

CiC NEXTBOOK

Co-created Interactive Courseware

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

Case study report - KU Leuven: Feedback after the exam in
Uncertainty in Artificial Intelligence

2020-2021

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December 2022



Co-funded by the
Erasmus+ Programme
of the European Union

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The course material of this case study report is available here:
<https://nextbook.io/book/uai-exam-january-2021-model-solution/>

Table of Contents

1. Context	1
2. Challenge	1
3. Co-creation solution	1
Preparation for the mid-term test	1
Feedback after the mid-term test	6
Situation within co-creation framework of Bovill	10
4. Discussion	14
Acknowledgments	14

1. Context

This case study reports on an intervention with the interactive courseware platform Nextbook targeted at activating students around the feedback after the official course exam of the course Uncertainty in Artificial Intelligence at KU Leuven. The 4ECTS course is offered in the Advanced Master program of Artificial Intelligence at KU Leuven, Belgium. KU Leuven is a highly ranked research-intensive university both regarding research and education. The master of Artificial Intelligence is a multi-disciplinary one-year master that recruits many international students. The course Uncertainty in Artificial Intelligence is a mandatory course for students in the Engineering and computer science option (ECS) option, and a voluntary course for other students in the same program. Moreover the course is also offered as a voluntary course in other master programs and PhD programs at KU Leuven.

Typically, the course of Uncertainty in Artificial Intelligence has around 200 students, and a high success rate of around 85%. Students entering the course have diverse backgrounds, with different levels of experience and skills in mathematics, probability calculus, and programming. The case study focuses on how the co-creation software of nextbook supported the transition to a new hybrid pedagogical approach based on flipped tracking.

2. Challenge

Providing feedback and activating students around this feedback has proven to be challenging. First, one has to ensure that students are offered feedback within the 7-day time-frame provided by the university. Therefore, the process has to be organized efficiently such that all students have the opportunity to get feedback within this limited time frame. Second, students should have the opportunity to learn from the feedback. The feedback should trigger reflection with them regarding not only their own particular solutions, but also regarding how they have tackled the course, and can learn from this for the future.

For the teachers of the course, the feedback process is important. At the same time they hope that students use the opportunities for feedback, such that their efforts can pay off in the learning process of the student. At the same time, the teachers do not have the time to organize feedback in person to each student due to the large number of students in the class and the short time frame available.

3. Co-creation solution

The teachers decided to offer a model solution with video explanations through the Nextbook platform. As such that students could check the feedback at their own pace and at a self-selected time. Students were invited to ask their questions and start discussions connected to the model solution on the Nextbook platform. Additionally, a Q&A session connected to the model solution was offered where the questions and discussions started on Nextbook were further handled.

The feedback was offered through Nextbook to all 220 students enrolled in the course.

UAI exam January 2021 — model solution

Settings Tinne


UAI exam January 2021 — model solution

Tinne De Laet at [KU Leuven](#)

English Continue reading →

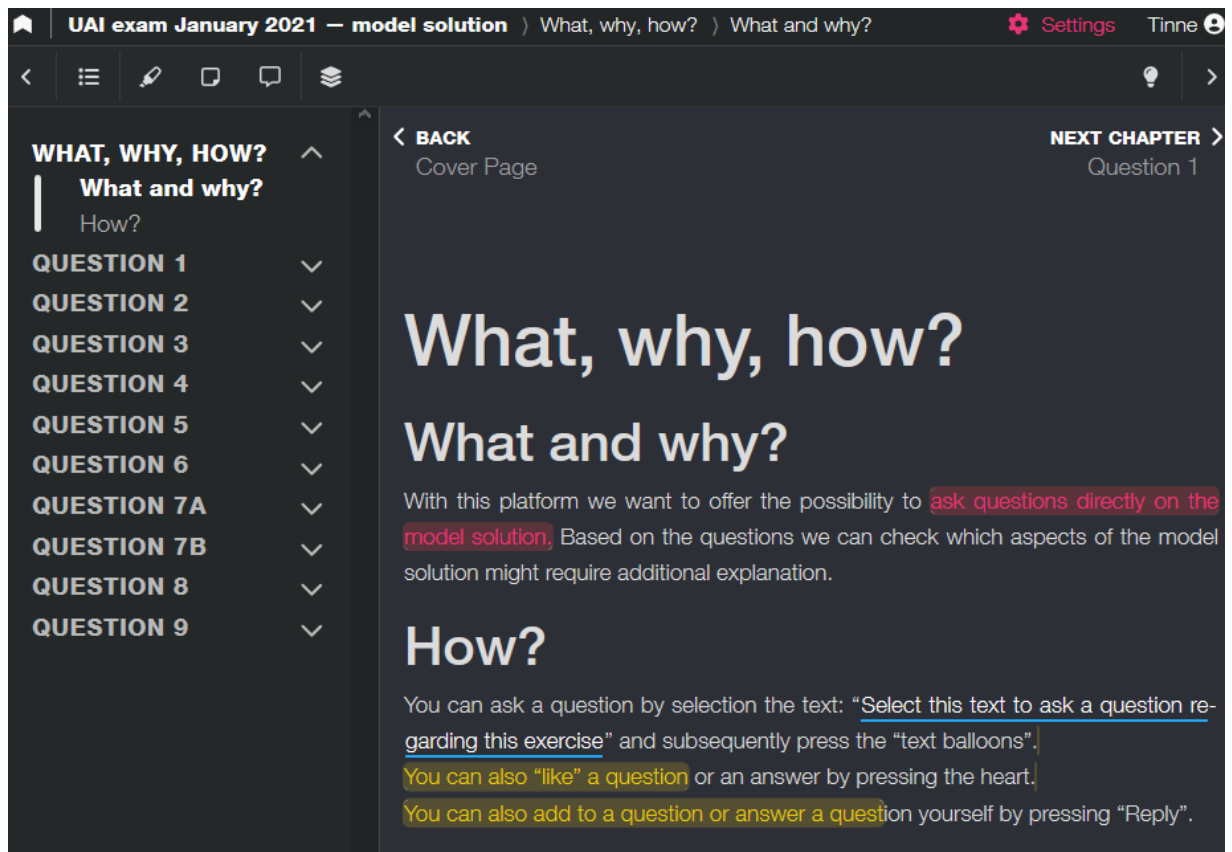
WHAT, WHY, HOW?

- QUESTION 1**
- QUESTION 2**
- QUESTION 3**
- QUESTION 4**
- QUESTION 5**
- QUESTION 6**
- QUESTION 7A**
- QUESTION 7B**
- QUESTION 8**
- QUESTION 9**



Feedback for the January 2021 exam as offered on Nextbook.

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



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

For each of the questions of the exam, a hand-written model solution was offered together with an explanatory video including an elaboration on typical errors made.

UAI exam January 2021 — model solution Question 2

Settings Tinne

WHAT, WHY, HOW? QUESTION 1 QUESTION 2 QUESTION 3 QUESTION 4 QUESTION 5 QUESTION 6 QUESTION 7A QUESTION 7B QUESTION 8 QUESTION 9

Written solution

2. (2pts) Prove Bayes' rule using basic rules of probability. Use variable names A and B.

$$P(A,B) = P(B|A)P(A)$$

$$P(A,B) = P(A|B)P(B)$$

Thus $P(A|B)P(B) = P(B|A)P(A)$

$$\rightarrow P(A|B) = \frac{P(B|A)P(A)}{P(B)}$$

Explanatory video

The video shows a question about Bayesian networks. The question asks to consider a Bayesian net and determine if it is a perfect, independence, or dependence map for the true distribution. It also asks to add a minimal number of edges to the true middle distribution to obtain an independence map. The video shows a hand-drawn diagram of a Bayesian network with nodes A, B, C, and D. The diagram shows A as a parent of B and C, and C as a parent of D. The video also shows a question about adding edges to the true middle distribution and a hand-drawn diagram showing that no arrows need to be added.

For each question of the exam, a hand-written model solution is offered together with an explanatory video also commenting on common mistakes.

Students used Nextbook's functionality to ask questions connected to the model solution of the exam. The figure below shows an example:

Question 9

Select this text to ask a question regarding this exercise.

Written solution

9. (6pts) Sampling: Consider the following Bayesian network.

(a) (4pts) Assume you want to obtain, as efficient as possible, ONE sample for each of the queries below using **ancestral sampling**, assuming you have a list of random and independent samples from a uniform distribution between 0 and 1 available.

Indicate for each of the queries a) if you would need rejection or not, b) list the (un)conditional probabilities available in the network that have to be sampled from, in the order they have to be sampled from, and c) order the queries according to efficiency (assuming each (un)conditional probability of the network is equally efficient to sample from).

query	rejection needed: Yes/No	ordered list of (un)conditional network probabilities	computational efficiency (1=most efficient, 3=least efficient)
$p(Y_3)$	No	$p(x_1)$ $p(x_2 x_1)$ $p(y_3 x_2)$ $p(y_3 x_3)$	2

You

Reply

Send

For the last exercise: shouldn't the expression be normalised? Because if you want to sample X_4 in practice you need to normalise it as well.

Conor O'Rourke

(already a reply, but will still handle the question in the Q&A)

For sampling, the normalization does not matter as it is a normalization `_constant_`, independent of the variable we want to sample.

You can also check this in the lecture notes for rejection sampling for instance, there we also need to know the target distribution up to a normalization constant.

Example of how a student uses Nextbook's functionality to ask a question connected to the model solution for an exam question.

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(220)	>500	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 2020-2021 all 220 students in the course were enrolled in the Nextbook handbook supporting the feedback on the exam.

Only three students asked a question through the Nextbook platform. Students rather asked their questions during the Q&A session directly to the professors. 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.

Acknowledgments

We gratefully acknowledge the support of the European Erasmus+ programme for the project “Co-created Interactive Courseware”, with project-number 2019-1-UK01-KA203-061669. This publication has been produced with the support of the Erasmus+ Programme of the European Union. The contents of this publication are the sole responsibility of the project Consortium and can in no way be taken to reflect the views of the Commission.