvullingen, vertalingen met elkaar te delen.

De TU Delft heeft een deel van het materiaal dat al door de TU Berlin was gemaakt vertaald van het Duits naar het Engels en aangevuld met nieuwe inhoud. Het materiaal is geschikt gemaakt voor de cursus Lineaire Algebra zoals die wordt aangeboden aan studenten van de Faculteit Lucht- en Ruimtevaart. Er is in studiejaar 2010 een pilot uitgevoerd door MUMIE aan te bieden als extra oefenmateriaal. Aan deze pilot hebben ca. 100 studenten deelgenomen. Ruim tweederde van de studenten die hebben deelgenomen geeft de aanbeveling om MUMIE aan alle studenten aan te bieden. In studiejaar 2011/2012 MUMIE is aangeboden aan alle studenten (520) van de Faculteit Lucht en Ruimtevaart die zich hebben ingeschreven voor het vak Lineaire Algebra. Ruim 300 studenten hebben daadwerkelijk MUMIE gebruikt en een aantal of alle opgaven gemaakt en ingeleverd. De evaluatie laat zien dat 82% van de studenten de aanbeveling doet om MUMIE te gebruiken bij het bestuderen van de leerstof. De interactieve demonstraties en oefensessies van MUMIE motiveren hen om actief de leerstof te bestuderen en bij te houden.

### *Trefwoorden*

Hoger onderwijs, internationalisering, e-learning, share ware, visualisaties, oefenen, motiveren, eerstejaars studenten, studeerbaarheid

## **MUMIE, een internationaal wiskundig E-learning pakket en platform**

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 end users, the pilot has been organised.

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.

### **1 Student conclusions**

The main conclusion from the feedback is that students find Mumie usefull, around 70% of the students who 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 are 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.

### **2 Mumie authoring team conclusions**

The development Mumie pilot has gone pretty smooth. It has been a great advantage that we could 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, it just takes time. Having said that, once the content has been made, it can be reused with minimal effort.

### 3 **Future plans, improvements and recommendations**

In the academic year 2011/2012 MUMIE will be offered as an extra learning tool to all students for the Linear Algebra course at the department Aerospace Engineering. In the following paragraphs we give some information about the implementation and the results.

### 4 **Implementation and results using MUMIE in study year 2011/2012**

The set-up of the course is as follows;

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

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

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

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

#### 4.1 RESULTS

##### 4.1.1 *Survey*

The survey that the students had to work out at the end of the course mainly consisted out of multiple choice question, also the students had the opportunity to leave any comments/remarks/suggestions at the end of the survey. Because this year is the first time Mumie is used at a large scale, feedback from the student is very important for us in order to improve the material for next year(s). For this reason it was mandatory for the students to fill in the questionnaire in order to gain the bonus point. In total 331 students worked out the questionnaire. In this section an overview of the most important results from this survey is given.

##### 4.1.1.1 *Summary of the response to the multiple choice questions*

- 50% of the students attended most or all of the classroom lectures.
- 40% of the students went through most or all of the Lectures from Mumie, these contain the theory and applets with demo and training exercises.

- 80% of the students have done most or all of the homework exercises. The most important reasons for only doing a few of the exercises is:
  - Busy with other things (32%)
  - Bad planning (20%)
  - Did not understand the exercise (17%)
  - Problems with the timeframes (15%)
- 63% of the students thinks the difficulty of the applets in the Lecture part is just right, these applets consist of demo and training exercises in order to help the student understand certain concepts.
- 55% of the students thinks the difficulty of the Homework exercises that were to be handed in at specified deadlines is just right. 33% thinks they are moderately difficult.
- 60% of the students indicate that the applets are (very) helpful to understand the course material.
- 60% of the students (strongly) agrees that the applets motivates them to learn the course.
- 70% of the students thinks the Mumie program is (moderately) helpful for doing the exercises from Lay.
- 70% of the students indicated that Mumie is well structured, or at least enough structured.
- 60% of the students agreed there is enough documentation to help them start with Mumie.
- 70% of the students has no problem entering there solution in the applets.
- 45% of the students (strongly) agrees that it is clear which Homework exercises are done and saved. However 35% (strongly) disagreed to this point.
- 82% of the students (strongly) recommends Mumie for the Li.

## 5 Improvements and recommendations

There is still quite some work that can be done to improve the Linear Algebra course in Mumie. There are 3 topics currently missing in the course; Least-Squares Problems, Symmetric matrices and Quadratic Forms, and work should be done to have these added to the course for next year.

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

Adress website: <https://www.mumie.net/>