CiC NEXTBOOK

Co-created Interactive Courseware

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

Case study report - KU Leuven: Model solutions reflective exercises, 2021-2022 and 2022-2023

Tinne De Laet| KU Leuven

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

https://nextbook.io/book/modeloplossing-reflectiemodule-1

https://nextbook.io/book/modeloplossing-reflectiemodule-2

https://nextbook.io/book/modeloplossing-reflectiemodule-3

https://nextbook.io/book/modeloplossing-reflectiemodule-4

https://nextbook.io/book/modeloplossing-reflectiemodule-5

https://nextbook.io/book/modeloplossing-reflectiemodule-6

https://nextbook.io/book/modeloplossing-reflectiemodule-7

https://nextbook.io/book/modeloplossing-reflectiemodule-8

The challenge description is based on [1].

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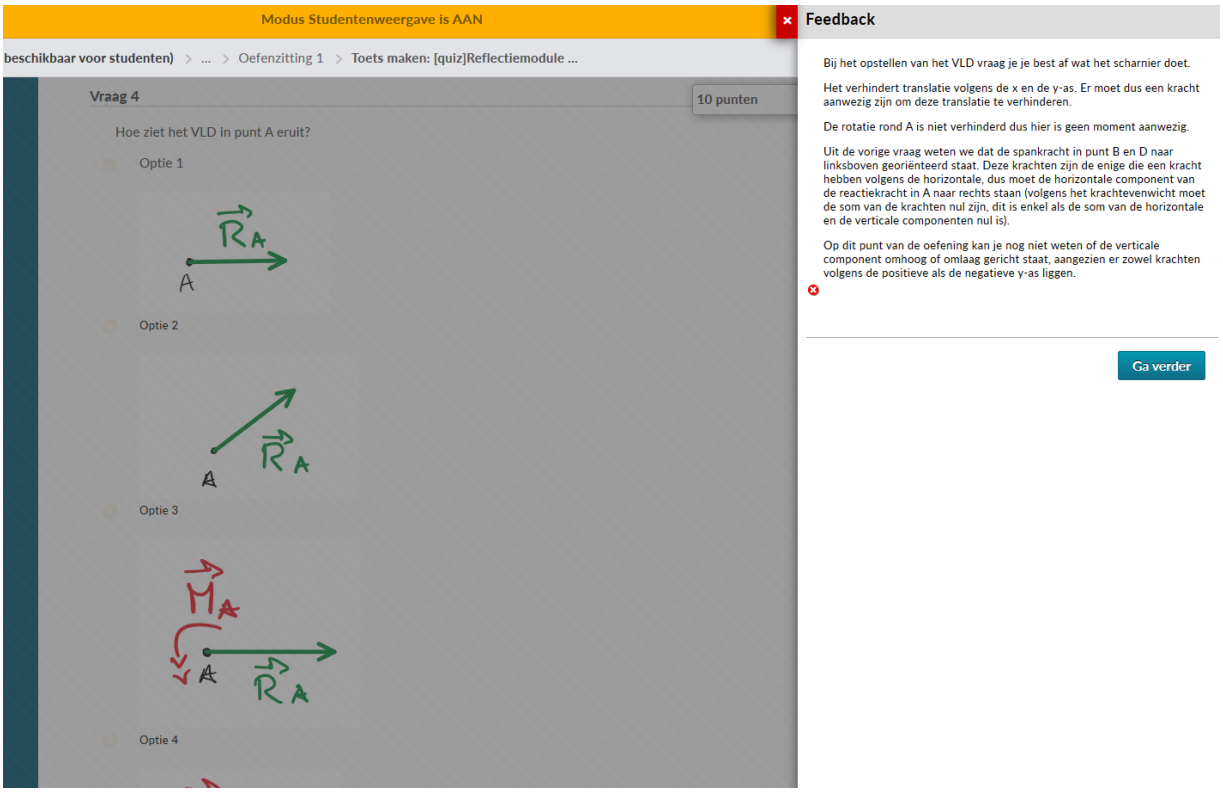
1. Context

This case study reports on an intervention with the interactive courseware platform Nextbook targeted at providing first-year students additional support for physics problem-solving in a first-semester course.

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 is 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. To this end students have to use problem-solving and self-regulatory skills. Developing good problem-solving and self-regulatory skills is challenging for many students.

2. Challenge

Self-regulated learning strategies support learning. Not only is there a strong theoretical support for this claim [2], also intervention studies have shown that self-regulation is associated with academic achievement [3]. Feedback is a potentially very powerful tool to impact learning and achievement, but different types of feedback can have different (levels) of impact [4]. Feedback can therefore also play a role in triggering of meta-cognition and self-reflection as Hattie and Timperley [4] state: “Feedback that attends to self-regulation is powerful to the degree that it leads to further engagement with or investing further effort into the task, to enhanced self-efficacy, and to attributions that the feedback is deserved and earned. When feedback draws attention to the regulatory processes needed to engage with a task, learners’ beliefs about the importance of effort and their conceptions of learning can be important moderators in the learning process.” Furthermore, feedback is more powerful when it supports the building cues and information regarding wrong hypotheses and ideas [5], which is potentially easier in domain-specific reflections. Next, developing problem-solving skills and conceptual knowledge in engineering subjects is difficult, not well-understood yet, but definitely requires particular attention [6]. To support the development of self-regulatory and problem-solving skills connected to physics problems, the approach of the Disciplinary Learning Companion was developed, researched, and implemented at KU Leuven [1]. The Disciplinary Learning Companion consists of a set of questions connected to a particular physics exercise. The questions aim at causing reflection and thereby the development of self-regulated learning skills. Due to the limited functionality regarding questions and feedback in the Nextbook platform the reflection questions themselves were implemented in the virtual learning environment Toledo of KU Leuven (see figure).



Example of a reflection question and feedback connected to a free body diagram of a physics problem.

To allow students to actively ask questions connected to the physics problem and its solution that underlies the reflection questions, the model solution was offered on Nextbook.
For the course, eight reflection modules, and therefore eight Nextbook handbooks were created:

https://nextbook.io/book/modeloplossing-reflectiemodule-1

https://nextbook.io/book/modeloplossing-reflectiemodule-2

https://nextbook.io/book/modeloplossing-reflectiemodule-3

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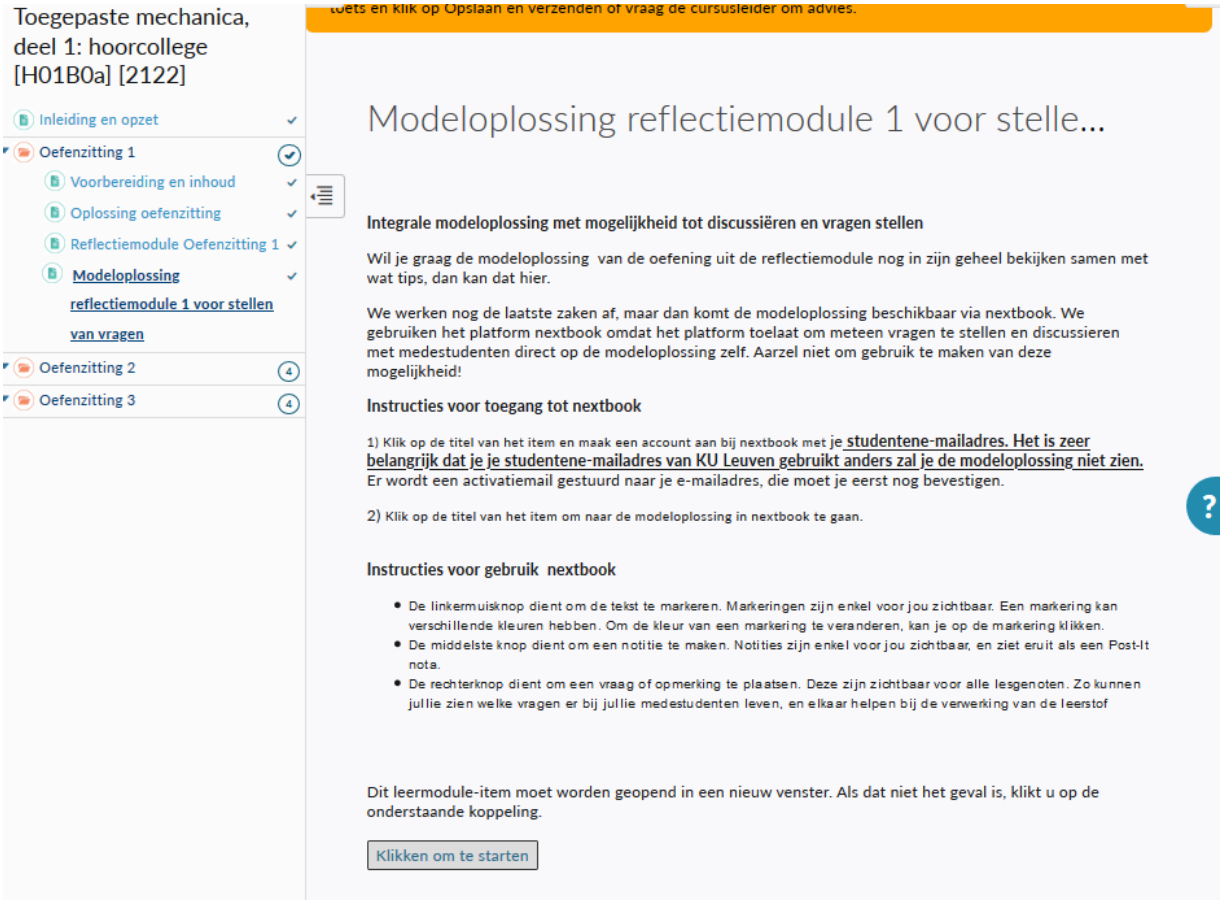
https://nextbook.io/book/modeloplossing-reflectiemodule-7

https://nextbook.io/book/modeloplossing-reflectiemodule-8

3. Co-creation solution

The eight reflection modules, and the Nextbook handbooks connected to it, were offered to students in the course Applied Mechanics, 1 in academic years 2021-2022 and 2022-2023. Therefore, **727 students in 2021-2022 and 757 students in 2022 and 2023** were added to the Nextbook handbooks.

In the virtual learning environment of the course students, connected to each of the eight reflection modules, students were invited to view the integral model solution of the exercise of the reflection module and ask a question or start a discussion connected to this model solution.

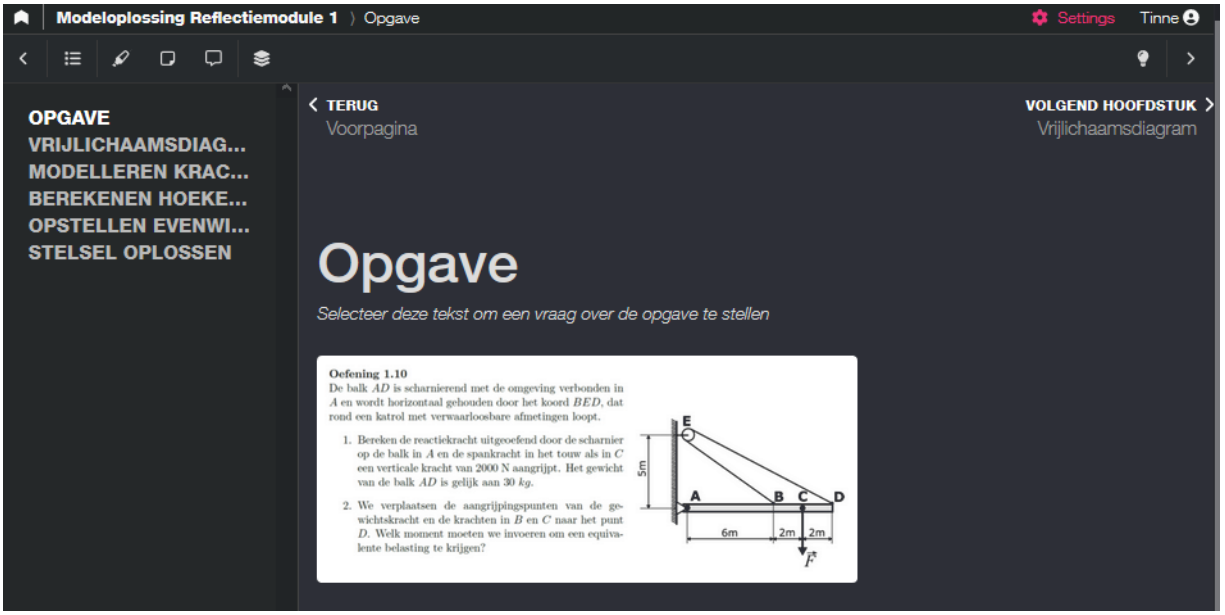


View of the virtual learning environment with for each exercise session ("Oefenzitting"), the reflection module and the model solution as being offered on Nextbook. The figure presents the explanation provided to students regarding the goal and the procedure to reach the Nextbook Handbook for the model solution.

Below, we show some screenshots showing the content of the first of the eight reflection modules.

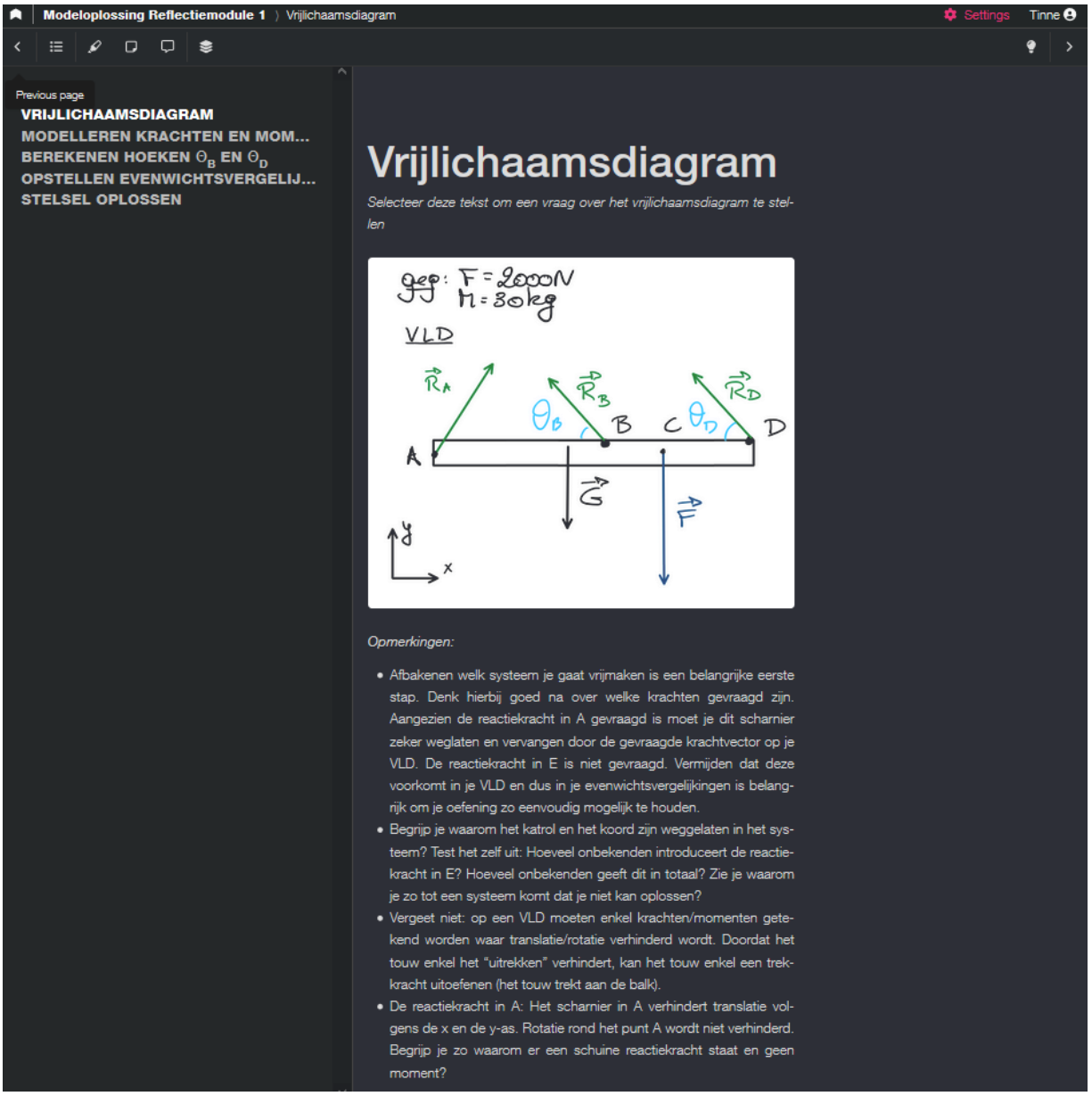
Landing page of the Nextbook handbook containing the model solution for the exercise on which the first reflection module was based.

Students are first presented with the exercise itself.



In the Nextbook handbook, first the exercise itself is presented.

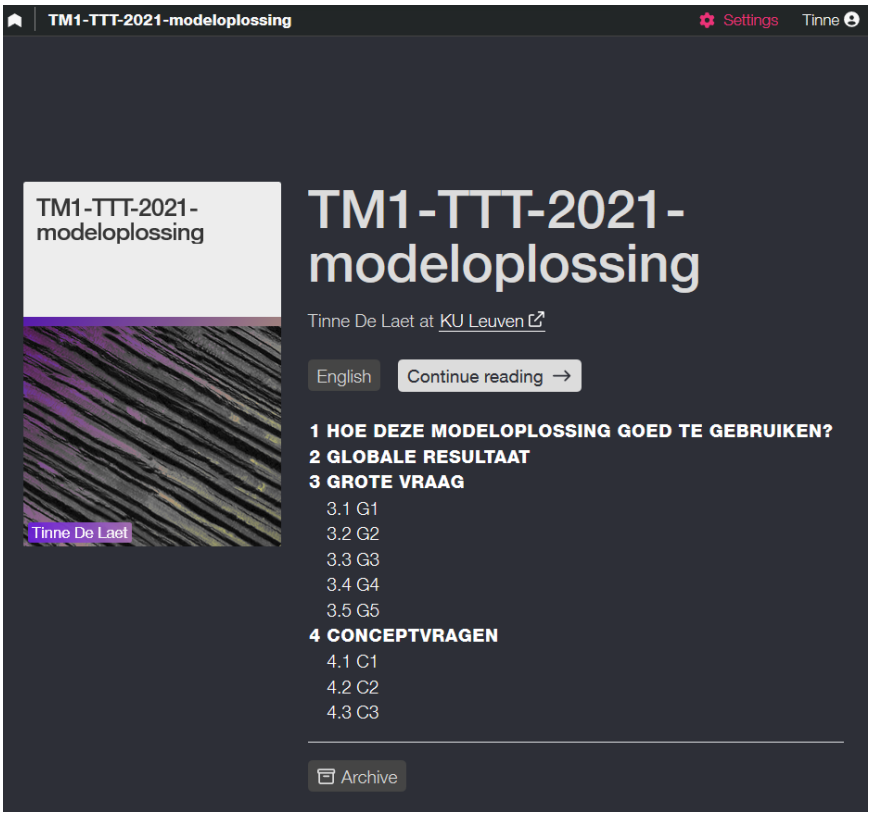
Subsequently, for each of the major steps used in the reflection module, the hand-written solution is shown together with remarks that provide important tips and elements regarding the particular step.



Screenshot of the nextbook material connected to the model solution of the first step of the reflection process: it contains a hand-written solution and additional remarks ("Opmerkingen") regarding the model solution, typical errors, etc.

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.



4. 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 (1484)	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)
….								

5. Discussion

The eight reflection modules, and the Nextbook handbooks connected to it, were offered to students in the course Applied Mechanics, 1 in academic years 2021-2022 and 2022-2023. Therefore, **727 students in 2021-2022 and 757 students in 2022 and 2023** were added to the Nextbook handbooks. Especially the first year, we noticed that many students did not find the reflection modules and the Nextbook material connected to it. The course offers a lot of material scattered around different platforms. Therefore, in academic year 2022-2023 it was decided to bring this additional material more to the students' attention by printing a symbol (R, for reflection module) in the printed exercise handbook of the course, for exercises that had a reflection module and thus Nextbook material connected to it.

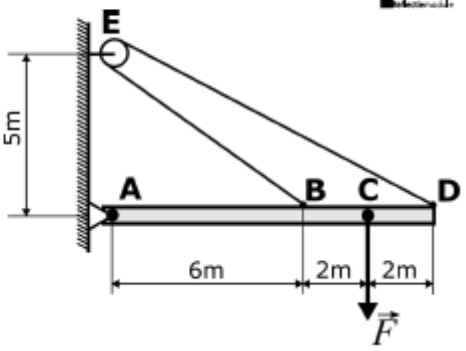
Oefening 1.10

De balk AD is scharnierend met de omgeving verbonden in A en wordt horizontaal gehouden door het koord BED, dat rond een katrol met verwaarloosbare afmetingen loopt.

1. Bereken de reactiekracht uitgeoefend door de scharnier op de balk in A en de spankracht in het touw als in C een verticale kracht van 2000 N aangrijpt. Het gewicht van de balk AD is gelijk aan 30 kg.

2. We verplaatsen de aangrijpingspunten van de gewichtskracht en de krachten in B en C naar het punt D. Welk moment moeten we invoeren om een equivalente belasting te krijgen?

R



Despite students being more aware of the existence of the material in the academic year 2022-2023, students still did not use Nextbook to ask questions or start a discussion. 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. 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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References

[1] De Laet, T., Sijmkens, E., De Cock, M. 2021. Triggering reflection and meta-cognition in physics problem solving. In: Blended Learning in Engineering Education: challenging, enlightening – and lasting?, (180-188). Presented at the SEFI 49th Annual Conference, online, Berlin, Germany, 13 Sep 2021-16 Sep 2021. ISBN: 978-2-87352-023-6.

[2] Haller, E. P., D. A. Child, and H. J. Walberg. 1988. "Can Comprehension Be Taught? A Quantitative Synthesis of 'Metacognitive' Studies." Educational Researcher 17(9): 5

[3] Dignath, C., and G. Büttner. 2008. "Components of Fostering Self-Regulated Learning among Students. A Meta-Analysis on Intervention Studies at Primary and Secondary School Level." Metacognition and Learning 3(3): 231–264.

[4] Hattie, J., & Timperley, H. (2007). The Power of Feedback. Review of Educational Research, 77(1), 81–112. https://doi.org/10.3102/003465430298487

[5] Streveler, R.A., Litzinger, T.A., Miller, R.L. and Steif, P.S. (2008), Learning Conceptual Knowledge in the Engineering Sciences: Overview and Future Research Directions. Journal of Engineering Education, 97: 279-294. https://doi-org.kuleuven.ezproxy.kuleuven.be/10.1002/j.2168-9830.2008.tb00979.x