Lessons learned from distance teaching of basic statistics during the COVID-19 pandemic

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Abstract

Like the majority of courses at German universities, the basic course on statistics in the part-time bachelor's program in business administration at Harz University of Applied Sciences in Wernigerode was conducted almost entirely digitally in the summer semesters of 2020 and 2021 due to the COVID-19 pandemic. This paper lists the tools used and tries to summarize the main impressions from both "Corona semesters" from the perspective of the lecturer as well as from the students' point of view.

Background and challenges

Due to the COVID-19 pandemic, the Ministry of Economics, Science and Digitization of the state of Saxony-Anhalt instructed the state's universities on March 13th 2020 to suspend classroom teaching until April 20th and to offer courses primarily digitally – a state that would persist over the next three semesters. This directive also affected the basic statistics course taught by the author since 2016 in the part-time bachelor's degree program in business administration at Harz University of Applied Sciences in Wernigerode[1]. The 10 ECTS course over 40 hours is usually taken by 15 to 25 students and taught in four- to six-hour weekend seminars, the first of which was scheduled for March 28th. Attending the course is expected to enable students to independently plan and conduct data collections and to analyze data using appropriate methods and statistical software. The course includes topics from descriptive, explorative and inductive statistics as well as from probability theory and research methodology. The performance assessment is carried out via a 60-minute midterm exam on descriptive and explorative statistics and a 120-minute final exam on all course contents.

With the announcement regarding distance learning, this course had to be converted to an online format within 14 days. In this, four different software platforms – Zoom, stud.IP, ILIAS and YouTube – were utilized, the use of each being briefly presented and evaluated below. While most of the lectures were given in "classic" seminar form via Zoom, the preparation and follow-up took place in stud.IP and on YouTube with exams being taken (partially) in ILIAS.

Solution implemented

Zoom

The basic advantages and disadvantages of Zoom for university distance learning have been the subject of numerous publications since the beginning of the pandemic – see e.g. [Lowenthal et al. 2020] or [Wong 2020] – and will not be revisited here. Considering topics and group size, Zoom proved to be a reliable and performant tool for the course at hand. However, it quickly became apparent that the established time format with blocks of up to six hours in length was unsuitable, as concentration and performance dropped after about two hours. The blocks were therefore divided into shorter teaching units of one to two hours.

The option of recording complete lectures and making them available to students was offered to both groups, with students in 2020 opting for recording and students in 2021 opting against it. For personal privacy, the recording of student video images was completely refrained from and all recordings were made available to course members only. The decision for or against activating their own cameras was left to each individual student.

[1] https://www.hs-harz.de/bwl-berufsbegleitend

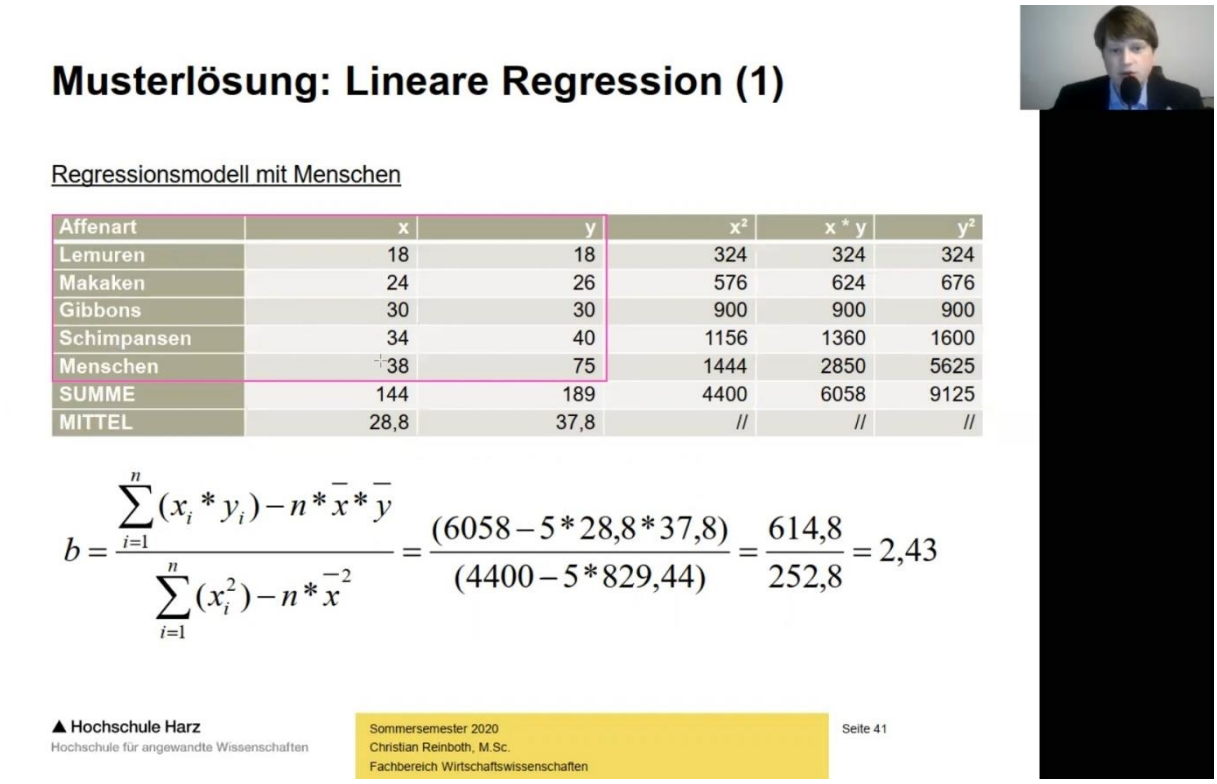

Figure 1: Conducting a lecture in Zoom (with student profiles hidden).

Since it was unclear at the start of the 2020 semester whether the exams would also have to be held digitally, the implementation of statistical methods in the RStudio[2] development environment for the statistical programming language R[3] was integrated into the course in order to gain the possibility of performing assessments in this digital environment. Since R and RStudio are available at no cost across platforms and have only minimal hardware requirements, all students were able to use them. This enabled the class to easily switch between the screens of the instructor and various participants during collaborative R exercises.

stud.IP

The preparation and follow-up was largely carried out via the platform stud.IP ("Studienbegleitender Internetsupport von Präsenzlehre"[4]), which was already in use at Harz University as a web-based working environment for course organization before the pandemic. The platform provides restricted areas only visible to authorized participants, in which lecturers and students can share files, discuss questions, manage appointments, rooms and literature lists and work on collaborative wikis. A detailed overview of the potential uses of stud.IP can be found in [Schnekenburger 2009], while an exemplary introduction of this system at a German university is described in [Appelrath et al. 2006].

In the context of the course under discussion, participants used the forum (55 posts in two semesters) for the exchange of information and the wiki (106 entries in two semesters) as a quick reference for lecture content.

[2] https://www.rstudio.com/
[3] https://www.r-project.org/
[4] https://www.studip.de/

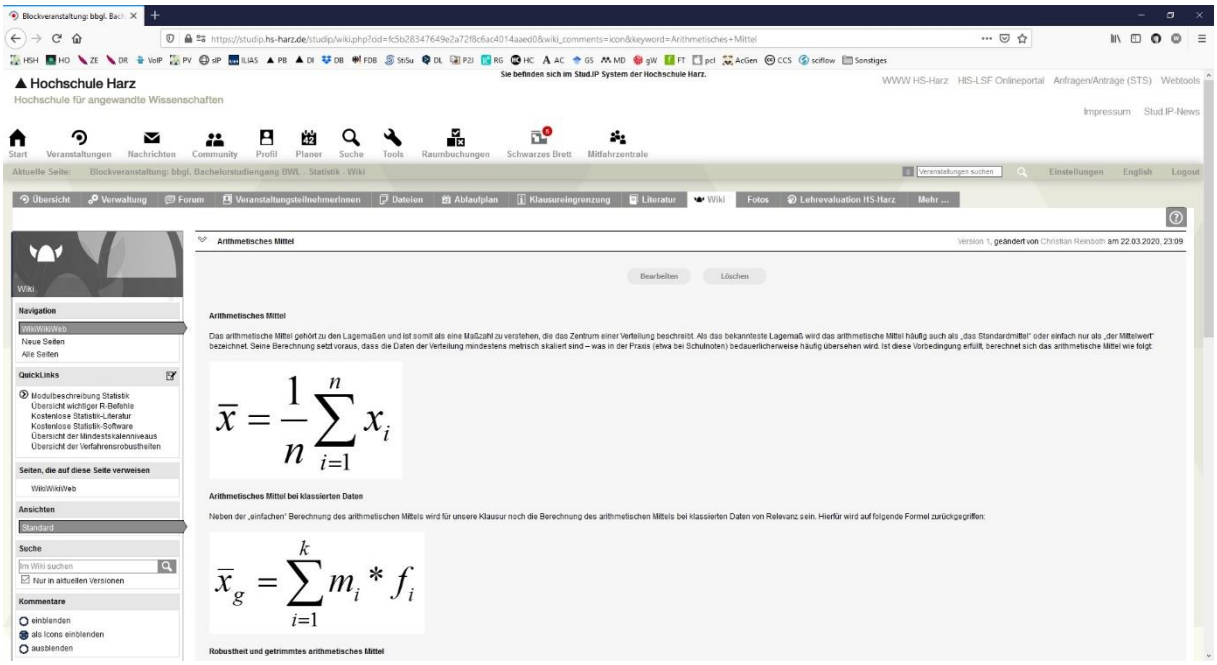

Figure 2: Entry on the arithmetic mean in the class wiki.

ILIAS

Due to the local pandemic situation, both 60-minute midterm exams (in May) had to be organized fully digitally, while both final exams (in July) could be held on-site.

For the midterm exam in 2020, a simple setup was developed in cooperation with the "Teaching Lab" staff tasked with promoting digital teaching formats at Harz University[5]. At the beginning of the exam, students were provided with a data set for analysis in RStudio, after which they were able to log in to the online learning platform ILIAS[6] (the broad range of uses for this platform is described in [Rapp & Qekaj 2015]) and had to answer 30 questions about the data set within 60 minutes. The questions were drawn randomly from a pool of 200 questions categorized into three difficulty levels. This ensured that each examinee would write an exam that was individual in the order and composition of the questions and yet of equal difficulty. Hidden collusion between participants (e.g. via chat) would thus be pointless. During the exam, all participants remained logged into Zoom and could therefore be supervised and contact the instructor.

Although the ILIAS exam proved to be effective, a more traditional approach was used for the midterm exam in 2021. Students worked through an assignment provided to them in digital form for printing out under supervision via Zoom and then scanned the results using a smartphone app. The outcomes of all examinations in both pandemic semesters did not deviate negatively from the outcomes in previous semesters, all while maintaining the same academic standards.

[5] https://www.hs-harz.de/teachinglab
[6] https://www.ilias.de/

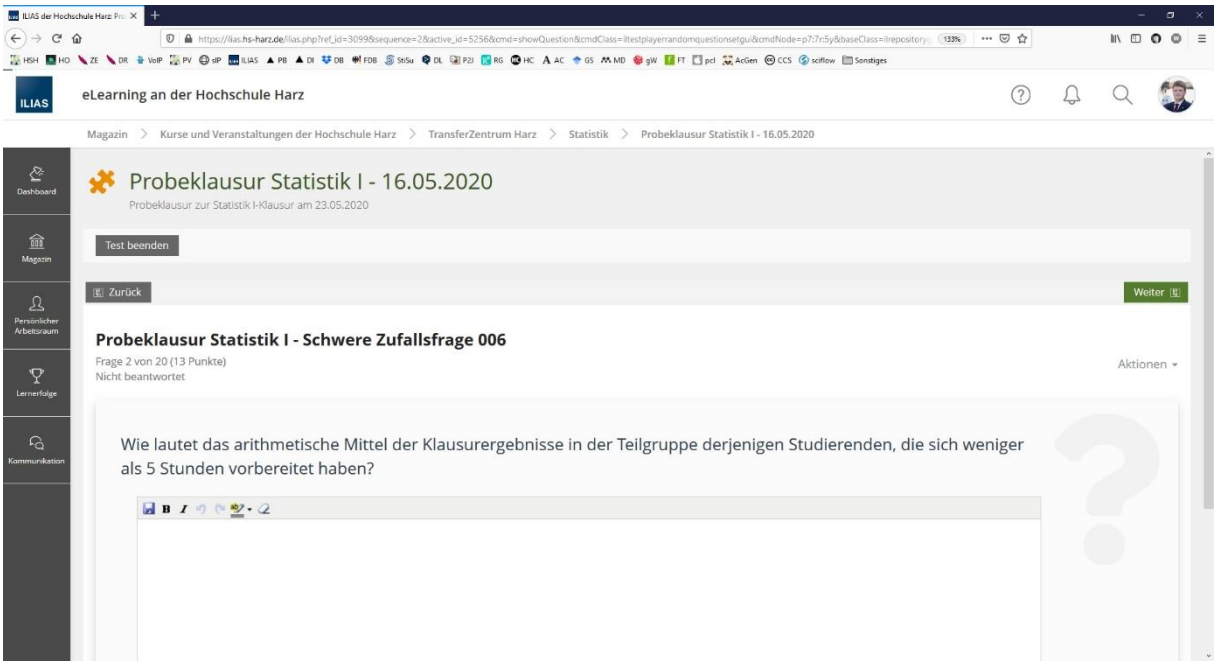

Figure 3: Sample assignment from a mock exam realized in ILIAS.

YouTube

To support preparation and follow-up, three series of screencasts – one with theoretical content[7], one with exercises[8] and one as a R and RStudio tutorial[9] – were created as well. All screencasts were made publicly available via YouTube. While the first two series were created using Microsoft Movie Maker, the R tutorial was recorded in Zoom. All screencasts are between 5 and 15 minutes long, with each (for scripting, recording, revising and editing) requiring approximately two to three hours of work. As of August 23rd 2021, there are a total of 35 screencasts with a running time of 247 minutes, which have been viewed 7,519 times on YouTube. The content created for the course thus reaches a steadily growing audience significantly larger than the number of actual course participants.

	Theory	Exercises	R Tutorial	Total
Number of screencasts	17	8	10	35
Runtime (in minutes)	153	37	57	247
Views as of 08/23/2021	3,250	402	3,867	7,519

Table 1: Number and runtime of screencasts and total YouTube views as of 08/23/2020.

Evaluation and outlook

Nine out of 11 participants in 2020 and five out of 10 participants in 2021 took part in the online course evaluation, which equates to a total response rate of 67%. Since a direct comparison with previous semesters via statistical indicators would not be sensible due to the small number of cases, the number of course participants and the respective response rates are merely shown in the table below.

	2016	2016/17	2017	2018	2019	2020	2021
Course participants	22	23	27	18	16	11	10
Eval response rate	14%	30%	48%	61%	50%	82%	50%

Table 2: Number of course participants and evaluation response rates.

[7] https://www.youtube.com/playlist?list=PL72wu65njBcXlakkHBxW-wDCSuJt_cszo
[8] https://www.youtube.com/playlist?list=PL72wu65njBcWEztrfZr-v6Y150hrIHCK0
[9] https://www.youtube.com/playlist?list=PL72wu65njBcWetuWUEs-CsG8XhYF6YKm3

If one combines these 14 evaluations, the following picture emerges: On a scale of 1 ("very good") to 6 ("very poor"), 100% of the students rated the course as "very good". The individual learning success on a scale of 1 ("learned very much") to 6 ("learned nothing") was assessed by 10 participants to be 1 and by four participants to be 2. More revealing than the scale ratings are the (sometimes extensive) comments in which the screencasts (10 mentions), the integration of R into the course (four mentions), the wiki (three mentions), and the shortening of online lectures (three mentions) were particularly praised. The work with stud.IP and ILIAS was unanimously evaluated positively (to quote from one evaluation: "The use of stud.IP and ILIAS should be promoted much more – great potentials for online/distance learning – these are not simply file sharing platforms").

In view of the positive feedback, some elements of digital coursework will certainly be kept once on-site education becomes possible again. This applies in particular to the continued use of the already existing screencasts and their further expansion, as well as to the possibility of offering at least some of the weekend courses in Zoom, thus saving part-time students the need to travel to Wernigerode – a desirable outcome in light of the sustainability goals of Harz University.

Sources

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