

CiC NEXTBOOK

Co-created Interactive Courseware

Project No: 2019-1-UK01-KA203-061669

Case study report - KU Leuven: Preparation for and
feedback after mid-term test Applied Mechanics Part 1,
2022-2023

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The course material of this case study report is available here:

<https://nextbook.io/book/tm1-ttt2022-modeloplossing>

<https://nextbook.io/book/tm1-tt-2021modeloplossing>

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1. Context

This case study reports on an intervention with the interactive courseware platform Nextbook targeted at activating students around the mid-term evaluation (called “tussentijdse toets”) of a first-year bachelor course at KU Leuven..

The case study was executed at KU Leuven in Flanders, Belgium. KU Leuven is a highly ranked research-intensive university both regarding research and education. The course of this case study was a first-year bachelor course in engineering mechanics (Applied Mechanics, part 1), a mandatory course for students in the bachelor of Engineering Science and the bachelor of Engineering Science: Architecture. Applied Mechanics, part 1 is a course with around 700 engineering and engineering architecture students, with a low success rate (around 40%). It is considered to be a hard course by students because it is expected that they can apply basic mechanical principles of statics, dynamics, and kinematics to real-life applications.

2. Challenge

In order for students to be successful in their university studies, academic integration of first-year students is key. First-year students have to get familiar with the expectations of university education, especially regarding exams. To this end, the faculty of Engineering Science of KU Leuven organizes mid-term tests for their first-year students. These mid-term tests take place in the middle of the first semester and provide students with a realistic exam-setting both regarding the content of the exam and the exam circumstances. To motivate students to prepare well for the mid-term tests, the final grade of students who pass the mid-term test will consist of 25% of the score of the mid-term test, provided that it improves the final score. As a result, a student’s final score can only improve based on the mid-term test.

Only half of the students of the bachelor of Engineering Science can participate in the mid-term test of the course. The program draws a lot two two weeks before the actual test to decide which students participate in which two mid-term tests of the four mid-term tests offered. For the bachelor of Engineering Science: architecture, all students can participate in the mid-term test.

Within the course of Applied Mechanics, part 1, students are provided with dedicated preparation material for the mid-term test, and elaborate feedback after the mid-term test. This material is obviously of interest to all students, not only students that participate in the mid-term test.

Compared to the [case study of the previous year in the same course](#), where Nextbook was only used for the feedback on the mid-term test, this case also included the preparation for the mid-term test on Nextbook.

3. Co-creation solution

Both the preparation for the mid-term test and the feedback after the mid-term test was offered on the Nextbook platform to **757 students**.

Preparation for the mid-term test

In the virtual learning environment of the course students were offered preparatory material for the mid-term test, built around the mid-term test of the previous year.

The screenshot shows a virtual learning environment interface. The left sidebar contains a navigation menu for 'Toegepaste mechanica, deel 1: hoorcollege [H01B0a]'. The main content area is titled 'TTT 2021' and displays two items:

- Opgave TTT 2021**: Shows attached files 'TTT_2021.pdf (385,777 kB)' and 'TTT_2021_antwoordblad.pdf (76,225 kB)'. Below the files, it states: 'Hier vind je de opgave van de TTT van 2021 samen met het antwoordblad dat ingevuld moest worden.' The date '21/2/2023' is visible at the bottom of this item.
- Modeloplossing TTT 2021**: Includes the text: 'Integrale modeloplossing van TTT met mogelijkheid tot discussiëren en vragen stellen. Wil je graag de modeloplossing van de TTT bekijken samen met de aandachtspunten en de statistieken? Dat kan hier! De modeloplossing is beschikbaar nextbook. We gebruiken het platform nextbook omdat het platform toelaat om meteen vragen te stellen en discussieren met medestudenten direct op de modeloplossing zelf. Aarzel niet om gebruik te maken van deze mogelijkheid!' Below this, it lists instructions for accessing the solution via Nextbook.

Instructies voor toegang tot nextbook

- 1) Klik op de titel van het item en maak een account aan bij nextbook met je studentene-mailadres. Het is zeer belangrijk dat je je studentene-mailadres van KU Leuven gebruikt anders zal je de modeloplossing niet zien. Er wordt een activatiemail gestuurd naar je e-mailadres, die moet je eerst nog bevestigen.
- 2) Klik op de titel van het item om naar de modeloplossing in nextbook te gaan.

View of the virtual learning environment with the preparatory material built around the mid-term test of the previous year (TTT 2021). The item “Modeloplossing TTT 2021” refers to the material in Nextbook, where the model solution was made available.

The Nextbook platform was used to offer the model solution to the mid-term test of the previous year, together with statistical information from last year’s student cohort.

TM1-TTT-2021-modeloplossing

TM1-TTT-2021-modeloplossing

Tinne De Laet at [KU Leuven](#)

English Continue reading →

- 1 HOE DEZE MODELOPLOSSING GOED TE GEBRUIKEN?**
- 2 GLOBALE RESULTAAT**
- 3 GROTE VRAAG**
 - 3.1 G1
 - 3.2 G2
 - 3.3 G3
 - 3.4 G4
 - 3.5 G5
- 4 CONCEPTVRAGEN**
 - 4.1 C1
 - 4.2 C2
 - 4.3 C3

Archive

Model solution of the mid-term test of 2021 as preparatory material.

First, students are instructed on how this model-solution can be used most beneficially, including how they can use the Nextbook functionality for asking questions or discussing the model solution.

TM1-TTT-2021-modeloplossing > Hoe deze modeloplossing goed te gebruiken? Settings Tinne

< ☰ ✎ □ 💬 ☰ ⚡ >

1 HOE DEZE MODELOPL...
2 GLOBALE RESULTAAT
3 GROTE VRAAG ▾
4 CONCEPTVRAGEN ▾

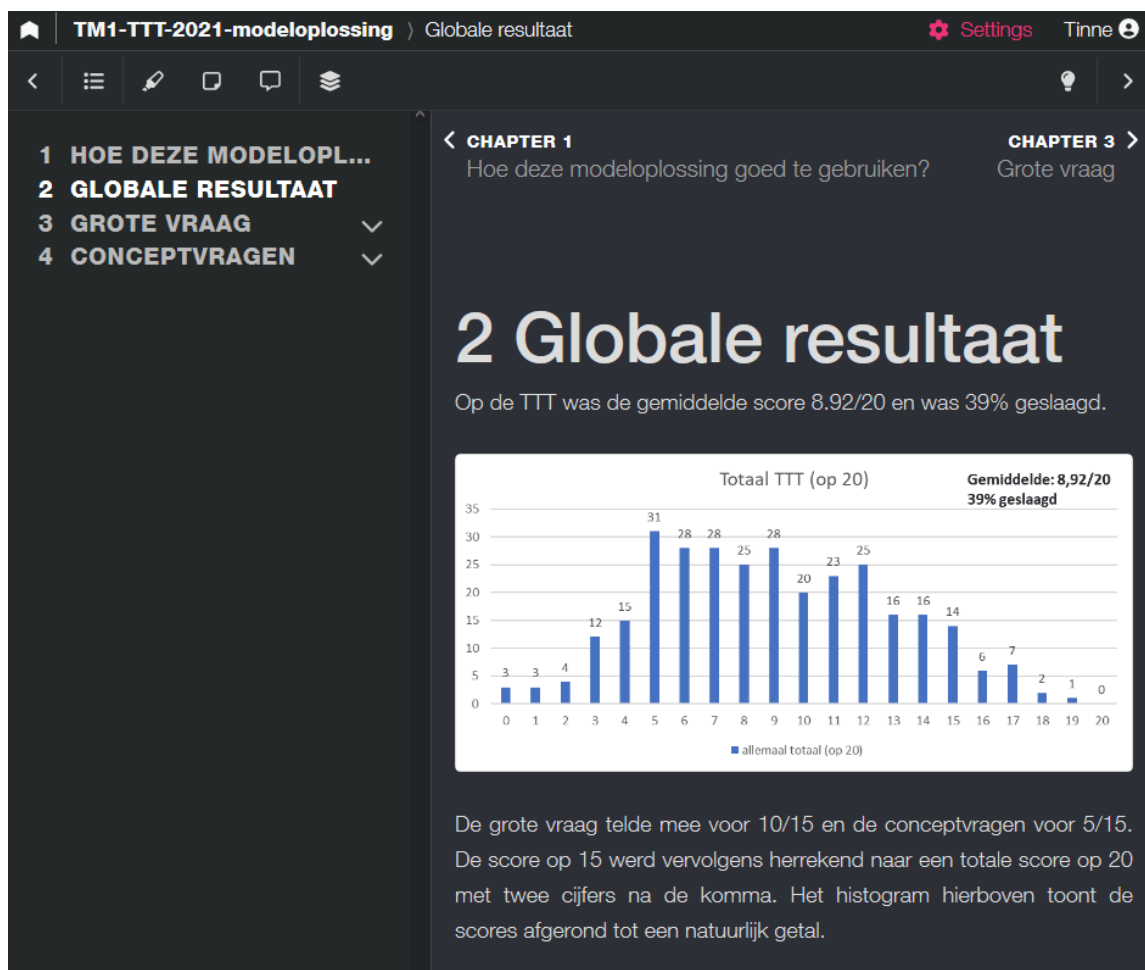
< BACK > CHAPTER 2 >
Cover Page Globale resultaat

1 Hoe deze modeloplossing goed te gebruiken?

- Het is uiteraard belangrijk dat je de opgave eerst zélf probeert op te lossen. Eens je een oplossing ziet lijken heel wat stappen “logisch” terwijl ze dat niet noodzakelijk zijn. Neem de opgave én je eigen oplossing er bij.
- Er worden telkens aandachtspunten vermeld, op basis van fouten die dikwijls werden gemaakt.
- Er is ook een statistische informatie van de resultaten opgenomen.
- Je kan vragen stellen rechtstreeks op deze modeloplossing door een stuk tekst te selecteren en dan op het tekstballonnetje te drukken

Instructions on how to use this model solution, including instructions on how to ask questions using Nextbook's functionality

To provide students with information on how students typically score on the mid-term test, statistical information on the scores of last year's student cohort is offered.



The preparatory material includes statistical information on the scores of last year's student cohort.

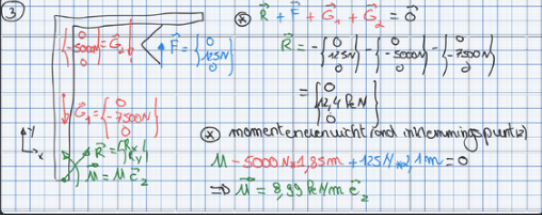
For each of the questions of last year's mid-term test, a hand-written model solution is offered together with points of attention ("aandachtspunten"), and information on last year students' scores on the particular question. The points of attention hope to point to important elements and help students prevent typical mistakes.

TM1-TTT-2021-modeloplossing Grote vraag G3 Settings Tine

1 HOE DEZE MODELOPLOSSING G...
 2 GLOBALE RESULTAAT
 3 GROTE VRAAG
 3.1 G1
 3.2 G2
 3.3 G3
 3.4 G4
 3.5 G5
 4 CONCEPTVRAGEN

3.3 G3

Selecteer deze tekst om een toelichting of verduidelijking te vragen over de oplossing van deze deelvraag.



Handwritten solution for question 3.3 G3:

③

$$\begin{cases} \sum \vec{F} = \vec{0} \\ \sum \vec{M} = \vec{0} \end{cases}$$

$\vec{R} + \vec{F} + \vec{G}_1 + \vec{G}_2 = \vec{0}$
 $\vec{R} = - \begin{pmatrix} 0 \\ 215\text{N} \\ 0 \end{pmatrix} - \begin{pmatrix} 0 \\ 0 \\ -5000\text{N} \end{pmatrix} - \begin{pmatrix} 0 \\ 0 \\ -7500\text{N} \end{pmatrix}$
 $= \begin{pmatrix} 0 \\ 425\text{N} \\ 0 \end{pmatrix}$

⊗ momentenevenwicht (rond inklempingspunt)

$$M - 5000\text{N} \cdot 4,35\text{m} + 425\text{N} \cdot 4\text{m} = 0$$

$$\Rightarrow M = 9,99\text{ kNm } \vec{e}_z$$

Aandachtspunten:

- Correct systeem vrijmaken: geheel van laadpaal én laadmechanisme (maar zonder bus en grond)
- Invoeren van correcte reactiekrachten en reactiemomenten in de doorgesneden verbinding met de grond.
- Externe kracht van bus op laadmechanisme: laadmechanisme drukt tegen bus, dus drukt ook de bus tegen het laadmechanisme (actie-reactie).
- Schrijven van krachten en momenten als vectoren met componenten in het gegeven assenstelsel.
- Krachten- en momentenevenwicht correct opschrijven
- Antwoord zijn kracht- en moment vectoren, met gepaste eenheden.

Punten

- Deze vraag telde mee voor 3.5 van de 10 punten op de grote vraag.
- Gemiddelde score: 2.20/3.5

For each question on last year's mid-term test, a hand-written model solution is offered together with points of attention ("aandachtspunten"), and information on last year students' scores on the particular question.

Feedback after the mid-term test

In the virtual learning environment of the course students were offered feedback after the mid-term test. This feedback was directly relevant for the students that took the mid-term test, but also for students that could not take the mid-term test but were enrolled in the course.

TTT 2022

Resultaten TTT

14/11/2022

Opgave TTT 2022

Bijgevoegde bestanden: TTT_2022.pdf (434,802 kB)
TTT_2022_antwoordblad.pdf (77,253 kB)

Hier vind je de opgave van de TTT van 2022.

Studenten die niet konden deelnemen aan de TTT kunnen dankzij deze opgave de TTT zelf maken en ook profiteren van de feedback.

Modeloplossing TTT 2022

Integrale modeloplossing van TTT met mogelijkheid tot discussiëren en vragen stellen

Wil je graag de modeloplossing van de TTT bekijken samen met de aandachtspunten? Dat kan [hier!](#)

De modeloplossing is beschikbaar nextbook. We gebruiken het platform nextbook omdat het platform toelaat om meteen vragen te stellen en discussieren met medestudenten direct op de modeloplossing zelf. Aarzel niet om gebruik te maken van deze mogelijkheid!

View of the virtual learning environment with a link to the model solution of the mid-term test ("Modeloplossing TTT 2022")

In the Nextbook platform the student could immediately get an overview of the structure of the model solution

TM1 - TTT2022 - modeloplossing

Settings Tinne

TM1 - TTT2022 - modeloplossing

Tinne De Laet aan [KU Leuven](#)

Nederlands Lees verder →

1 HOE DEZE MODELOPLOSSING GOED GEBRUIKEN?

2 GROTE VRAAG

- 2.1 G1a
- 2.2 G1b
- 2.3 G2a
- 2.4 G2b
- 2.5 G2c
- 2.6 Het antwoordblad

3 CONCEPTVRAGEN

- 3.1 C1
- 3.2 C2
- 3.3 C3
- 3.4 Het antwoordblad

Archiveren

Overview of the Nextbook material containing the model solution for the mid-term test of 2022.

Next, students were instructed on how this model-solution can be used most beneficially, including how they can use the Nextbook functionality for asking questions or discussing the model solution.

The screenshot shows a Nextbook interface with a dark theme. At the top, the document title is 'TM1 - TTT2022 - modeloplossing' followed by 'Hoe deze modeloplossing goed gebruiken?'. There are navigation icons for home, settings, and user profile. Below the title bar, there are icons for back, list, edit, copy, comment, and share. On the left, a table of contents lists three sections: '1 HOE DEZE MODELOPLOSS...', '2 GROTE VRAAG', and '3 CONCEPTVRAGEN'. The main content area has a heading '1 Hoe deze modeloplossing goed gebruiken?' and a list of three bullet points. The first bullet point states that it is important to try solving the task yourself first. The second bullet point mentions that attention points are provided based on common mistakes. The third bullet point explains that questions can be asked directly by selecting text and clicking a question icon. Navigation links for 'TERUG' (back) and 'HOOFDSTUK 2' (chapter 2) are visible at the top and bottom of the content area.

TM1 - TTT2022 - modeloplossing) Hoe deze modeloplossing goed gebruiken? Settings Tinne

< >

1 HOE DEZE MODELOPLOSS...
2 GROTE VRAAG
3 CONCEPTVRAGEN

< TERUG
Voorpagina

HOOFDSTUK 2 >
Grote vraag

1 Hoe deze modeloplossing goed gebruiken?

- Het is uiteraard belangrijk dat je de opgave **eerst zélf probeert op te lossen**. Eens je een oplossing ziet lijken heel wat stappen “logisch” terwijl ze dat niet noodzakelijk zijn. Neem de opgave én je eigen oplossing er bij.
- Er worden telkens aandachtspunten vermeld, op basis van fouten die dikwijls worden gemaakt.
- Je kan vragen stellen rechtstreeks op deze modeloplossing door een stuk tekst te selecteren en dan op het tekstballonnetje te drukken

< TERUG
Voorpagina

HOOFDSTUK 2 >
Grote vraag

Instructions on how to use the model solution, including instructions on how to ask questions using Nextbook's functionality.

For each of the questions of the mid-term test, a hand-written model solution is offered together with points of attention (“aandachtspunten”). The points of attention hope to point to important elements and help students prevent typical mistakes.

TM1 - TTT2022 - modeloplossing > Grote vraag > G2a Settings Tinne

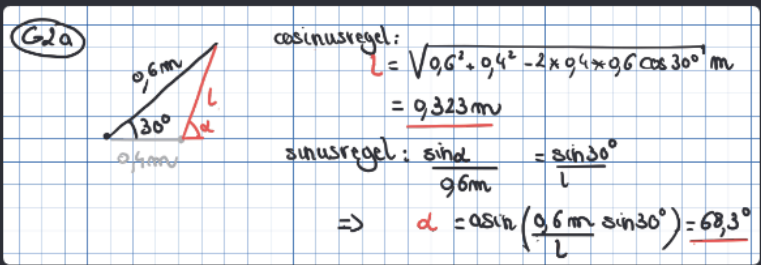
1 HOE DEZE MODEL...
 2 GROTE VRAAG ^
 2.1 G1a
 2.2 G1b
 2.3 G2a
 2.4 G2b
 2.5 G2c
 2.6 Het antwoordblad
 3 CONCEPTVRAG... v

G1b G2b

2.3 G2a

Beschouw de situatie waarbij enkel de neerwaarts gerichte verticale kracht met grootte 1000 N aangrijpt op het midden van de rand van het hoofduiteinde.

Bepaal de lengte van de zuiger (l) en de hoek tussen de zuiger en het horizontale vlak (α).



cosinusregel: $l = \sqrt{0,6^2 + 0,4^2 - 2 \times 0,4 \times 0,6 \cos 30^\circ}$ m
 $= 0,323$ m

sinusregel: $\frac{\sin \alpha}{0,6 \text{ m}} = \frac{\sin 30^\circ}{l}$
 $\Rightarrow \alpha = \arcsin\left(\frac{0,6 \text{ m}}{l} \sin 30^\circ\right) = 68,3^\circ$

Aandachtspunten:

- Eenheden bij het antwoord (meter en graden/radianen)
- Gebruik van driehoeksmetkunde (zie ook Toolbox 1 van wiskundig modelleren)

For each question of the mid-term test, a hand-written model solution is offered together with points of attention (“aandachtspunten”).

Students could ask questions directly on the model solution as illustrated in the figure below.

TM1 - TTT2022 - modeloplossing > Grote vraag > G2c

Settings Tinne

2.5 G2c

Beschouw de situatie waarbij enkel de neerwaarts gerichte verticale kracht met grootte 1000 N aangrijpt op het midden van de rand van het hoofdeinde.

Bepaal de grootte van de snedekrachten en snedemomenten in S, het midden van de staaf A_2H_2 van het hoofdeinde. Benoem ze (dwarskracht, ...).

Krachtenevenwicht

$$\vec{R}_{A2} + \vec{R}_S = \vec{0} \Rightarrow \vec{R}_S = -\vec{R}_{A2} = \begin{pmatrix} 0 \\ 259 \text{ N} \\ 150 \text{ N} \end{pmatrix}$$

normaal kracht: $|259 \text{ N} \cos 30^\circ + 150 \text{ N} \sin 30^\circ| = 300 \text{ N}$

dwarskracht: $|259 \text{ N} \sin 30^\circ - 150 \text{ N} \cos 30^\circ| = 40,4 \text{ N}$

Momentenevenwicht

$$\vec{M}_S + \begin{vmatrix} \vec{e}_x & \vec{e}_y & \vec{e}_z \\ 0 & -0,3 \cos 30^\circ & -0,3 \sin 30^\circ \\ 0 & R_{A2y} & R_{A2z} \end{vmatrix} = \vec{0}$$

$$\vec{M}_S = (R_{A2z} \cdot 0,3 \cos 30^\circ - R_{A2y} \cdot 0,3 \sin 30^\circ) m \vec{e}_x = 0,121 \text{ N/m} \vec{e}_x$$

buigmoment: $0,121 \text{ N/m}$

torsiemoment: 0 N/m

Is de dwarskracht niet 0,404N en als je met cijfers na de komma werkt zelfs 0N? Hetzelfde voor het moment.

De formule is correct, maar de uitkomst van de geschreven formule is inderdaad 0,404N. Door de voorgaande afrondingen zijn we de nauwkeurigheid na de komma hier inderdaad ook kwijtgespeeld ...

Jij

Antwoorden

Verzenden

A student asking a question by interacting in Nextbook.

Situation within co-creation framework of Bovill

We situate the co-creation solution within the framework of Bovill, 2019.

Question	Possible responses							
Who initiates the co-creation?	Staff-led	Student-lead	Staff and students					Other (elaborate)
What is the focus of the co-creation? (see Bovill & Woolmer, 2018; Healey et al., 2014)	Entire curriculum (co-creation of the curriculum)	Learning & teaching (co-creation in the curriculum)	Educational research & evaluation	Disciplinary research	Wider student experience			Other (elaborate)
What is the context for the co-creation? (see Bovill & Woolmer, 2018; MercerMapstone et al., 2017)	Curricular	Extra-curricular	University-wide					Other (elaborate)
How many students are involved? (see Mercer-Mapstone et al., 2017)	1-5 (specify specific number)	6-10 (specify specific number)	11-20 (specify specific number)	21-30 (specify specific number)	31-100 (specify specific number)	101-500(250)	>500 (757)	Other (elaborate)

Have you selected students from a larger group or are you involving a whole class? (See Bovill, 2019; Bryson et al., 2015)	Selected	Whole class/group						Other (elaborate)
Which students are involved? (See Bovill, 2014)	Retrospective	Current	Aspiring/Future					Other (elaborate)
What year of study are the students in?	First -year of Bachelor	Bachelor later than 1st year	Master	Master after Master	PhD	Postgraduate	Lifelong-learning	Other (elaborate)
What is the scale of the co-creation?	1 class/interaction moment	several classes / interaction moments	1 project	several projects	Entire course	Faculty/school-wide	Institution-wide	Other (elaborate)
How long does the co-creation last?	Days	Months	Years					
What is the role of the student? (See	Representative	Consultant	Co-researcher	Pedagogical co-designer	Participant			Other (elaborate)

Bovill et al., 2016)								
What is the nature of student involvement? (See Bovill, 2017; Könings et al., 2017)	Informed	Consulted	Co-researcher	Pedagogical co-designer	Contributor			Other (elaborate)
What is the nature of reward or recompense given to students?	Payment in money	Payment in vouchers	Course credit	Refreshments	No payment or reward			Other (elaborate)
What is the goal of the co-creation?	To improve the course	To enhance student engagement	Aiming for a socially just higher education	To get the benefits of co-creation in the course	Incorporating the student perspective	To enhance student's skills		Other (elaborate)
....								

4. Discussion

In the academic year 2022-2023 all 757 students in the course were enrolled in the two Nextbook handbooks supporting the mid-term test.

For the preparation: from the virtual learning environment unfortunately no students actively engaged with the preparatory material on Nextbook itself. Also for the feedback on the mid-term test merely three questions were asked through the Nextbook platform. Students prefer to use the tools used for other material in the course to ask their questions: the discussion forum on the virtual learning environment, or ask their teaching assistants in class. So despite that with respect to the case study of last year, not only the feedback after the mid-term test but also the preparation for the mid-term test was integrated on Nextbook, it did not increase the active interaction of students on the platform.

Therefore, we learned that if we want to promote interaction and co-creation through a platform such as Nextbook, that this platform should be preferably used by all material in the course and from the beginning of the course itself. Furthermore, the interaction and co-creation should be more actively stimulated especially with first-year students and large classes.

Acknowledgments

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