Inverted Classroom, Challenge-Based Learning und die Interaktive Leseplatform Perusall- Praktische Erfahrungen aus einem neu etablierten MSc.-Kurs der Biologie

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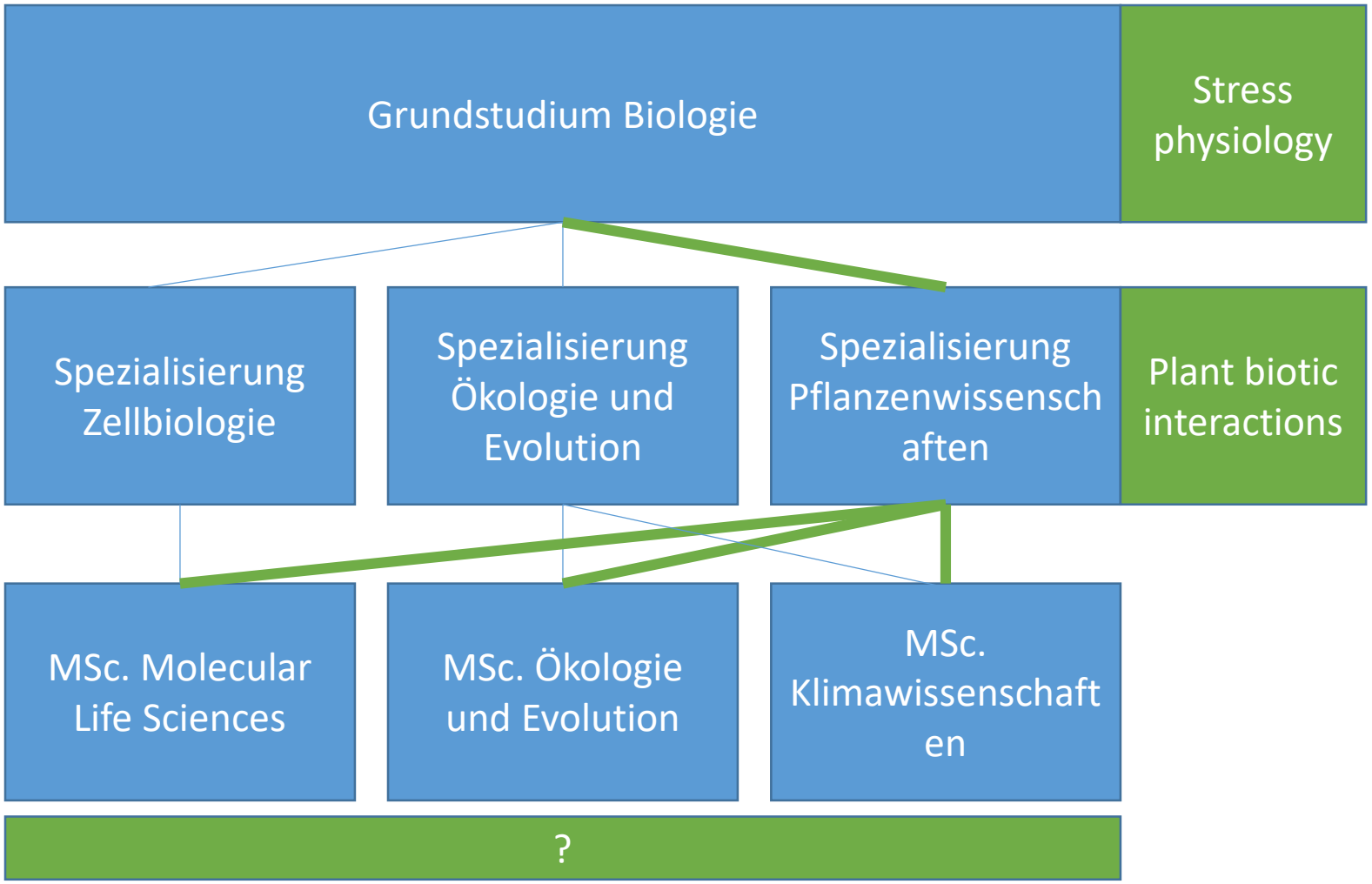
Institut für Pflanzenwissenschaften

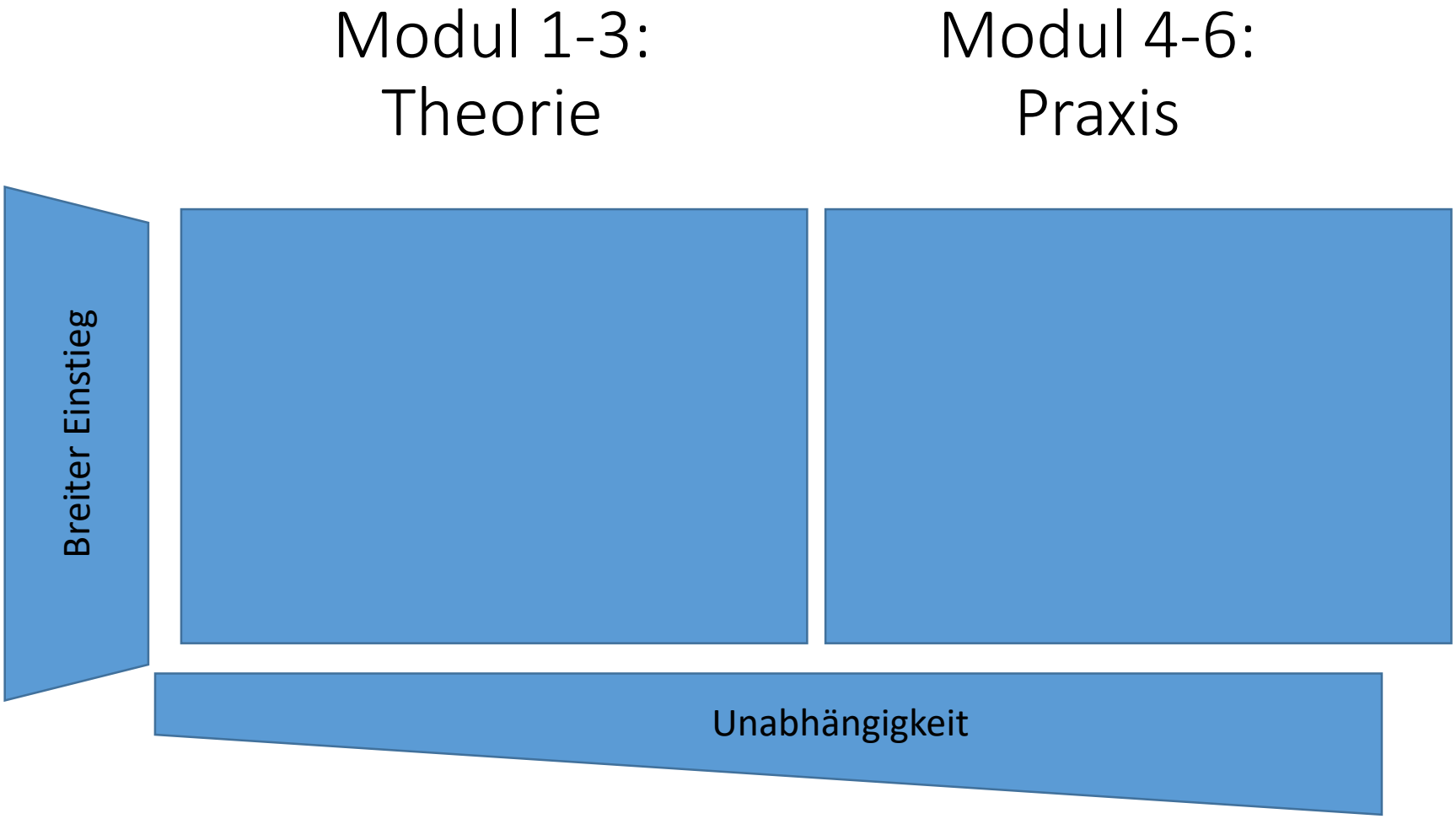
Universität Bern

Was war die Motivation, diesen Kurs aufzubauen?


Grundstudium Biologie
Stress physiology
Spezialisierung Zellbiologie
Spezialisierung Ökologie und Evolution
Spezialisierung Pflanzenwissenschaften
Plant biotic interactions
MSc. Molecular Life Sciences
MSc. Ökologie und Evolution
MSc. Klimawissenschaften
?

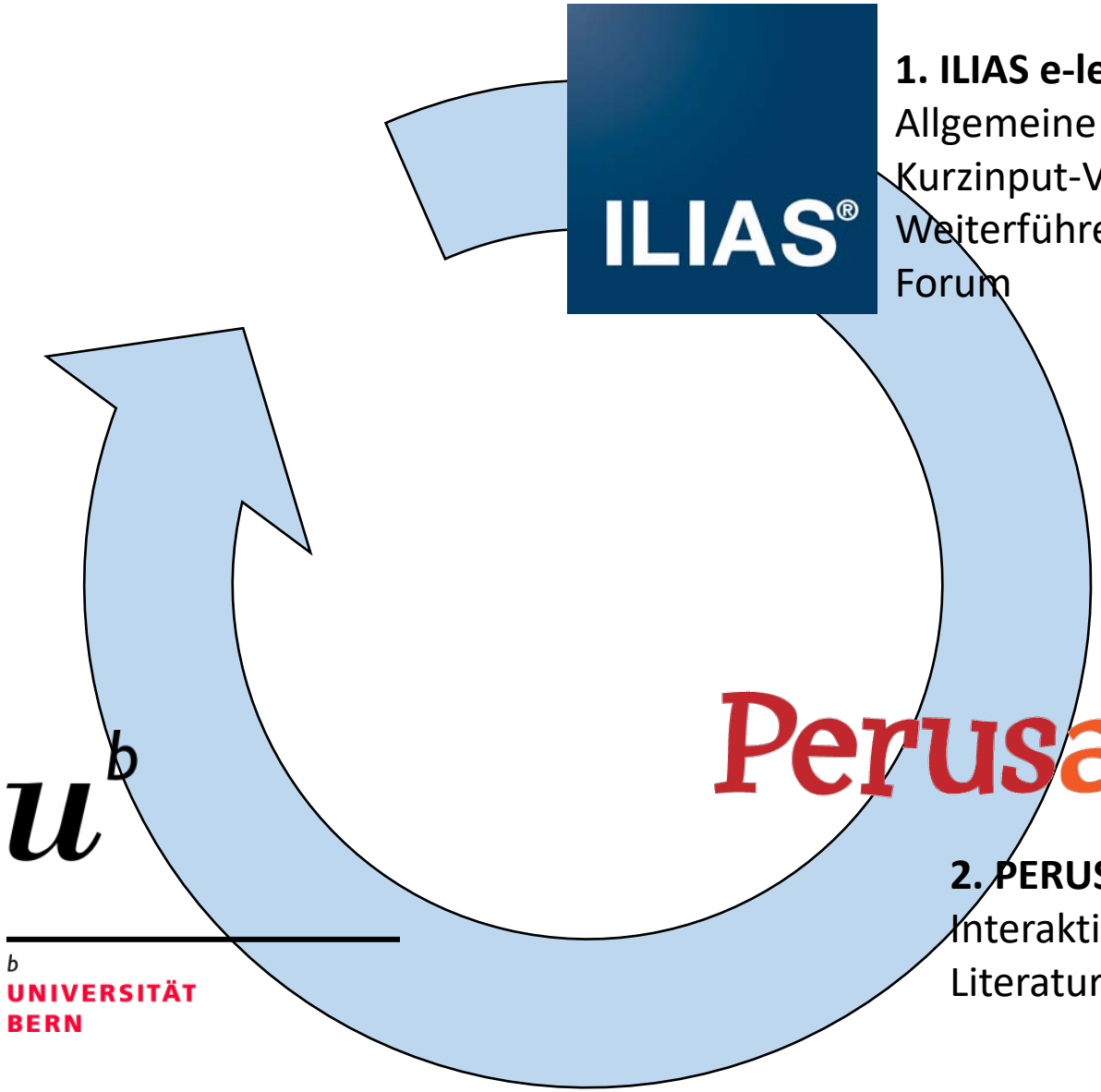
Transition von passivem zu aktivem Lernen

Wie haben wir die Kursstruktur an diese Anforderungen angepasst?


Modul 1-3:
Theorie
Modul 4-6:
Praxis
Breiter Einstieg
Unabhängigkeit

- Module 1: Basics in Plant-Herbivore Interactions
- Module 2: Frontiers in Plant-Herbivore Interactions
- Module 3: Scientific Experimentation in Plant-Herbivore Interactions

Flipped/ inverted classroom



1. ILIAS e-learning platform:
Allgemeine Informationen
Kurzinput-Videos
Weiterführende Literatur
Forum

2. PERUSALL reading platform
Interaktive Diskussion der Literatur

3. Kurse @ IPS
Antworten auf offene Fragen
Zusätzliche Diskussionen

436479-HS2018-0: Solving Current Challenges in Plant-Herbivore Interactions

Aktionen

Inhalt | Info | Einstellungen | Mitglieder | Lernfortschritt | Metadaten | Export | Rechte | Voransicht als Mitglied aktivieren

Zeigen | Verwalten | Sortierung | Seite gestalten

Neues Objekt hinzufügen

INHALT

- Course Materials
- Course program 2018
  Updated program
  pdf 17,9 KB 18. Sep 2018, 12:38 Anzahl Seiten: 1
- General Communications & Questions Forum
  Ask your general questions here. Course tutors will also post announcments and important messages here, so check frequently!
  Beiträge (Ungelesen): 9 (4) Neue Beiträge: 2
  Letzter Beitrag: Thank you for your comment and the li... von c.senn, 05. Dez 2018, 14:56

Neuigkeiten

(1-5 von 64) weiter

Forum: General Communications & Questions Forum
3 Beiträge hinzugefügt.

Datei: Course program 2018.pdf
Die Datei wurde aktualisiert.

Forum: General Communications & Questions Forum
Es wurde ein Beitrag hinzugefügt.

Datei: EcologyEvolution.pptx
Die Datei wurde hinzugefügt.

Datei: Course program 2018.pdf
Die Datei wurde hinzugefügt.

Kalender

Dez 2018

KW	Mo	Di	Mi	Do	Fr	Sa	So
48						1	2
49	3	4	5	6	7	8	9
50	10	11	12	13	14	15	16
51	17	18	19	20	21	22	23
52	24	25	26	27	28	29	30
01	31						

iCal

Part 3: Defense phenotyes

Aktionen

Inhalt | Info | Einstellungen | Lernfortschritt | Export | Rechte

Zeigen | Verwalten | Sortierung | Seite gestalten

Neues Objekt hinzufügen

INHALT

3 Defense phenotypes
mp4 47,6 MB 09. Mär 2018, 13:07

Defense phenotypes
pptx 3,5 MB 09. Mär 2018, 13:06

elife-13720-v1
pdf 1,4 MB 09. Mär 2018, 13:06

elife00007
pdf 2,4 MB 09. Mär 2018, 13:06

Lernvideos

Solving Curre...
My Courses and Cl...
Course home
Course setup
Gradebook
People
Notifications
Add to my calendar

Readings

Documents
InsectPlantBiology_Ch...
InsectPlantBiology_Ch...
elife00007
elife-13720-v1
annurev.arplant.59.032...
Show more...

Assignments
Oct 24: EMBR-16-1250
Oct 24: platt1964
Oct 24: festing2003
Oct 24: vaux2014
Oct 10: Reading for M...
Oct 10: Reading for ...
Oct 10: Reading for M...
Oct 10: Reading for M...
Oct 10: Reading for M...
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Oct 3: Reading for Mo...
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Chats

eLIFE elife.elifesciences.org

RESEARCH ARTICLE

Herbivory-induced volatiles function as defenses increasing fitness of the native plant *Nicotiana attenuata* in nature

Meredith C Schuman, Kathleen Barthel†, Ian T Baldwin*

Department of Molecular Ecology, Max Planck Institute for Chemical Ecology, Jena, Germany

Abstract From an herbivore's first bite, plants release herbivory-induced plant volatiles (HIPVs) which can attract enemies of herbivores. However, other animals and competing plants can intercept HIPVs for their own use, and it remains unclear whether HIPVs serve as an indirect defense by increasing fitness for the emitting plant. In a 2-year field study, HIPV-emitting *N. attenuata* plants produced twice as many buds and flowers as HIPV-silenced plants, but only when native *Geocoris* spp. predators reduced herbivore loads (by 50%) on HIPV-emitters. In concert with HIPVs, plants also employ antidigestive trypsin protease inhibitors (TPIs), but TPI-producing plants were not fitter than TPI-silenced plants. TPIs weakened a specialist herbivore's behavioral evasive responses to simulated *Geocoris* spp. attack, indicating that TPIs function against specialists by enhancing indirect defense.
DOI: 10.7554/eLife.00007.001

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†**Present address:** Federal Research Center for Cultivated Plants, Institute for Breeding Research on Horticultural And Fruit Crops, Julius Kühn Institute, Dresden, Germany

Competing interests: See page 26

Funding: See page 26

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Introduction

Plant indirect defenses are traits that disable or remove herbivores by manipulating tri-trophic interactions to the advantage of the plant (***Price et al., 1980***). They attract and inform the third trophic level, predators or parasitoids, resulting in increased attacks on herbivores (***Turlings and Wäckers, 2004***). Indirect defenses are widespread and include domatia, extrafloral nectar, and food bodies which provide shelter and nutrition for predators and parasitoids, as well as herbivory-induced plant volatiles (HIPVs) which convey information about feeding herbivores (***Heil, 2008***). Field studies with the native tobacco *Nicotiana attenuata*, a desert annual, and with maize have shown that HIPVs can reduce herbivore loads by 24% to more than 90%, by increasing both predation and parasitization of herbivores (***Kessler and Baldwin, 2001***; ***Rasmann et al., 2005***; ***Halitschke et al., 2008***; ***Degenhardt et al., 2009***; ***Allmann and Baldwin, 2010***) and deterring herbivore oviposition (***Kessler and Baldwin, 2001***).

If HIPVs really function as defenses, they should increase Darwinian fitness, defined as successful reproduction, for plants under herbivore attack (***Karban and Baldwin, 1997***). But because HIPVs can be perceived by many other members of the ecological community—from herbivores, pollinators, predators and parasitoids to competing or parasitic plants—it is not clear whether HIPVs increase plant fitness in nature (***Dicke and Baldwin, 2010***; ***Kessler and Heil, 2011***). The field studies described above have either spanned too short a time to reveal Darwinian fitness benefits, or have not reported fitness data at all (***Kessler and Baldwin, 2001***; ***Rasmann et al., 2005***; ***Halitschke et al., 2008***; ***Degenhardt et al., 2009***; ***Allmann and Baldwin, 2010***). Two laboratory studies showed that parasitization of herbivores can increase plant reproduction (***van Loon et al., 2000***; ***Hoballah and Turlings, 2001***), but the parasitization in these studies was not mediated by HIPVs. Hence three decades after their description, it remains unclear whether HIPVs are really indirect defenses.

Long-term field studies comparing HIPV-emitting vs -deficient plants are required in order to demonstrate a defensive function for HIPVs. Experimental additions of pure volatiles or mixes to

eLife digest As the population of the world continues to increase beyond 7 billion, and agricultural pests continue to rapidly evolve resistance to pesticides, it is becoming ever more important to cultivate arable land in a way that is sustainable for both humans and the environment. A better understanding of the different mechanisms used by wild plants to deter herbivores will help to increase crop production without harming the environment.

Plants use both direct and indirect methods to fend off herbivores. Direct defense methods include the production of chemicals that are toxic to herbivores or give them indigestion, and the growth of sticky prickles and spines that can injure or kill the herbivore. Indirect defense methods, on the other hand, generally rely on the plant attracting organisms that are either predators or parasites of the herbivore.

Plants produce odors known as herbivory-induced plant volatiles (HIPVs) that are thought to

All conversations

Page 4
irLOX2: I found that ir is an abbreviation for inverted-repeat.D...
I wonder where the precursor molecules of these two genes ... 2

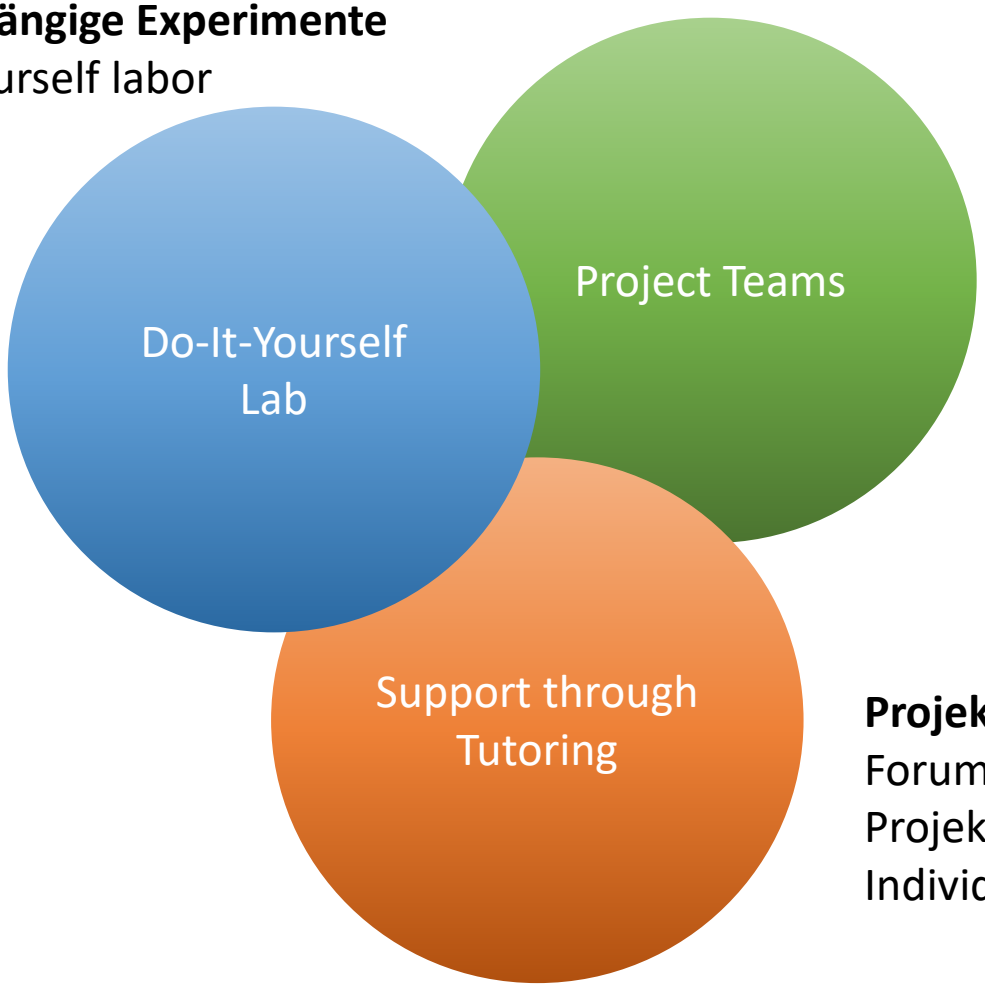
Page 5
Hemizygous means one allele is missing (so one instead of... 2

Page 17
I think that, in a next study, it will be very interesting to stu...
This is a pertinent study that shows how direct plant defens...
This study is very informative, as it shows the effect of HIPV in n...
Would the results differ if the plant is dependend on pollin... 2

- Module 4: Find Your Own Challenge in Plant-Herbivore Interactions
- Module 5: Solve Your Challenge through Experimentation
- Module 6: Understand and Communicate Your Knowledge

Challenge-based learning

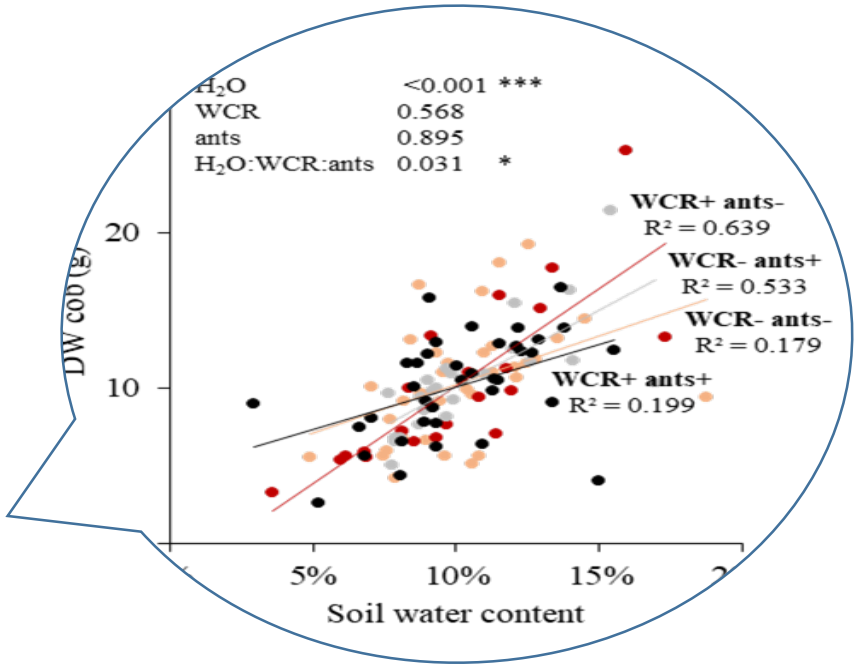
Undabhängige Experimente
Do-it yourself labor



Projektteams
Frage zusammen identifizieren
Experimente planen
Arbeit koordinieren

Projektbetreuung
Forum auf Ilias
Projektpräsentation & Diskussion @IPS
Individuelle Unterstützung

Ziel für die Studenten: Ein experimenteller Test einer eigenen Hypothese, als Präsentation den Kursteilehmern vorgestellt.



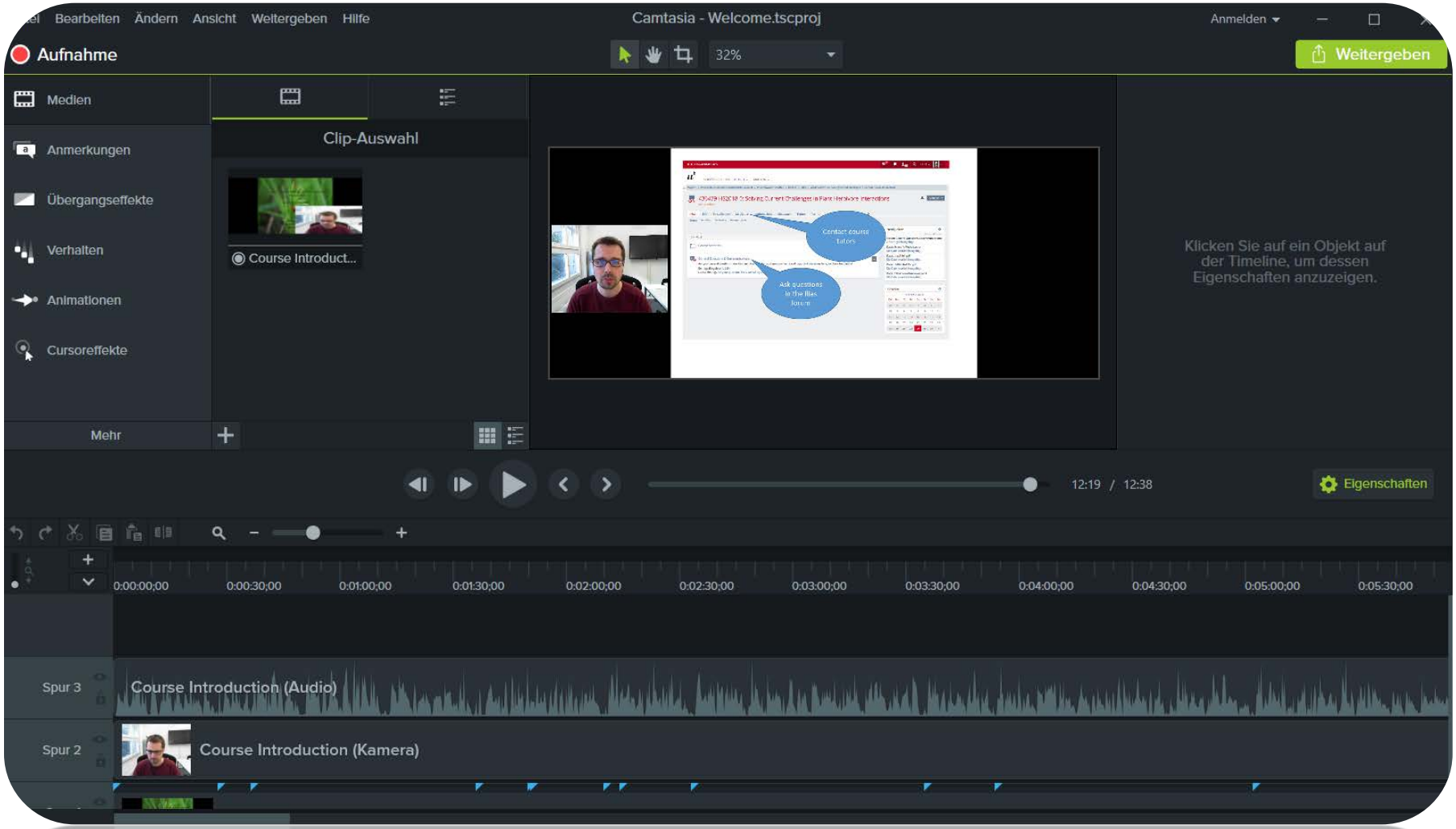
Wie haben wir den Kurs validiert?

Erik Poelman, Professor für Entomologie, Wageningen University

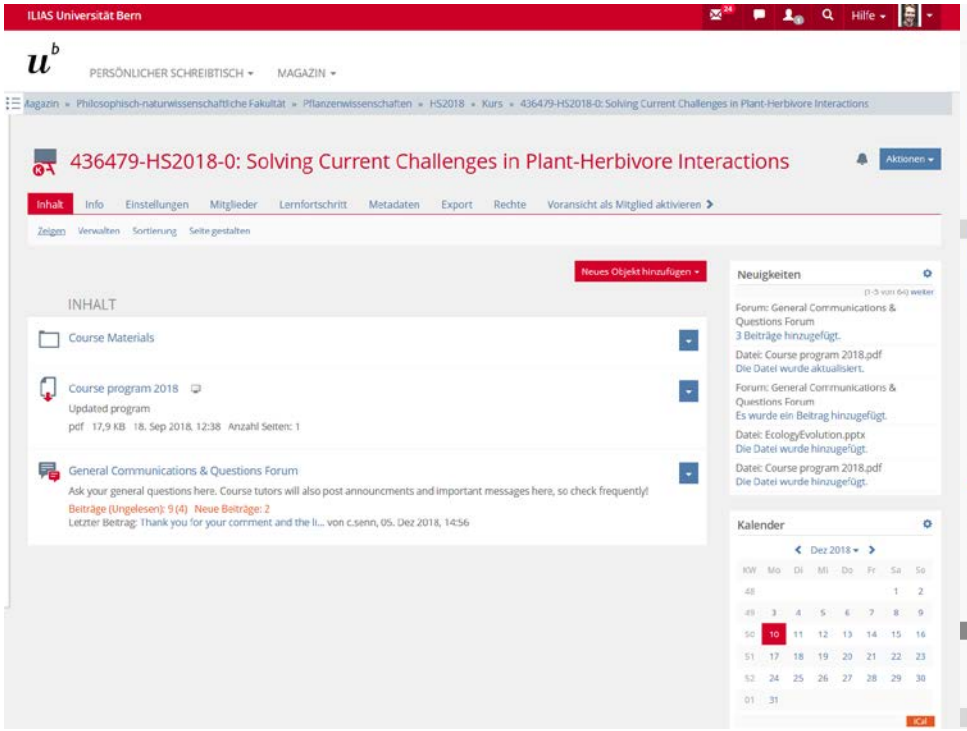
Thomas Tribelhorn, Leiter Hochschuldidaktik & Lehrentwicklung, Universität Bern

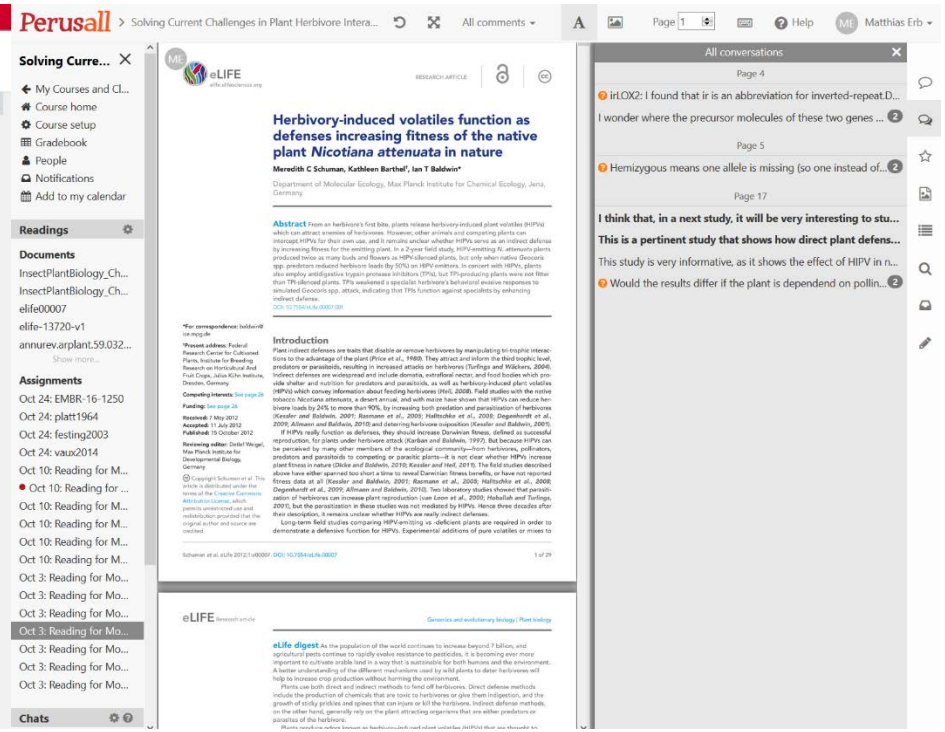
Vorbereitungsphase: Was hat funktioniert, was nicht?

Videos erstellen: Sehr effizient dank low-tech



Ilias und Perusall- einfaches Management





Zeitplanung des Kurses- schwer

Timing is everything

Wie haben wir den Kurs angestossen?

Apéro als Einstieg

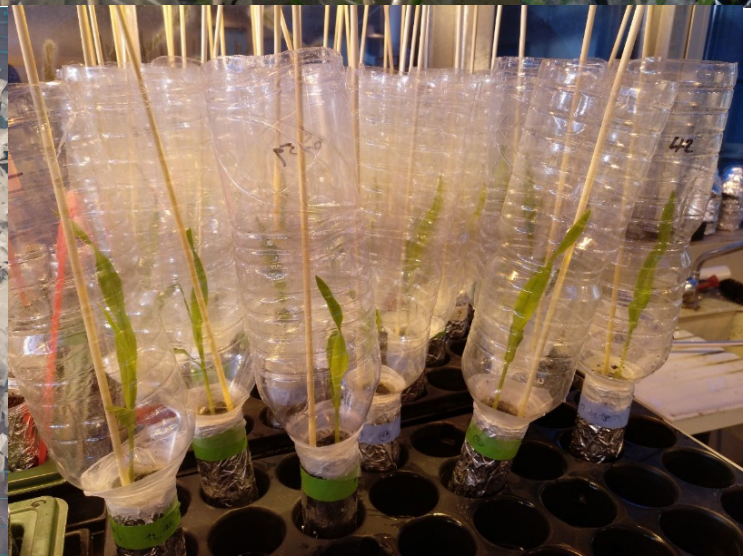
Wie hat der «Inverted Classroom» Teil funktioniert?


Perusall
Every student prepared for every class.
Get started now

Gruppendiskussionen

Wie hat der «Challenge-Based Learning» Teil funktioniert?

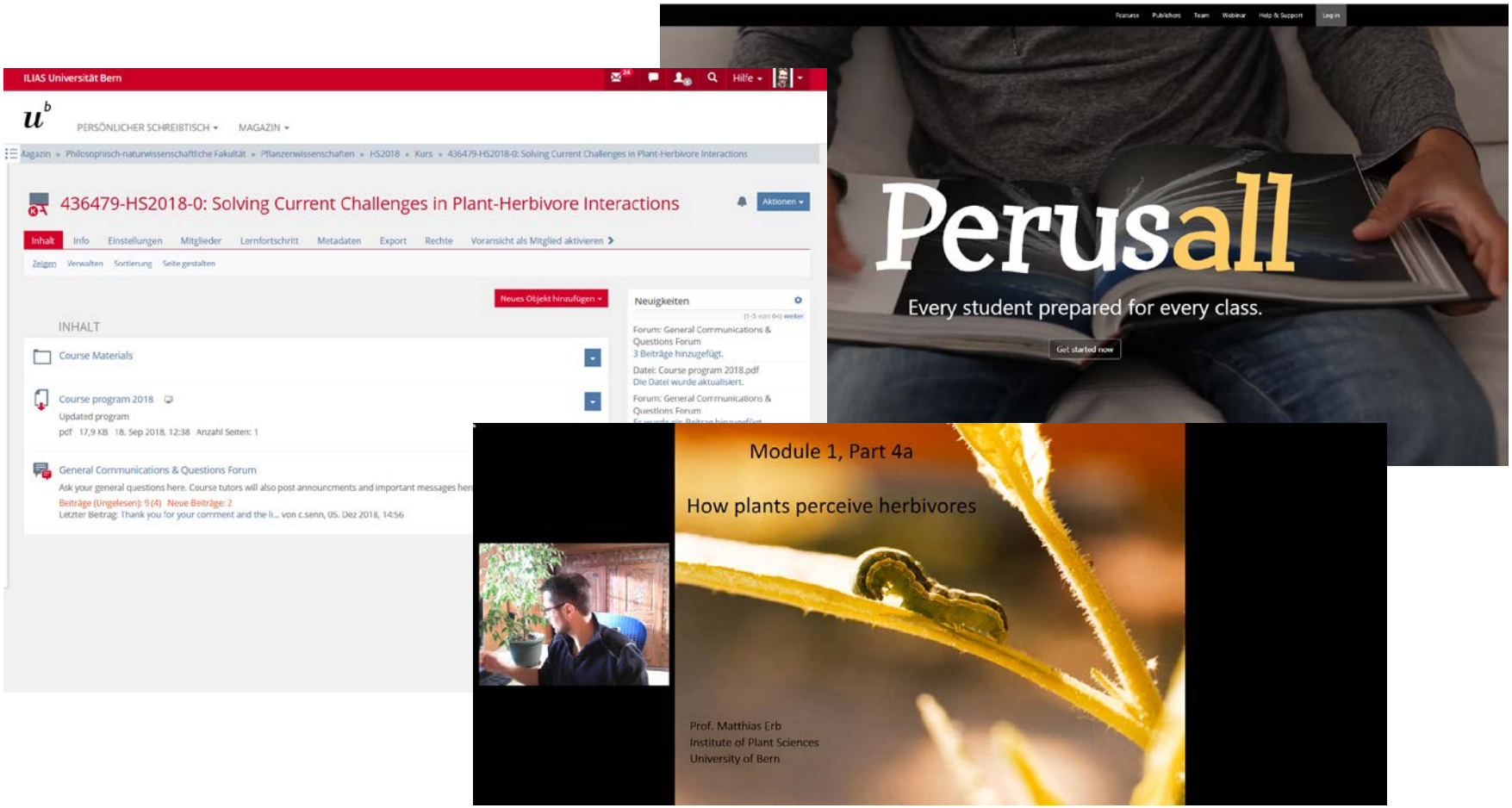

sématerra
50



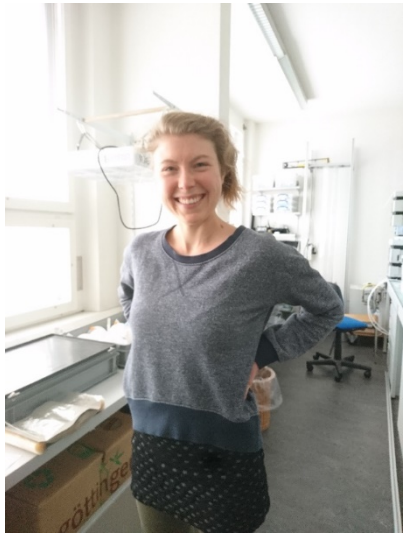

Treatment: T5
Replicate: 9
Date:
Insect:
Bacteria:

Durchführungsphase: Was hat funktioniert, was nicht?

Videos, Ilias & Perusall: Gute Kombination



Entwicklung der Studierenden: positiv



Eigenes Projekt entwickeln: Schwierig für die Studierenden

Gute Lehre an der Universität Bern

Förderung Innovative Lehre (FIL)




Christelle Robert Erik Poelman Thomas Tribelhorn Claudia Buser