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Embeddedness as an Integrative Quality Assessment Tool for Student-Centered Extracurricular Studies

ABSTRACT/ZUSAMMENFASSUNG

Das Studium Generale bietet Universitäten die Möglichkeiten über einzelne Studiengänge hinausgehendes Wissen anzubieten, etwa zu Nachhaltigkeit oder Digitalisierung. Während das Scholarship of Teaching and Learning (SoTL) umfassende Hilfestellungen für studierendenzentriertes Lernen in regulären Studiengängen bereithält, finden sich kaum äquivalente Empfehlungen für interdisziplinäre Lehr- und Lernformate. Um diese Lücke zu schließen, entwickelt der Artikel ein „Einbettungsinstrument", das die universitären Kontexte bei der Gestaltung, Durchführung und Verbesserung extracurricularer Formate berücksichtigt. Das Einbettungsinstrument wird auf das Seminar "Foundations of Planetary Thinking" angewandt, ein Prototyp eines Studiums Generale, um Fallstricke, bewährte Verfahren und fehlende Einbettungsgrade aufzuzeigen. Die Ergebnisse zeigen, dass extracurriculare Formate eingebettet sind, wenn sie mit den spezifischen universitären Kontexten in Resonanz stehen und die Integration beider studierendenzentriertes Lernen ermöglicht. Falls weitere Studien diese Ergebnisse stützen, kann das Einbettungsinstrument zur Selbstevaluation extracurriculare Formate im Sinne des SoTL dienen.

Schlagworte: Embedding Tool – Internationale Studierende – Asynchrone Lehre – Interdisziplinäres Seminar – Selbstevaluation

Extracurricular studies are a way for universities to deal with issues that are relevant for students beyond their individual study programs, such as sustainability or digitization. While the Scholarship of Teaching and Learning (SoTL) provides profound advice for regular study programs on how to reach high levels of student engagement, similar recommendations for extracurricular studies are virtually non-existent. To address this gap, this article develops a quality assessment tool based on the notion of embeddedness to take different universities' conditions into account when designing, investigating, and refining extracurricular studies. The article applies the 'embedding tool' in context of a prototype seminar for extracurricular studies entitled 'Foundations of Planetary Thinking' to exemplify pitfalls, best practices and missing degrees of embeddedness. The results indicate that extracurricular studies are 'embedded' when they resonate with the specific university conditions at hand, and the integration of both enables student-centered learning. If refined and supported by further studies, the findings imply that the embedding tool allows for a self-evaluation to 'embed' extracurricular studies.

Keywords: embedding tool – international students – asynchronous teaching – interdisciplinary seminar – self-evaluation

Figure 1:
Cover of the Syllabus

Introduction

Seminars can differ along various axes. They can, for example, address a small group of specialized students or a whole cohort, present basic definitions or engage students in original research, be taught in the native language of the university's national residence or in an international language, have a regular schedule or only a few deadlines, meet in person or online as distance learning, and rely on rather student- or teacher-centered pedagogies. At the same time, choosing a combination of these characteristics for one's own teaching substantially relies on the respective implementation conditions, including an elite versus a mass university, the fit into modules within a course of study, the degree of internationalization of the faculty, the duration of the semester, the availability of digital teaching and learning platforms, and the personality of the lecturer. Within established and successful courses of study, both the seminar didactics and the conditions at the respective university intersect and create resonance in order to reach high levels of student engagement.

Extracurricular studies are a special kind of seminar as they are not part of a specific study program and thus need to consider a much broader diversity of students and overall university conditions beyond departmental structures. The main question then becomes: How can extracurricular studies reach high levels of student engagement? Answers from within SoTL are hard to spot, as what is usually referred to as 'context' is too narrow in terms of extracurricular studies, "since all SoTL is rooted in particular classroom, disciplinary, institutional and cultural contexts" (Felten 2013: 122-123, see also Huber & Hutchings 2005). Not surprisingly, the Association for Interdisciplinary Studies states that – with few exceptions on a rather basic level (see, for example, McKinney 2013) – "[r]elatively little of the SOTL work that has been done involves interdisciplinary teaching and learning" (Association for Interdisciplinary Studies 2021).

To understand how extracurricular studies can be student-centered and thus reach high levels of student engagement, I propose a respective quality assessment tool which I call the 'embedding tool' and exemplify it with a novel seminar. The MA seminar investigated is a prototype for extracurricular studies at Giessen University (Germany), entitled 'Foundations of Planetary Thinking', which I taught in the winter term 2020/21 and summer term 2021. The seminar crosses three conventional boundaries: spatial, as it addresses international students around the world and local students in times of a pandemic; temporal, as students live in different time zones, making digital asynchronous teaching-learning processes key; and interdisciplinary, as the seminar is open to students of all disciplines. The seminar thus extends the above-mentioned definition of contexts of SoTL in all respects, as it is rooted not in a particular classroom but, rather, in an online platform, is interdisciplinary as it is open for students from all disciplines and includes international students with different cultural contexts from around the world in different time zones. In order to subsume research on these kinds of extracurricular studies within SoTL, I define SoTL fundamentally "as systematic reflection and study on teaching and learning made public" (McKinney 2006: 38, in a similar vein Roxå, Olsson & Mårtensson 2008: 282).

The following study is thus a combination of what is in SoTL perceived as a conceptual article – as it introduces a quality assessment tool – and a reflective essay – as it provides a plausibility check based on experiences with a seminar developed from scratch (Haley, Matthews & Cook-Sather 2019). The scope of the article is broad in terms of the seminar characteristics and university conditions that are connected, but it integrates these various dots as they emerge in real-world teaching-learning practices in a quality assessment tool. Accordingly, the article also contributes to the rising debate on quality assurance approaches in student-centered learning (Gover, Loukkola & Peterbauer 2019).

In order to develop an integrative quality assessment tool for student-centered extracurricular studies, the article proceeds in five steps: first, I outline the quality assessment tool based on the notion of embeddedness; second, I elaborate on the specific conditions at Giessen University (institutional embeddedness); third, I explain the topics included in the seminar (thematic embeddedness); fourth, I examine personal exchange within the seminar (social embeddedness); and, finally, I discuss challenges for refining Foundations of Planetary Thinking based on the insights gained by applying the 'embedding tool'.

Embeddedness as a Quality Assessment Tool

In general terms, embeddedness can be defined as the dependence of a phenomenon on its environment (Schmidt 2019). Karl Polanyi, who introduced the concept in his seminal text The Great Transformation (Polanyi 1944), argues that economies have to be understood in the context of social worlds into which they are embedded: an economy that is run as if it were unrelated to the historically derived, organizational and social configurations will create more harm than good. In this twofold sense of embeddedness, as an analytical concept and a principle, the conditions within which social action happens and upon which it relies come into focus. Embeddedness thus echoes, for example, Jürgen Habermas' idea of the lifeworld and was used by the French-based regulation school. More recently, the idea of embeddedness gained prominence within research on sustainability transformations, as the largely fossil fuel-based world economy became apparent as not being embedded in the earth system it relies upon (WBGU 2011).

It is thus no surprise that sustainable transformation research defines the role of universities as embedded and part of societies that have to contribute to sustainability transformations (see, e.g., Schneidewind 2015, Strohschneider 2014). In this vein, sustainable education through research requires active students and problem-based learning that relates various contents, applies diverse concepts, and theorizes about how change happens (Biggs 1999: 59). This becomes more likely when students can help shape their learning processes, where interdisciplinary cooperation is enabled and demanded, where the plurality of students (such as diverse international backgrounds) is considered, or where the ability to further develop scientific knowledge and its social benefits becomes visible. Finally, it is a matter of applying different perspectives to what was previously unquestioned and,

in doing so, of looking beyond one's own disciplinary boundaries for inspiration and respectful collaboration. At this point, teaching, learning, and research begin to be directly related, as they share the same goals and are mutually dependent. In other words: they are embedded.

While various and partly interchangeable dimensions have been identified within the literature on embeddedness (BECKERT 2007), this article is centered around three that come into focus in the context of extracurricular studies at a university: the institutional, the thematic and the social contexts of the seminar. Institutional context refers to the specific conditions of the university, such as departments or previously existing interdisciplinary structures, in which the seminar is taught. Thematic embeddedness deals with the contents of the seminar, for example, whether it focuses on sustainability or digitization and what particular issues are investigated. The social context of a seminar considers overall social structures, such as the way exchanges between students and between students and the teacher are organized. In order to develop an integrative quality assessment tool for student-centered extracurricular studies, these contextual dimensions need to be combined with the specific (inter)disciplinary, spatial and temporal characteristics of the seminar investigated. In the case of 'Foundations of Planetary Thinking', these characteristics are the interdisciplinary background of the students, the international participants from around the world, and, consequently, the asynchronous schedule. This results in the following quality assessment tool, the so-called 'embedding tool'.

Context / Characteristics	Institutional	Thematic	Social
Disciplinary: Interdisciplinary	Does the interdisciplinary character of the seminar fit the institutional structure of the university?	Are the seminar's contents accessible by students of all disciplines?	Do students engage with students with different disciplinary backgrounds?
Spatial: International	Are international students institutionally supported in accessing the seminar?	Do international students actively engage in the seminar's topics?	Do international students take equal part in seminar discussions?
Temporal: Asynchronous	Do institutional competences exist that enable asynchronous teaching and learning?	Does the asynchronous character of the seminar allow thoughtful inputs?	Does the asynchronous character allow for social exchange?

Figure 2:
The Embedding Tool

Note: The characteristics need to be adjusted to the specifics of the respective extracurricular studies to be evaluated, e.g., extracurricular studies might not be asynchronous but take

place in person and en bloc at a weekend, which results in an alternative focus to the questions for each field of the embedding tool matrix.

The embedding tool is thus a quality assessment tool to actively embed extracurricular studies based on guiding questions focusing on the creation of student-centered learning environments in order to achieve high levels of student engagement. The embedding tool can be applied at any stage of seminar development: during the design phase, the implementation phase, or afterwards for evaluation. With the help of the embedding tool, it is possible to show how student-centeredness is represented by the frameworks and structures of teaching-learning activities. This then enables learning to occur because students have to do something that the learning outcomes require. This also means that the embedding tool forces teachers to create an architecture of engagement (Riggs 2016). Instead of teacher-centered teaching activities with lecture and exam pedagogies, voluntary or elective extracurricular studies need to function as an active learning place with the student in the center. In what follows, I apply the embedding tool to the seminar 'Foundations of Planetary Thinking' in order to exemplify pitfalls, best practices and missing degrees of embeddedness.

Institutional Embeddedness

First, regarding the disciplinary dimension, does the interdisciplinary character of the seminar fit the institutional structure of the university? The interdisciplinary character of the seminar meets a department and course structure largely organized around disciplinary boundaries. Giessen University describes two key goals in its development plan 2030 that are key to (or 'at the core of') understanding the institutional genealogy of 'Foundations of Planetary Thinking'. The university aims to establish a Panel on Planetary Thinking "as a research-oriented think-tank that draws on the interdisciplinary expertise of top-level researchers at JLU, endorses the University's stance on sustainability and also supports the transfer of appropriate subjects from research and teaching to society through high-profile events" (JLU 2020: 47, see also Hanusch, Leggewie & Meyer 2021). In addition, JLU aspires to set up thematically broad extracurricular studies available for all students in the form of a so-called 'studium generale', most probably as a digital or partly digital format (JLU 2020: 26). In combination and backed up by discussions with the head of the presidential office and the Department of Study, Teaching, Continuing Education and Quality Assurance, the idea was born to develop an interdisciplinary seminar as a prototype for the studium generale based on the topics addressed by the Panel on Planetary Thinking. Embedding a prototype seminar in the context of a university where a studium generale and respective structures do not yet exist is only possible by using various detours. As an interdisciplinary seminar, it needs to be open for students of all faculties. The institution closest to offering interdisciplinary seminars, which are extracurricular and focused on developing job-related skills and capabilities for students, is the Center for Competence Development

(Zentrum für fremdsprachliche und berufsfeldorientierte Kompetenzen, ZfbK). This is why Foundations of Planetary Thinking is offered at the ZfbK. Yet, as the ZfbK does not offer courses with credit points for MA students, I have to write respective letters for every student. This case-by-case recognition within their courses of study needs to explain – similar to module descriptions in disciplinary study programs – how the workload relates to credit points. Another workaround needed to be found as the seminar does not appear in the course catalog of the disciplinary study programs, but only as part of the ZfbK. When Foundations of Planetary Thinking was offered for the first time in the winter term 2020/2021, advertisements were placed on the Twitter and Facebook pages of Giessen University and through the newsletter of the general students' committee (AStA). The second time the seminar was offered, it was reasonable to expect that it could not always be advertised when there are hundreds of other seminars that are not. I decided to ask course coordinators from the two faculties that represented most of my students from the last semester to advertise the seminar among their students. In sum, these workarounds are necessary to enable student-centeredness and to identify students motivated to take part in extracurricular studies, yet they are largely temporary and no substitute for permanent structures of a studium generale.

Second, regarding the spatial dimension, are international students institutionally supported in accessing the seminar? This was almost automatically addressed as Giessen University's International Office, fueled by the pandemic, coincidentally established a so-called Virtual International Program that enabled international students to enroll as exchange students at Giessen University even though they could not be in Giessen. 'Foundations of Planetary Thinking' is listed in this program and the highly supportive structure established by the International Office not only provides a list of students interested in the course, but also collects and submits final grades. International students thus do not have to worry about collecting their credits and grades from an extracurricular seminar without knowing whether it will be counted in their exchange certificates.

Third, regarding the temporal dimension, do institutional resources exist that enable asynchronous teaching and learning? The asynchronous character of the seminar could be easily embedded in the digital learning platform ILIAS provided by Giessen University. ILIAS allows numerous features with opening and closing deadlines. In addition, at Giessen University there is an expert team on digital teaching (Kompetenzteam Digitale Lehre), which was highly supportive in developing a respective digital format that translated the needs of the seminar into a digital form. A digital architecture of engagement putting the student in the center could be easily built.

Thematic Embeddedness

First, on the level of disciplinarity, are the seminar's contents accessible for students of all disciplines? The advertisement and syllabus accordingly welcome prospective students with the following words: "You're ready to admit that the Earth is an everchanging planet with all the consequences this might have for earthlings like us? And you're eager to engage in interdisciplinary and intellectually challenging debates? Seems you're right in this course!"

A more detailed view in the syllabus provides a comprehensive picture on how interdisciplinary embeddedness is envisioned thematically. The description of purpose and goals states:

> "Novel perspectives are the most exciting and vital aspect of science: we are able to pose pioneering questions, formulate fresh theories and deliver original insights and evidence about the way the world works. But before doing such research, we have to become familiar with the foundations of a new perspective. With this in mind, the seminar supports you in developing a planetary way of thinking. To think planetarily means knowing the Earth as a planet. What may sound trivial means understanding human life and societies through a constantly changing planet, which extends from the Earth's core to interplanetary space, stretches in time from nanoseconds to deep time and ranges materially from elementary particles to the Earth's mass. You will learn that how we know the world and how we shape our coexistence with it depends on each other. You will understand that decisions about how to continue to live on this planet, live well or deal with the loss of life depend on insights into how the universe functions as a whole, quite independently of our ability to influence it. This raises big questions: How can we deal with the irregularly regular planetary changes outside of human influence? How have we acquired planetary powers that are capable of transforming the Earth? What does it mean to have such powers, how can they be used or withheld? With which planetary dynamics can we additionally merge or reunite, which mergers should we end if possible?"

The course objectives and intended learning outcomes are, according to constructive alignment, defined before the teaching takes place and, in form of a general overview (Biggs 2014), state that students are able to:

- grasp a planetary perspective, which is achieved by watching lectures and other media and debating them in an online discussion forum
- evaluate publications of leading authors within the field, which is realized by reading core publications, debating them in a discussion forum and writing a literature review
- recognize, explain and reflect upon core concepts, issues and scenarios of planetary thinking, which is realized by writing glossary entries and translating scientific knowledge in everyday language in the form of a meme or creating a 'Fakebook' page (similar to Facebook yet not public and designed for teaching purposes)

— form their own opinion about conflicting proposals and debates, which is realized by entries in a personal reflection blog and the design and realization of an infographic.

Students told me in personal communications that the vastly interdisciplinary character of the seminar raised their research desires in looking at the big planetary picture, but workload and interdisciplinary studies were much more demanding than their disciplinary seminars.

Second, on the spatial level, do international students actively engage in the seminar's topics? The syllabus aims to include a broad and international range of perspectives in planetary thinking, but there remains a clear cultural bias in the reading and lectures, etc., which is why representation of the diversity of international students' perspectives has to be seen as an ongoing task. As of now, a mixed picture exists, as from the first cohort of international students, none submitted final exams. In contrast, the second cohort of international students is much more engaged in discussion fora. This observation needs further investigation and, in particular, more diverse readings will be added to the syllabus to allow for easier connections to planetary thinking regardless of cultural background. However, reasons might also be found in terms of the social context, as I individually welcomed students of the second cohort based on their self-presentation in the respective ILIAS forum.

Third, on the temporal level, does the asynchronous character of the seminar allow thoughtful inputs? The asynchronous character allows for extended reflection time and holds the opportunity to compose thoughtful, probing inputs. Particularly, the written language holds more opportunity for reasoned thought on complex material, more ability to go in-depth, more time to think through an issue before posting a comment and rereading archived content. The often-unfamiliar interdisciplinary topics, concepts, approaches and ideas dealt with in the seminar can be looked up by the students in a self-paced manner. This self-directed learning serves the experience of autonomy and has a motivational effect (Deci & Ryan 2008).

Social Embeddedness

Regarding the first category of disciplinarity, do students engage with peers from different disciplinary backgrounds? Disciplinary cultures need to be sidelined. The program starts with a seminar outline that does not use disciplinary language. It needs to be cognitively easy to understand and very clear and explicit in what its expectations are, so that misunderstandings in tasks and activities due to different disciplinary backgrounds can be avoided. This is why the course has a modular structure, which is consistent and predictable and clearly translated in the ILIAS platform (Figures 3 and 4).

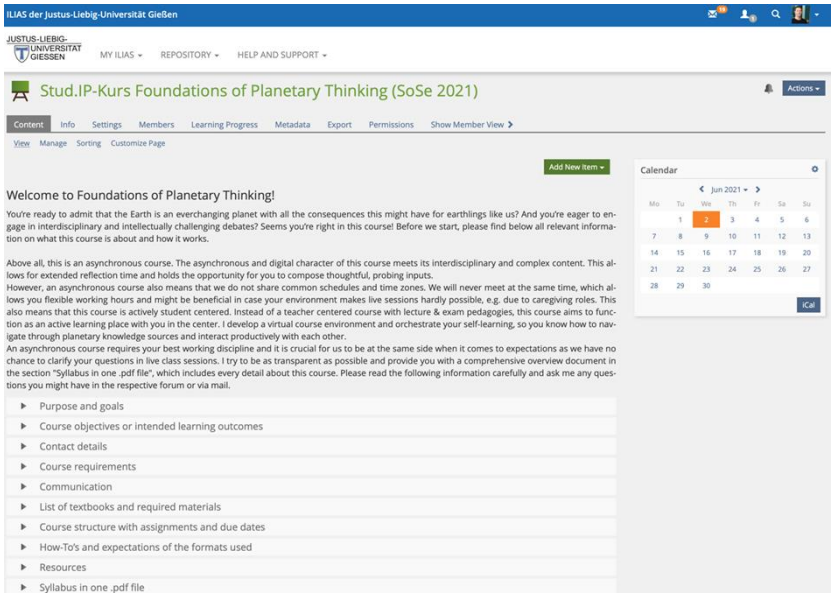


Figure 3:
ILIAS Start Page

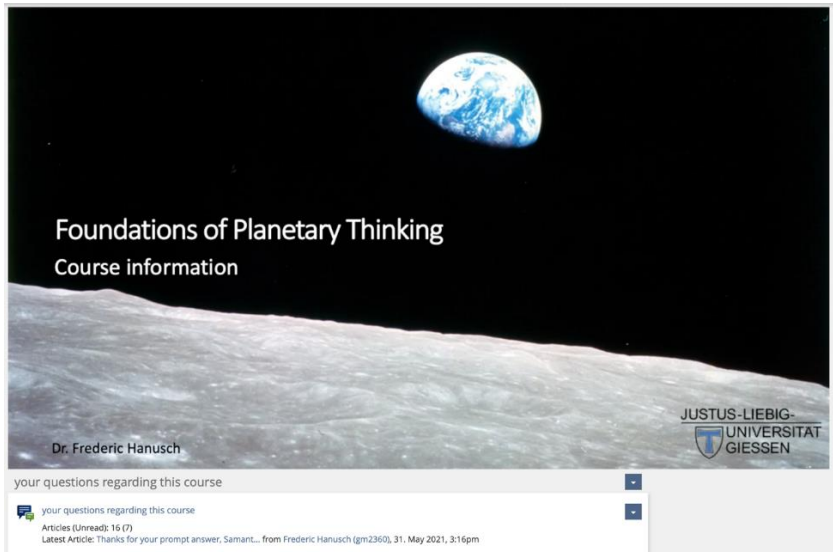


Figure 4:
Introduction Lecture and Questions Forum in ILIAS

After an introduction week, the seminar is divided into four consecutive modules, each consisting of four consecutive units. This means students start in module one with their first unit (1.1), then proceed with the module's second unit (1.2), etc. The first two units of each module are primarily about exploring content, while the other two are for producing content.

Content-wise, the first module is 'PERSPECTIVES'. In this module, origins of planetary thinking (such as the overview-effect) and key frameworks (such as the Anthropocene) are identified and discussed to allow students to grasp a planetary perspective. Second, the seminar focuses on 'CONCEPTS'. Within this module, key concepts relevant for planetary thinking (such as materialism) are introduced, discussed and related to help students learn to think planetarily. Third, the seminar takes a look at empirical 'CONSTELLATIONS'. This module investigates a diverse set of phenomena conjoined by their planetary character (such as the Pleistocene Park or a single molecule like hydrogen) to interpret the realities we face as a planetary species. Fourth and last, we encounter planetary 'SCENARIOS'. Here, the seminar explores emerging scenarios on and beyond our home planet (such as terraforming Mars or Earth system governance) and evaluate these proposals.

In terms of the didactic structure, each unit becomes progressively more complex. The first unit is always about 'CONSUMPTION', via an introduction lecture by the teacher and several other media, such as TED Talks or online exhibitions. The students aim to get in touch with a novel topic and discuss their impressions in discussion forums. As such, each unit prepares the students for the next unit within each module. The second unit, 'SELF-STUDY' is focused on self-study. Based on basic knowledge acquired through media in the first unit, students self-study publications and discuss their insights in a discussion forum. This is the basis for Unit Three, in which the students transfer their insights of the first two units into a glossary entry and everyday language in the form of a meme and a Fakebook entry they share. They also have fun in an online seminar with their peers. Last, unit four of each module, 'REFLECTION', focuses on thinking about the main learning of the module in a personal blog and identifying ideas and topics that might be of interest for the literature review and infographic the students have to create after completion of all modules. In sum, within each module students are tasked with increasing levels of engagement, which allows them to reach their learning outcomes (see above) (Biggs 1999: 59).

Taken together, this results in the following Table (Figure 5) where activities are iterative throughout the four modules (for a visual impression of the respective ILIAS structure, see Figures 6 and 7 on the following pages).

Foundations of Planetary Thinking at a Glance

ACTIVITY / MODULE	**CONSUMPTION** *of an intro lecture and media with a predefined focus*	**SELF-STUDY** *of publications for your literature review*	**TRANSFER** *of your insights in the daily life and in a glossary*	**REFLECTION** *of your learnings to produce an info-graphic*
1. PERSPECTIVES *Origins of planetary thinking and key frameworks are identified and discussed to grasp a planetary perspective.*	**UNIT 1.1** *approaching a planetary perspective*	**UNIT 1.2** *deepening a planetary perspective*	**UNIT 1.3** *formulating a planetary perspective*	**UNIT 1.4** *making sense of a planetary perspective*
2. CONCEPTS *Concepts relevant for planetary thinking are introduced, discussed and set into relation to learn to think planetary.*	**UNIT 2.1** *approaching planetary thinking*	**UNIT 2.2** *grasping concepts of planetary thinking*	**UNIT 2.3** *developing notions of planetary thinking*	**UNIT 2.4** *knowing how to think planetary*
3. CONSTELLATIONS *A diverse set of phenomena conjunct by their planetary character are investigated to interpret the realities we face as a planetary species.*	**UNIT 3.1** *observing planetary-human constellations*	**UNIT 3.2** *understanding planetary-human constellations*	**UNIT 3.3** *consolidate planetary-human constellations*	**UNIT 3.4** *realizing a world full of planetary-human constellations*
4. SCENARIOS *We explore emerging scenarios on and beyond our home planet and evaluate these proposals.*	**UNIT 4.1** *explore planetary future scenarios*	**UNIT 4.2** *figuring out the drivers of planetary futures*	**UNIT 4.3** *explaining features of planetary scenarios*	**UNIT 4.4** *interpret planetary future scenarios*

Figure 5:
Module Structure

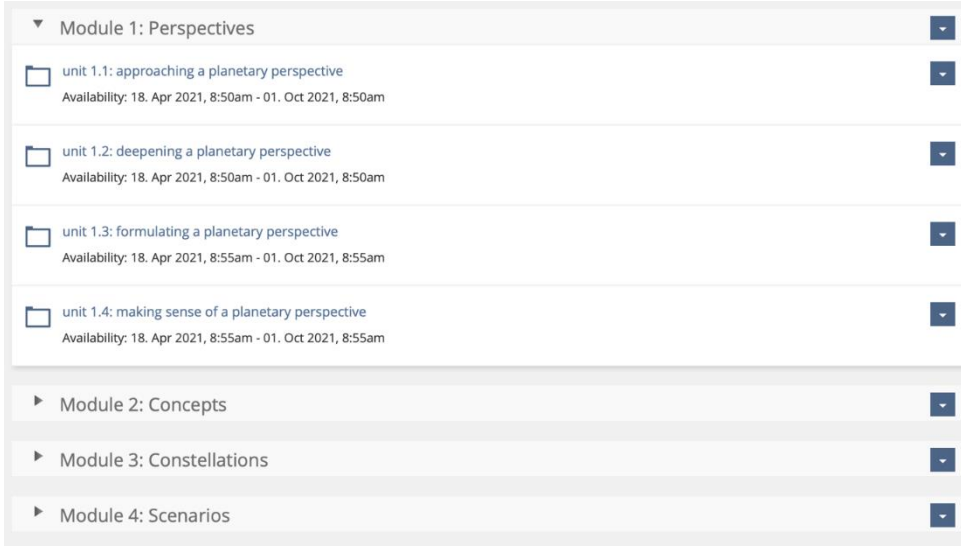


Figure 6:
Module Structure in ILIAS

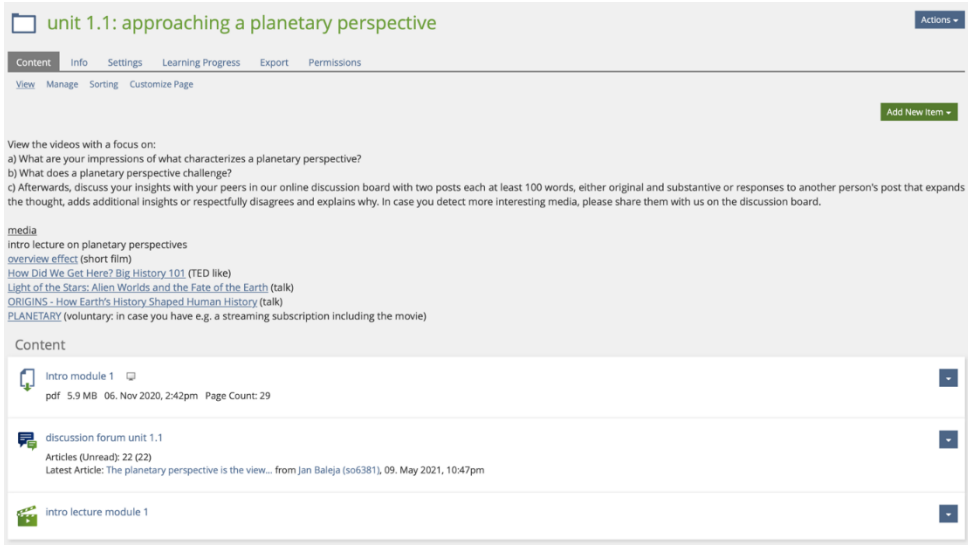


Figure 7:
Unit within one Module

Throughout the four modules, students recognize that compulsory assignments become less important and assignments with more choice become more important, as the schedule increasingly opens up to their interests. This is in line with the student-centered approach enabling research-based learning and the experience of autonomy regardless of disciplinary knowledge and background.

Regarding the second category of spatiality, do international students take equal part in seminar discussions? Authentic and clear communication seems to be key. In terms of authentic self-presentations, the students are asked in the first week to introduce themselves in whatever format (video, text, picture, etc.) they find most appropriate. I have chosen to take a video in my garden in front of my beehives (Figure 8), connecting the transportation of bee breeds to the vast amount of exchange of plants, animals and even slaves during the Colombian Exchange to provide a glimpse on how everyday life is connected to the topic of the seminar.

Figure 8:
Self-presentation Video of the Lecturer

The majority of communication in Foundations of Planetary Thinking takes place in the online course space in ILIAS. The primary means of communication is written. As already explained, the written language has many advantages for the seminar. However, written communication also has certain disadvantages, such as a lack of the face-to-face signaling that occurs through body language, intonation, pausing, facial expressions, and gestures. As

a result, students need to be made aware of the possibility of miscommunication and are asked to compose their comments in a positive, supportive, and constructive manner. I make the time I spend in ILIAS transparent and let the students know that I typically log in to monitor course activities every Tuesday and Thursday. They can expect responses to questions posted in the class or sent by email within two days, though I usually respond within one day. Students are encouraged to do their best to plan the timing of their questions accordingly. In the ILIAS discussion forums, I read every post, but will not reply to every post so as not to dominate the conversation. When necessary, I will provide feedback or new prompts, but usually post a summarizing comment of discussion highlights and provide feedback at the end of each unit. During the seminar's first iteration, international students were rather silent in discussion forums, but within the second cohort I cannot detect a similar pattern, as both domestic and international students contribute equally to seminar activities. This might also be the result of the fact that the discussion forum entries now have to be made in pairs, whereas the entries were individual during the first semester the seminar was taught.

Regarding the third category of temporality, does the asynchronous character allow for social exchange? An asynchronous course means that students and lecturer do not share common schedules and time zones. They will never meet at the same time, which allows them to have flexible working hours and might be beneficial in different circumstances where live sessions are not possible, e.g., due to caregiving activities. I developed a virtual course environment and I orchestrate students' self-learning so they know how to navigate through planetary knowledge sources and interact productively with each other. This, of course, also includes very clear communication of assignments and due dates, which the syllabus describes in the following section:

> "We move through the course as a cohort. Each module is three weeks long with an opening and a closing date. After completion of all modules, you have to deliver two follow-up assignments. This is your workload within each three-week module, make sure you reserve corresponding time slots in your calendar to:
>
> 1. consult media (videos, podcasts, etc.) and write two discussion posts
> 2. read three publications, discuss them with one of your fellow students and post one common discussion post on your key insight
> 3. make one Fakebook entry or a meme
> 4. write one brief glossary entry
> 5. reflect about your learnings in your personal blog.
>
> Detailed instructions for each unit can be found in ILIAS and at the end of this document (see table 'Foundations of Planetary Thinking at a Glance'), so you know precisely what is expected and can easily stay on track."

In a similar vein, very clear and unambiguous communication is required regarding grading and expectations of the graded formats used. Here, student-centeredness means that students are already aware of how they can reach particular grades before the seminar starts and the relative weighting of specific learning outcomes towards their final grade. Students can then autonomously decide how much work they want to spend on what tasks. In terms of Foundations of Planetary Thinking, the respective communication in the syllabus reads as follows:

> "Your final grade consists of:
>
> — four instances of active participation in each module (each worth 5% = 20%)
> — one literature review that can be opened with a word processing program (such as OpenOffice, Pages or Word), uploaded in ILIAS (20%)
> — one infographic sent to me via email (60%).
>
> You will receive your final grade with comments by email within two weeks after submission of all assignments. Students who need no credit points are not required to do the literature review and infographic, but to engage in all other class activities."

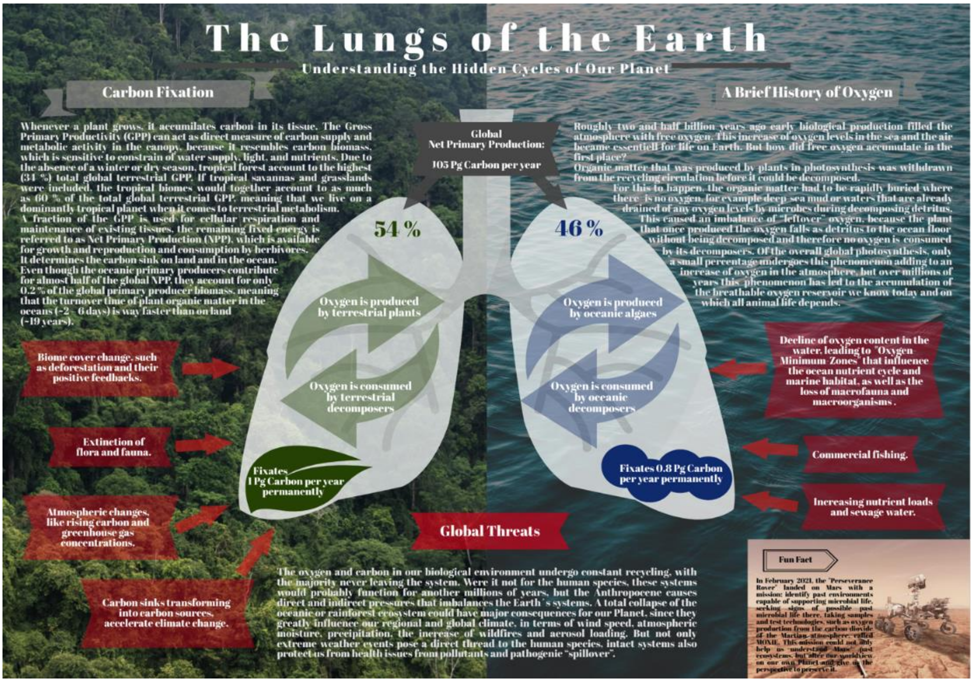
What follows is a table specifying the equivalence between grades and percentage points achieved, a note on plagiarism and a section entitled 'How-tos and expectations of the formats used'. As the brief conversations before and after in-person seminar sessions do not take place in an asynchronous seminar, the syllabus and my explanations in the introductory lecture include further links to resources, such as those to the women's and equal opportunity representative. As of now, I received no questions that led to a redefinition of the above-cited instructions and the resulting Fakebook entries, memes, glossaries and infographics are inspiring pieces of student work (see Figures 9-12 on the following pages).

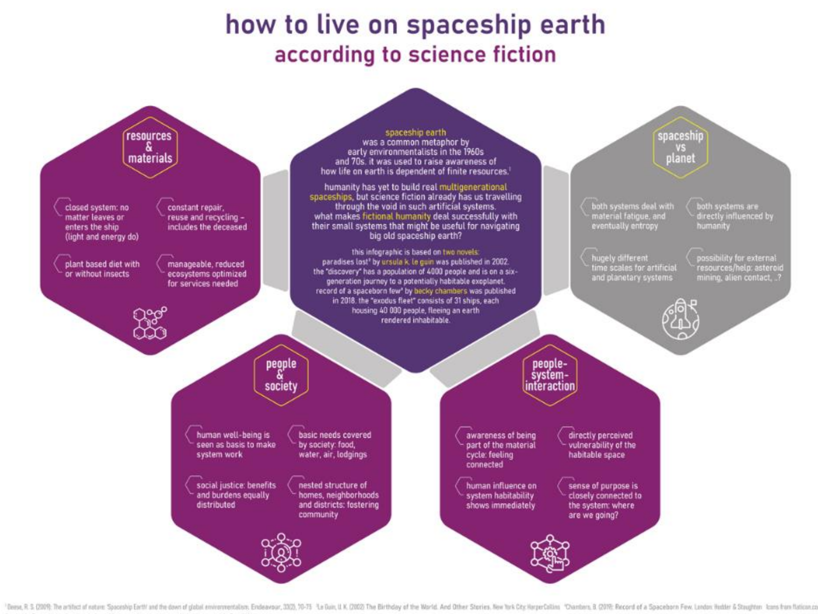
Figure 9:
Student Fakebook Entry for Bruno Latour

Term	Definitions
(new) Ethnoprimatology	"Ethnoprimatology mixes cultural, economic, and political elements with "traditional primatology" to conceptualize the human – alloprimate interface as aninteractive zone that is equalparts social and...
(new) Natureculture	Natureculture has been defined as an amalgam between the nature and culture that recognizes their inseparability in ecological relationships that are both biophysically and socially formed (Fuentes, 2...
(new) Radiative Forcing	Radiative Forcing is the difference between incoming and outgoing radiant energy that affects the earth's climate, measured in W m-2. When incoming radiant energy is greater than outgoing radiant ...
(new)Earth System	Refers to Earth's interacting physical, chemical and biological processes. The system consists of the land, oceans, atmosphere and poles. It includes the planet's natural cycles – the carbon, water, n...
Anthropause	Anthropause is a term given by some Ecologists and biologists to refer to the decreasing Human mobility and activities because of the restrictions due to the pandemic. As Searle & Lorimer (202...
Anthropocene	The Anthropocene has been introduced in the 18th century by E.F. Stoermer and has been redefined by P.J. Crutzen in 2000. Its definition consists out of two parts: The geological definition and the Ea...
Astrobiology	An interdisciplinary scientific interest, which holistically deploys tools and methods from different natural sciences to analyse the origin, evolution and future of life on Earth and in the whole uni...
Autopoiesis	The autopoiesis corresponds to a theory of knowledge and biology, formulated in 1974 from Humberto Maturana and Francisco Varela (both from Chile). This term makes an allusion to the existence itself ...
Big History	Big History is described as a sort of „universal history", or a history of all time (Christian, 2011). It seeks to understand the integrated history of the cosmos, Earth, life and humanity, using the ...
Biological Anthropology	Based on the study Biological anthropology is "the study of the variation and evolution of living humans, non-human primates, and extinct ancestors". However, the study highlighted that, despite i...
Biosphere	The biosphere is an ecological concept, describing the totality of all global ecosystems. It comprises living (biotic) and non-living (abiotic) components and the energy flows and interactions between...
Climate Geoengineering	Climate geoengineering methods are making technical efforts to stop or even reverse anthropogenic climate change. Techniques can be roughly categorized into schemes to remove CO2 from the athmosph...
Complex System	Neil Johnson (2009) states that "complexity science" is "the study of the phenomena which emerge from a collection of interacting objects" and the study of these complex connections at different level...
Complexity Economics	Complexity is the understanding, that we are part of an ever-changing, interlocking, non-linear, kaleidoscopic world (Waldrop, M. M. (2003). Therefore, complexity economics is an alternative ap...

Figure 10:
Exemplary Entries of the Glossary

Figure 11:
Two Exemplary Memes


The Lungs of the Earth
Understanding the Hidden Cycles of Our Planet
Carbon Fixation
Whenever a plant grows, it accumilates carbon in its tissue. The Gross Primary Productivity (GPP) can act as direct measure of carbon supply and metabolic activity in the canopy, because it resembles carbon biomass, which is sensitive to constrain of water supply, light, and nutrients. Due to the absence of a winter or dry season, tropical forest account to the highest (34 %) total global terrestrial GPP. If tropical savannas and grasslands were included, the tropical biomes would together account to as much as 60 % of the total global terrestrial GPP, meaning that we live on a dominantly tropical planet when it comes to terrestrial metabolism.
A fraction of the GPP is used for cellular respiration and maintenance of existing tissues, the remaining fixed energy is referred to as Net Primary Production (NPP), which is available for growth and reproduction and consumption by herbivores. It determines the carbon sink on land and in the ocean. Even though the oceanic primary producers contribute for almost half of the global NPP, they account for only 0.2 % of the global primary producer biomass, meaning that the turnover time of plant organic matter in the oceans (~2 – 6 days) is way faster than on land (~19 years).
Global Net Primary Production:
105 Pg Carbon per year
54 %
46 %
A Brief History of Oxygen
Roughly two and half billion years ago early biological production filled the atmosphere with free oxygen. This increase of oxygen levels in the sea and the air became essentiell for life on Earth. But how did free oxygen accumulate in the first place?
Organic matter that was produced by plants in photosynthesis was withdrawn from the recycling circulation before it could be decomposed.
For this to happen, the organic matter had to be rapidly buried where there is no oxygen, for example deep sea mud or waters that are already drained of any oxygen levels by microbes during decomposing detritus. This caused an imbalance of "leftover" oxygen, because the plant that once produced the oxygen falls as detritus to the ocean floor without being decomposed and therefore no oxygen is consumed by its decomposers. Of the overall global photosynthesis, only a small percentage undergoes this phenomenon adding to an increase of oxygen in the atmosphere, but over millions of years this phenomenon has led to the accumulation of the breathable oxygen reservoir we know today and on which all animal life depends.
Oxygen is produced by terrestrial plants
Oxygen is consumed by terrestrial decomposers
Oxygen is produced by oceanic algaes
Oxygen is consumed by oceanic decomposers
Biome cover change, such as deforestation and their positive feedbacks.
Extinction of flora and fauna.
Atmospheric changes, like rising carbon and greenhouse gas concentrations.
Carbon sinks transforming into carbon sources, accelerate climate change.
Decline of oxygen content in the water, leading to "Oxygen-Minimum-Zones" that influence the ocean nutrient cycle and marine habitat, as well as the loss of macrofauna and macroorganisms.
Commercial fishing.
Increasing nutrient loads and sewage water.
Fixates 1 Pg Carbon per year permanently
Fixates 0.8 Pg Carbon per year permanently
Global Threats
The oxygen and carbon in our biological environment undergo constant recycling, with the majority never leaving the system. Were it not for the human species, these systems would probably function for another millions of years, but the Anthropocene causes direct and indirect pressures that imbalances the Earth´s systems. A total collapse of the oceanic or rainforest ecosystem could have major consequences for our Planet, since they greatly influence our regional and global climate, in terms of wind speed, atmospheric moisture, precipitation, the increase of wildfires and aerosol loading. But not only extreme weather events pose a direct thread to the human species, intact systems also protect us from health issues from pollutants and pathogenic "spillover".
Fun Fact


how to live on spaceship earth
according to science fiction
spaceship earth
was a common metaphor by early environmentalists in the 1960s and 70s. it was used to raise awareness of how life on earth is dependent of finite resources.
humanity has yet to build real multigenerational spaceships, but science fiction already has us travelling through the void in such artificial systems.
what makes fictional humanity deal successfully with their small systems that might be useful for navigating big old spaceship earth?
this infographic is based on two novels:
paradises lost by ursula k. le guin was published in 2002. the "discovery" has a population of 4000 people and is on a six-generation journey to a potentially habitable exoplanet.
record of a spaceborn few by becky chambers was published in 2018. the "exodus fleet" consists of 31 ships, each housing 40 000 people, fleeing an earth rendered inhabitable.
resources & materials
closed system: no matter leaves or enters the ship (light and energy do)
constant repair, reuse and recycling – includes the deceased
plant based diet with or without insects
manageable, reduced ecosystems optimized for services needed
spaceship vs planet
both systems deal with material fatigue, and eventually entropy
both systems are directly influenced by humanity
hugely different time scales for artificial and planetary systems
possibility for external resources/help: asteroid mining, alien contact, ..?
people & society
human well-being is seen as basis to make system work
basic needs covered by society: food, water, air, lodgings
social justice: benefits and burdens equally distributed
nested structure of homes, neighborhoods and districts: fostering community
people-system-interaction
awareness of being part of the material cycle: feeling connected
directly perceived vulnerability of the habitable space
human influence on system habitability shows immediately
sense of purpose is closely connected to the system: where are we going?
Le Guin, U. K. (2002) The Birthday of the World. And Other Stories. New York City: HarperCollins
Chambers, B. (2019): Record of a Spaceborn Few. London: Hodder & Stoughton
Icons from flaticon.com
Created by Rosina Weber for "Foundations of Planetary Thinking", Justus-Liebig-University, Gießen, 2021

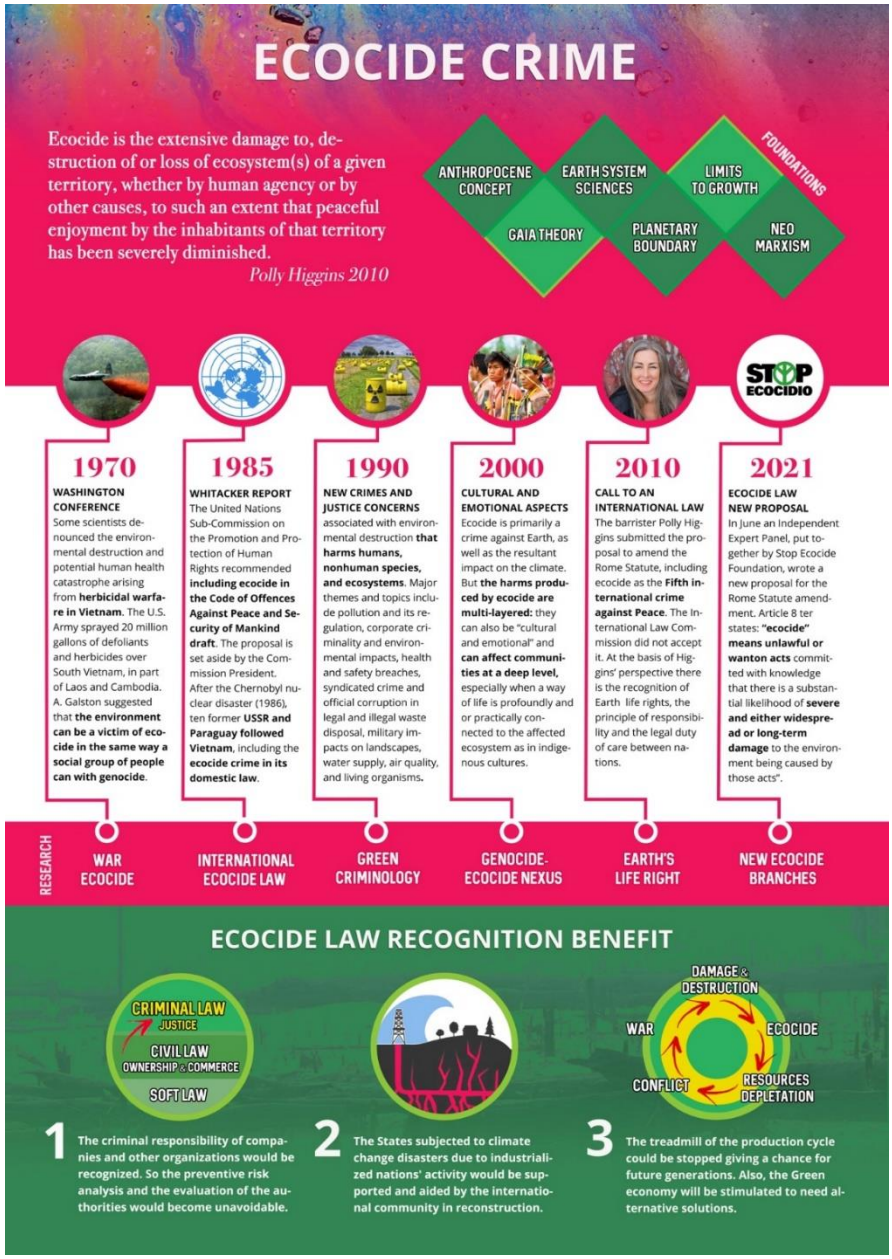


Figure 12:
Three Exemplary Infographics

Discussion of Challenges and Good Practice

Summing up the results, the following table provides an overview of insights gained by the embedding tool to understand whether Foundations of Planetary Thinking as a novel extracurricular seminar is embedded, thus enabling a student-centered learning environment through seminar characteristics that meet contextual conditions at Giessen University. In terms of providing an overview of the self-evaluation, a three-stage differentiation is applied: not embedded; partially embedded; fully embedded.

Context / Characteristics	**Institutional**	**Thematic**	**Social**
Interdisciplinary	*Not embedded* only through temporal workarounds that might cease to function	*Fully embedded* students show curiosity and are not discouraged by content	*Fully embedded* students are engaged in sharing novel insights beyond their disciplinary background
International	*Fully embedded* by the supportive structure of the International Office	*Not embedded (unclear)* unclear why international students dropped out	*Partially embedded* integration measures start to work out yet need to be further improved
Asynchronous	*Fully embedded* by the supportive structure of ILIAS and the digital teaching team	*Fully embedded* thoughtful contributions are allowed by the timely flexible character of the seminar	*Fully embedded* no queries on what a task means or complaints of unequal treatment are received

Figure 13:
Results of the Embedding Tool for 'Foundations of Planetary Thinking'

The embedding tool allows for at least three major insights. First, embedding the interdisciplinary character against the institutional context is a conditio sine qua non. In case it does not exist, complicated workarounds have to be established. This is the least surprising of the three findings, as I was spending most of my time designing workarounds that compensate for a currently missing structure in the form of a studium generale or similar. Second, it surprised me to recognize that there is maybe an inconsistency when it comes to the characteristic of internationality. Even though the support by the International Office was excellent, at least the first cohort of international students did not engage in the same manner as the domestic students. This changed with the second cohort and minor changes in the welcoming procedure, but further monitoring is required. One further idea is to invite researchers from JLU partner universities to give brief lectures to connect the seminar with internationally existing institutional structures. Third, it seems that in terms of the asynchronous

character, the concept of the seminar has proven to be learner-friendly. The intended learning outcomes were reached, which can, for example, be exemplified by the two exemplary infographics that aimed for the highest levels of student engagement, namely, to form their own opinion about conflicting proposals and debates (Figure 12). Students rarely made arguments in discussion forums based on disciplinary backgrounds, but on interdisciplinary reasoning. In some cases, students even wrote their literature review or designed their infographic in a field that had no direct connection to their respective study programs, but rather was of long-standing interest but where they had not had the possibility to work on it in disciplinary settings. In addition, those students that finished the seminar showed high levels of self-motivation, as expected for extracurricular studies.

In addition, a more general insight can be drawn. For every degree that the seminar lacks full embeddedness, the hurdle for students to stay in the respective seminar is higher. To give one example: Foundations of Planetary Thinking is designed with a workload for six credit point, but some optional compulsory modules in other Master's programs are designed for 10 credit points. A prospective student, for example, then has to discuss with me what kind of exam might be a substitute for the four credit points and hope that the examination office accepts the solution. Of course, under these uncertainties, a student is more likely to take a disciplinary optional compulsory module. In the case of Foundations of Planetary Thinking, this would mean identifying every study program that includes compulsory elective modules and discussing bilateral agreements with the respective examination office. This is a time-intensive task that would not be necessary if a studium generale structure existed.

In a more general sense, the embedding tool in this way can function as a (self-)evaluation matrix not only once a seminar is implemented, but also as a preliminary check before implementation on whether it can potentially be embedded at all. If not, the matrix can be used as a tool to anticipate whether implementation of the seminar would be successful. It also allows to further develop a seminar in case statistically significant course evaluations are missing, for example, when not enough students have finished the seminar within the first cohort.

Conclusion

The aim of this article was to understand how extracurricular studies can be student-centered and thus reach high levels of student engagement. I proposed a respective quality assessment tool which I call the 'embedding tool' and exemplified its application based on a novel seminar entitled 'Foundations of Planetary Thinking'.

If refined and supported by further studies, the embedding tool can serve as a way to self-evaluate the success of student-centered learning of extracurricular studies. The tool thus may help to address a major gap of SoTL in regard to extracurricular studies and interdisciplinary seminars in particular. A next research step to further develop the embedding

tool is the optional integration of student perspectives within the evaluation tool in order to include their experiences of the teaching-learning process.

Embedding extracurricular studies in the best possible way to specific contexts of respective universities is a never-ending quest for those interested in innovations in teaching and learning. Hopefully, the embedding tool provides a starting point within SoTL.

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