Blended Learning project tbv Lineaire Algebra

Opzet, elementen, ervaringen

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Overzicht presentatie

0 *Blended Learning.*
Interactief en activerend onderwijs.

1 In Blackboard (student view)

2 ’Producten" van het project

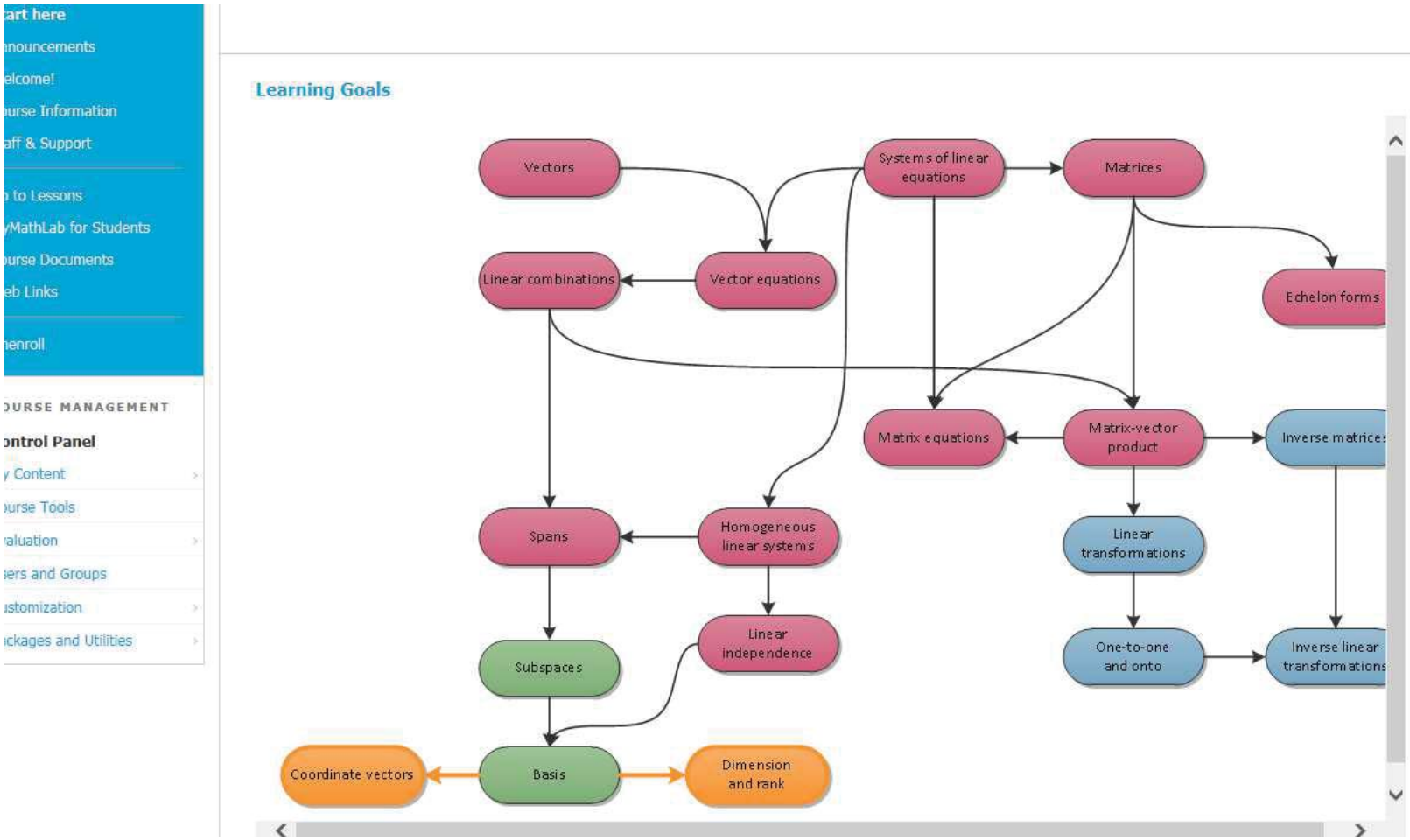
3 Ervaringen (Matthijs Joosten)

4 Slotopmerkingen

1. In Blackboard (student view)

- Learning goals
  + graaf structuur tussen begrippen
- Preparation: watch pre-lecture
- Lecture material: slide pack
- Exercises after lecture:
  → MyMathLab homework + assignments

Blackboard: graph with concepts



2. ’Producten’ van het project

A Pre-lecture video’s

B Slide pack (incl. voorbeelden van toepassingen)

C MyMathLab huiswerk systeem

D *Tussentijdse toets [kort antwoord opgaven]*

E Feedback Fruits (tijdens colstructie)

Uit evaluatie LR-studentgroep:

Course structure

The students feel that the 'new style' is good. It gives the students the opportunity to decide for themselves how to study. Watching the videos and following the lectures is thought to be a good way of better understanding the material. However there are still some students who study solely with the book. Moreover the students feel that for the first lecture, it was not clearly indicated that self-study had to be done before the lecture. An announcement on blackboard would have been helpful.

Exercise material

The students feel that there is sufficient practice material available in the book and during the lectures. Furthermore MyMathlab is a good addition to the course. The students do however think that with MyMathlab they sometimes learn to make questions instead of understanding the material.

Daalderop: That is indeed the problem with digitised exercises. There is a collection which focusses more on grasping the concepts. For next year we will focus more on the concepts, either via Feedback Fruits, homework or exercises in the lectures.

Blackboard

The students feel that the structure of Blackboard is really good. There are flowcharts indicating what should have been learned each lecture and how the lectures and material correlate.

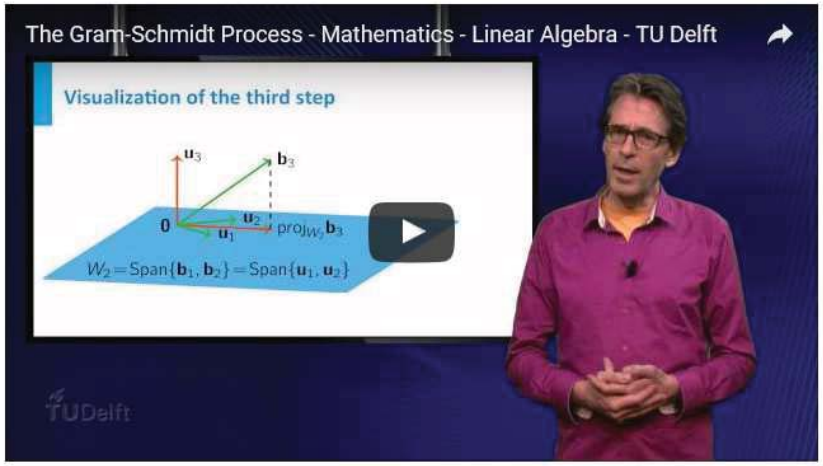
2A. Pre-lecture video's

- Inleidend t.b.v. college (!)
- Aansporing student om zich voor te bereiden
- Check: met Feedback Fruits
- Tijdwinst m.b.t. uitleg tijdens colstructie (?)
- Opmerkingen:
  - strak format [≠ uitleg in college]
  - *actief* leren tijdens 'video kijken'?
  - # kijkers per video: 60 - 220 (gemidd.140)

Pre-lecture video’s

Preparation: watch prelecture

Watch The Gram-Schmidt Process 15 min



Full screen

Does an orthogonal basis always exist? And how can we find such a basis for a given subspace? These are the questions that are tackled in this video. This has everything to do with the Gram-Schmidt process.

Prelecture exercises

To Do My MathLab prelecture exercises 15 min

After watching prelecture *The Gram-Schmidt process* you can answer the corresponding prelecture exercises in MyMathlab.

2A. Slides voor het college

- Overzicht van leerdoelen per colstructie
- Ter ondersteuning van de colstructie:
  definities, stellingen, eigenschappen
- Leidraad
- Beschrijving van toepassingen. Vb:
  - orthogonale projectie bij visualisaties,
  - kleinste kwadraten en gps,
  - traagheidstensor.
- Opm:
  - persoonlijke smaak
  - ‘work in progress’

Toepassing (in slide pack)

Coupled Springs

$$\begin{cases} x_1' &= v_1 \\ mv_1' &= -k_1 x_1 - k_2(x_1 - x_2) \\ x_2' &= v_2 \\ mv_2' &= k_2(x_1 - x_2) - k_3 x_2 \end{cases}$$

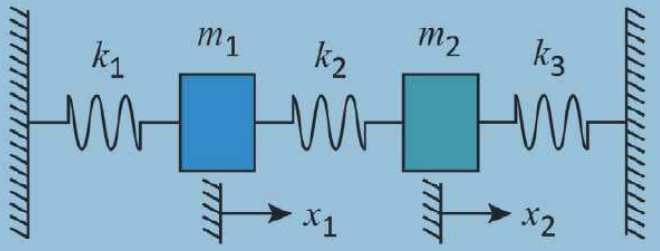


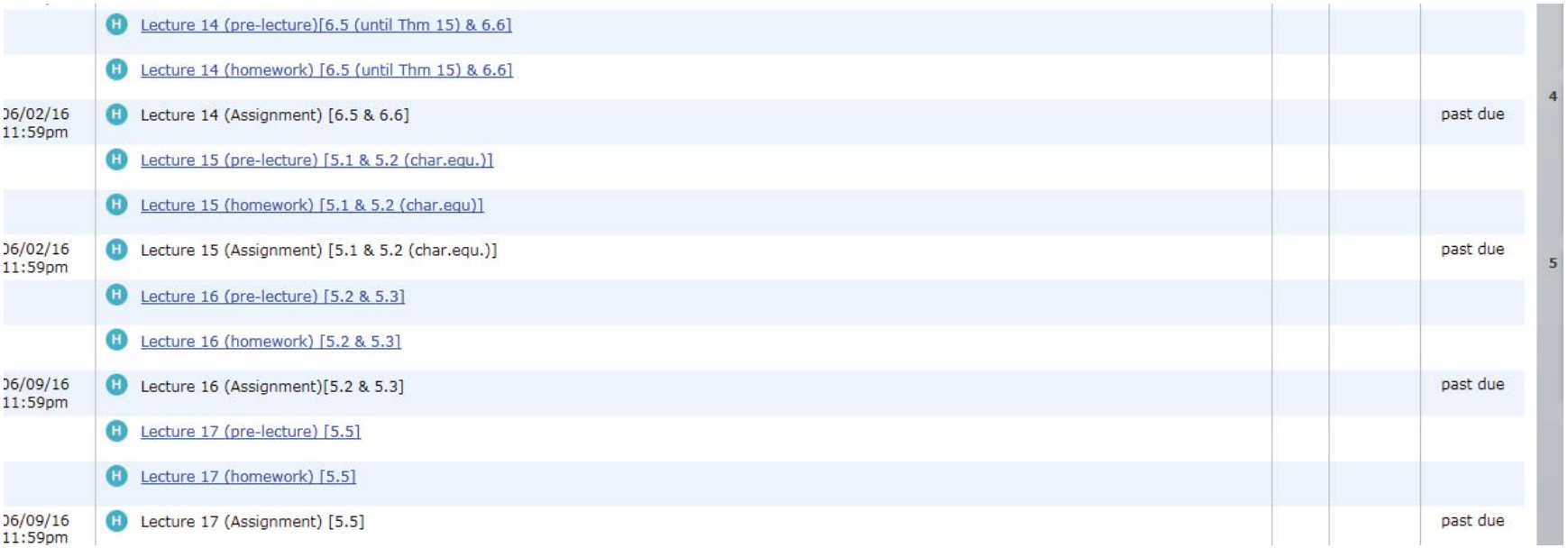
image from AE2135-II

$$\mathbf{x} = \begin{bmatrix} x_1 \\ v_1 \\ x_2 \\ v_2 \end{bmatrix} \longrightarrow \mathbf{x}' = \begin{bmatrix} 0 & 1 & 0 & 0 \\ (-k_1 - k_2)/m & 0 & k_2/m & 0 \\ 0 & 0 & 0 & 1 \\ k_2/m & 0 & (-k_2 - k_3)/m & 0 \end{bmatrix} \mathbf{x}$$

2C. MyMathLab huiswerk

- Onderscheid: zonder/met deadline
- Inspanningen van studenten zichtbaar
  - voor student zelf [⇒ aansporing . . .]
  - voor docent [⇒ feedback . . .]
- Opgaven: gekoppeld aan boek / hints / stappenplan
- Opmerkingen (nadelen):
  - aan uitgever gebonden
  - aard van opgaven: te "recht toe recht aan" vs. tentamen opgaven

MyMathLab:
Pre-lecture, Homework, Assignment



	Lecture 14 (pre-lecture)[6.5 (until Thm 15) & 6.6]				
	Lecture 14 (homework) [6.5 (until Thm 15) & 6.6]				
)6/02/16 11:59pm	Lecture 14 (Assignment) [6.5 & 6.6]			past due	4
	Lecture 15 (pre-lecture) [5.1 & 5.2 (char.equ.)]				
	Lecture 15 (homework) [5.1 & 5.2 (char.equ)]				
)6/02/16 11:59pm	Lecture 15 (Assignment) [5.1 & 5.2 (char.equ.)]			past due	5
	Lecture 16 (pre-lecture) [5.2 & 5.3]				
	Lecture 16 (homework) [5.2 & 5.3]				
)6/09/16 11:59pm	Lecture 16 (Assignment)[5.2 & 5.3]			past due	
	Lecture 17 (pre-lecture) [5.5]				
	Lecture 17 (homework) [5.5]				
)6/09/16 11:59pm	Lecture 17 (Assignment) [5.5]			past due	

2D. Tussentijdse toets (2 uurs)

- In de 4de week (avond)
  over de stof vd eerste 7 colleges [20]
- Kort Antwoord opgaven (nivo ~ tentamen)
- 'Wake up'
  - aansporing tot 'bijhouden'
  - waarschuwing tegen onderschatting
- Niet verplicht (vrijblijv.): 224 deeln. (op 390)
- Resultaat:
  - 82 met score: ≥ 29 vd 50 punten
  - 50 met score: < 20 vd 50 punten

Tussentijdse toets (na 7 lessen)

7 H Let be given the linear transformation

$$T(x_1, x_2, x_3) = (x_1 + 5x_3\,,\ x_3\,,\ -4x_1 + x_2 + 2x_3\,, 5x_1 + x_2)$$

Let A be the standard matrix of this transformation.

i. Determine matrix A.

Answer:

ii. Is the transformation T one-to-one, yes or no?

Answer:

iii. Is the transformation T onto, yes or no?

Answer:

3 I $T : \mathbb{R}^2 \to \mathbb{R}^2$ first performs a vertical shear that leaves $\mathbf{e}_2$ unchanged and maps $\mathbf{e}_1$ into $\mathbf{e}_1 + 3\mathbf{e}_2$, and then reflects points with respect to the line $x_1 = x_2$.
Determine the standard matrix of T.

Answer:

2E. Feedback Fruits

- Opgaven n.a.v. pre-lecture video's
- Opgaven m.b.t. basis concepten
- Bruikbaar voor discussie
  (o.a. door daarna de vraag te variëren)
- Afwisseling 'in de les'
- Participatie (> dan bij vragen 'aan de groep')
- Opmerkingen (nadelen):
  - multiple choice
  - afh. van PC / software / internet
  - vrijblijvende deelname

Feedback Fruits

FeedbackFruits

Applying Gram-Schmidt to the vectors

$$\left\{ \begin{bmatrix} 1 \\ 1 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 0 \\ 1 \\ 1 \\ 1 \end{bmatrix}, \begin{bmatrix} 1 \\ -1 \\ 1 \\ 1 \end{bmatrix} \right\}$$

gives, after rescaling, as third orthogonal vector

A) $\begin{bmatrix} 2 \\ -2 \\ 1 \\ 1 \end{bmatrix}$ B) $\begin{bmatrix} 1 \\ -1 \\ 1 \\ -1 \end{bmatrix}$ C) $\begin{bmatrix} -2 \\ 2 \\ -2 \\ 1 \end{bmatrix}$ D) $\begin{bmatrix} 2 \\ -2 \\ 2 \\ 1 \end{bmatrix}$

3. Aanvullend: context bij LR

- In TU naar verhouding goede studenten.
- Druk (vol) programma [m.n. Progr. cursus & Design and Construction cursus].
- Concurrentie vakken: opdrachten / deeltentamina tijdens college-periode
- Lineaire Algebra: structuur, boek en opgaven [Lay]: leent zich voor zelfstudie.
- In de laatste middaguren, laatste kwartaal.

Opkomst op de colstructie:
vrij snel omlaag naar 5 - 10 - 20 per groep.

4. Slotopmerkingen

- Project: samenwerking en betrokkenheid van diverse docenten (++)
- **‘Work in progress’**
- Infrastructuur (zaalinr., ict) moet kloppen
- Didactiek in dit systeem: m.i. geen sine cure.