

## Doing Open Science in a Research-Based Seminar: Students' Positioning Towards Openness in Higher Education

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Résumé de l'article

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# Doing Open Science in a Research-Based Seminar: Students' Positioning Towards Openness in Higher Education

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## Abstract

This study investigates undergraduate students' attitudes towards and experiences with open education practices (OEP) in a research-based linguistics seminar. Data was collected through written assignments in which two groups of students in subsequent terms were surveyed on their willingness to publish (a) academic posters in open access (OA); (b) teaching concepts as open educational resources (OER); and (c) personal reflections on the research process in OA. Through qualitative data analysis, we examine students' apprehensions and motivations to publish their artifacts. We find that key motivators are a sense of belonging, personal reward, and an active contribution to a culture of collaboration, whereas apprehensions are grounded in concerns about the quality of their work, uncertainties about licensing, and fear of vulnerability through visibility. We show that open science practices and OEP can be combined synergistically in process-oriented, research-based, and collaborative seminar concepts, and we formulate recommendations for lecturers on how to successfully address OEP in the classroom.

*Keywords:* Open science, open education, open education practices, open educational resources, research-based teaching, collaboration, higher education, students' attitudes

## Introduction

Open science (OS) unites highly diverse practices that range from (a) sharing resources (e.g., code, data, research materials, methods); (b) publishing in alternative formats, such as uploading preprints (i.e., manuscripts that have not yet been subjected to a peer-review evaluation) to an open repository or to one's personal website; to (c) sharing research questions and methodologies (Allen & Mehler, 2019, p. 2). Within this broad field, open education encompasses the free exchange of knowledge and ideas through “resources, tools and practices” (Cronin, 2017, p. 2) in educational contexts. The label *open* refers to four interrelated areas: (a) open admission to formal education; (b) free access to educational resources, online in particular; (c) open educational resources (OER); and (d) open educational practices (OEP) (Cronin, 2017, p. 3).

In this paper, we focus on OER and OEP. OER are considered a step beyond simply free access to educational resources, as *open* broadens its semantic scope from *gratis* (free of cost) to *libre* (enabling legal reuse (Winn, 2012, as cited in Cronin, 2017)). Open then includes rights, access, use, transparency, and participation (Pomerantz & Peek, 2016), but also, crucially, an attitude (Lalonde, 2012). The term OER, first coined in 2002, points to resources conceived in such a way as to enable reuse through open licenses such as Creative Commons licenses and/or open platforms belonging to the public domain [OER Commons](#) (Wiley et al., 2014, p. 782). OER can then not only be accessed openly, but also modified, reused, and/or repurposed in other contexts following the five Rs of openness: retain, reuse, revise, remix, and redistribute (Weller, 2018; Wiley, 2014; Wiley et al., 2014).

OEP “shift the focus from resources to practices, with learners and teachers sharing the processes of knowledge creation” (Cronin, 2017, p. 3). OEP, as “practices which support the (re)use and production of OER through institutional policies, promote innovative pedagogical models, and respect and empower learners as co-producers on their lifelong learning paths” (Ehlers, 2011, p. 4). OEP thus encompass not only the final product, but also the process of (collaboratively) producing educational resources. Importantly, OEP do not revolve around the educators only, but show the potential for integrated practices where all participants experience openness together. The seminar discussed here not only invites students to take part in research projects and develop educational resources, but also fosters critical thinking by integrating a personal reflection on the challenges and potentials of OS. We thus describe the seminar's conception and learning goals as embracing the principles of OEP.

Reflecting on the creation and dissemination of posters in OA as well as OER together with students who had little to no prior experience with openness in education, this case study of a university seminar in the humanities shows how OEP could be implemented in higher education. On the basis of qualitative findings on how students training to become teachers evaluate their experiences with OEP, we suggest directions for teaching openness in education. Since the assignments involved publishing a scientific poster and/or personal reflections in OA as well as the creation of OER, we refer to the students' positioning as their evaluation of OS.

By recentring the students' experiences, this paper proposes to advance the reflection on openness in education on two grounds. First, it shows how open education can be implemented in higher education with limited institutional support and funds, and shows that it indeed works at a small-scale level. Second, it also shows how open education is perceived by students enrolled in a program to become teachers. We

contribute to the growing body of literature on attitudes towards OS (Abele-Brehm et al., 2019) and open education (Anderson et al., 2017) with a focus on students' experiences (Axe et al., 2020; Cooney, 2016; Werth & Williams, 2021). With this first account of students' perception of open education in the humanities in Germany, we hope to show practicable ways to discuss and reflect OER and OEP in higher education.

The paper is structured as follows: We first offer an overview of the literature on OEP by presenting the common barriers to open education, highlighting why and how we implemented open education principles in the seminar *Grammar in the Digital Age* that took place at the University of Leipzig, Germany, in 2020–2021. We then explain how we collected and coded the qualitative data on the students' positioning towards OS. In the core section of this paper, we discuss the students' positioning towards OS. Specifically, we show that depending on the material, the participants present various degrees of engagement with OS. Students are rather open to the idea of publishing academic posters in OA because posters demonstrate high scientific standards, although students do not view themselves as researchers. A central argument for the publication of educational materials is the desire to be part of an ongoing conversation with (prospective) teachers. Personal reflections on the learning process during the course are met with more cautiousness: Less than half of the students find it valuable to publish personal reflections in OA. We then review possible limitations of the study. Finally, we make four concrete recommendations for lecturers on how to address OEP in the classroom.

## Engaging with OEP in a Research-Based Seminar

While OEP certainly have great potential to improve teaching and learning in the future, their adoptions in educational institutions have been relatively slow due to a range of systemic and personal barriers (Mishra, 2017, p. 375). We review prior research on OEP in higher education and potential barriers, then we outline the structure of the seminar *Grammar in the Digital Age*.

### Chances and Challenges of OEP in Teaching and Learning

Within the paradigm of openness, open education addresses barriers to learning by engaging with OS practices in the classroom and through the development and use of OER (Deimann, 2018). OEP encompass “collaborative practices that include the creation, use, and reuse of OER, as well as pedagogical practices employing participatory technologies and social networks for interaction, peer-learning, knowledge creation, and empowerment of learners” (Cronin, 2017, p. 4; see also Bellinger & Mayrberger, 2019).

In higher education, lecturers can make syllabi and teaching materials available for other teachers. These materials can subsequently be adapted to other teaching contexts, and teachers can improve them according to their experiences with the students. In this way, innovative and/or experimental teaching concepts can be made accessible for other teachers, and didactic considerations can be communicated easily, creating opportunities for exchange, community building, and visibility beyond their own workplace (Zimmermann 2018).

For students, OEP may contribute to fostering a collaborative learning culture, increasing learning engagement, and developing a sense of self (Axe et al., 2020). At the same time, the specific impact of OER on learning experiences and outcomes has yet to be investigated in depth. Smith and Seward (2017) suggest that “a static piece of digital content does not do anything on its own; it has to be part of a process of use for an outcome to emerge.” In order to make an impact, the implementation of OEP requires educators to shift their focus from the mere accessibility of materials to a broader view about integration of OER in the teaching-learning process (Ehlers & Conole, 2010). Wiley and Hilton (2018) developed a framework to develop and assess OER-enabled pedagogy and stipulated a set of criteria for the successful implementation of OEP into the classroom: (a) Students create new artifacts or revise existing OER; (b) the new artifact has value beyond supporting its creator’s learning; (c) students are invited to share their new artifacts publicly; and (d) students are invited to openly license their work. In our project, we implement key aspects of such a pedagogy into a research-based seminar that integrates the process of use of OER into the scientific process of student-led research projects. We aim to establish an understanding of OEP as being part of OS, and attempt to lay the groundwork for transparent and accountable research practices in higher education (also see Steinhardt, 2020).

### **Attitudes Towards Open Education**

Despite growing interest, OEP remain a niche phenomenon in (German) higher education, and the prospects for teaching innovation and workload reduction remain uncharted (Langfelder, 2018, p. 1). Early studies suggested that faculty members (at Californian schools) had reservations about using OER due to perceived lack of content quality, time pressures, high workload, and loss of compensation for authors (Harley et al., 2010; Lee et al., 2008), whereas more recent studies reveal increasingly positive attitudes towards OER (Allen & Seaman, 2014; Seaman & Seaman, 2017). However, many educators only have a vague understanding of what OER are. In addition to a lack of awareness and experience with OER, the successful and impactful adoption of OEP has been shown to require a more general culture of sharing that provides individual practitioners with opportunities for pedagogical innovation and collaboration (Carey et al., 2015; Karunanayaka et al., 2015).

In order to address the “combination of factors including fear, resistance, and lack of training” (Cooney, 2016, p. 3), the discourse around OER and OEP has predominantly been centered around faculty and educators. As a consequence, students’ attitudes towards and experiences with OER have only been researched to a very limited extent (Axe et al., 2020; Hilton et al., 2020). Students have been shown to have, for the most part, a positive attitude towards using OER; likely motivators for student engagement with OER encompass assessment requirements, learner awareness and involvement, engagement with communities of practice, and lecturers’ attitudes (Issa et al., 2020; Jurado & Pettersson, 2020).

### **The Seminar: Grammar in the Digital Age**

*Grammar in the Digital Age* is a research-based seminar dealing with digital writing practices from a linguistic perspective taught by Naomi Truan. The goal of the project was for participants to examine their own language use through the collection, annotation, and analysis of their written digital interactions

during the seminar (i.e., forums, chats, collaborative documents) and beyond the seminar (e.g., private messages, see Truan & Dressel 2021). The seminar has been conducted twice, in two subsequent semesters and with two groups of students. The participants were all teachers-in-training between their third and fifth year of study. In Germany, prospective teachers enroll in special programs including pedagogy, didactics, and two disciplines. In this case, one of the disciplines the students will teach at the end of their studies is German.

By producing, collecting, and analyzing their own data, students not only experienced the empirical research process first hand, but were also able to “actively immerse themselves in research activities” (Haaker & Morgan-Brett, 2017, p. 1). In this sense, they gained awareness of fundamental principles of OS: They (a) collaborated with other students in group projects; (b) shared their data, research process, and results with other seminar participants; and ultimately (c) could choose to make their findings publicly available. The participants learned how to appropriately deal with personal data and were sensitized to the advantages and challenges of sharing data and research findings with their peers. The participants signed a data privacy statement at the beginning of the semester that covered the use of their data online (e.g., use of learning platforms), as well as the data collected for the seminar (participants analyzed their own digital interactions) and the data on attitudes towards OS that are at the core of this paper.

Importantly, the seminar did not revolve around OS, nor was OS its ultimate goal. Rather, OS practices were implemented in addition to other practices such as collaborative data gathering, annotation, and analysis. OS was thus conceived of as a possible (and desired) effect of research-based teaching and made explicit only at moment of the assignments.

As can be seen in Table 1, the assignments differed slightly from semester to semester to accommodate the students' needs. Both groups completed Block 1 and 2, and were thus offered the possibility to publish an academic poster in OA. Due to COVID-19 restrictions, one of the groups could not work extensively on the production of teaching materials. Group 1 was thus invited to reflect on the learning process instead, which we summarized as personal reflections based on how the assignment had been interpreted by the participants. Group 2 produced teaching materials that they could decide to publish as OER.

**Table 1**

*Structure of the Grammar in the Digital Age Seminar, Including OEP and Data on Students' Experiences of OS*

Seminar component	Activities and learning goals	OEP	Data on students' attitudes
Block 1 (4 weeks) Theoretical framework: Writing in the digital age	Collaborative Etherpads (reading research literature) Collaborative text annotation with Perusall	Use of OER learning materials Collaboration on various platforms	/

Block 2 (6 weeks) Critical examination of one's own digital writing practices: Collecting and analyzing data	Research project in groups: Collect and categorize linguistic data Formulate research questions and hypotheses Present research process and findings as a poster	Collaborative development of an academic poster Possibility to publish an academic poster in OA	<b>Assignment 1</b> Willingness to publish poster in OA (group 1, $n = 23$ ; group 2, $n = 37$ )
Assignment on OS (in two parts)	Critical reflection on whether the participants opt for: 1) the publication of their academic poster in OA 2) the publication of their personal reflections in OA or their teaching concept as an OER		
Block 3 (4 weeks) Transfer to professional practice: Developing a teaching concept	Teaching materials integrating the research findings of the poster, either in groups or alone	Possibility to publish a teaching concept as an OER	<b>Assignment 2</b> Willingness to publish personal reflections in OA (group 1, $n = 23$ ) Willingness to publish teaching concept as OER (group 2, $n = 31$ )

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## Collecting and Coding Qualitative Data on Students' Positioning Towards OS

Our qualitative analysis relies on elicited written data based on open questions, thus allowing us to capture with nuance the multiplicity of the participants' experiences. The individual reflection on OS was integrated into the seminar as two asynchronous assignments. We first outline the assignments, then describe the coding scheme we developed within the framework of grounded theory.

### Collecting Qualitative Data

The students were asked to submit two statements of approximately 300 words, in which they brought forward their views on the opportunities and challenges of OS. They were provided a handout on OER in German, which detailed the core ideas and values of OER as well as examples of existing platforms. (The [handout is available as an OER](#) under a license CC BY 4.0.) The handout encouraged students to critically reflect on their needs as future teachers by asking about their motives for (not) making their own materials and preliminary results open. We furthermore indicated that our own materials would be published as OER and that the students opting to publish their materials would be part of a bigger project. The assignment was phrased as an invitation to critically reflect on the benefits and challenges of OS with only limited background or explanation on how OS works in general.

## Coding Qualitative Data

Our data collection and analysis are informed by the guiding principles of grounded theory practice. The objective of this methodology is to inductively build theory through a process of constructing analytic codes, concepts, and categories from data itself, rather than deducing theory from preconceived hypotheses (Charmaz, 2006, p. 5).

For the present study, grounded theory allows us to investigate how students perceived themselves and their work throughout the research process. Its inductive approach to theory building enables us to focus on the participants' individual and subjective experiences, while grasping patterns that emerge from the collectivity of subjectivities. Having only limited experience with OEP at the beginning of this project, this methodology also allowed us to develop an independent analysis and to formulate our own theoretical considerations before familiarizing ourselves with prior research.

The data was collected throughout the semesters. We inductively developed analytic categories that encompass a number of interrelated codes. We used the term *category* to denote a classification of concepts (Corbin & Strauss, 1990). Our six categories are audience, connection, quality, visibility, responsibility, and vulnerability.

**Table 2**

*Qualitative Data Analysis: Categories and Associated Codes*

Category	Category description	Associated codes
Audience	Arguments with regard to the target group(s) or imagined audience(s) of the participants' artifacts. Who will use the artifact and how? How does the target audience influence the design of the artifact?	within academia peers/university students teachers high-school students/children everyone (related: equal opportunities)
Connection	Perspectives on OEP fostering the mutual exchange of ideas, mostly within academia, and mostly during the research process, prior to publication. What are the chances and challenges of collaboratively producing and publishing an artifact?	collaboration academic dialogue/comparison accountability/transparency usefulness/utility multilingualism
Quality	Concerns about (perceived) scientific norms and requirements for publishing in OA. Is the research product scientifically sound and comprehensible? Who can provide supervision and/or feedback to ensure the quality of the artifact?	scientific standards references comprehensibility process (higher) workload supervision/quality control/feedback



Visibility	Thoughts on (anticipated) positive and negative consequences of sharing one's work and becoming visible to an audience beyond the classroom	motivation/reward anonymity data protection
Responsibility	Concerns about properly licensing and maintaining artifact subsequent to their publication	maintenance misuse/licensing
Vulnerability	Participants' implicit and explicit expressions of anxieties and insecurities concerning the relevance worthiness of their research	relevance value/worth qualification (lack of) experience personal reflections uncertainty

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## Students' Positioning Towards OS

In this section, we present a qualitative analysis of the participants' responses to the two assignments on OS the students wrote for their active participation in the class. In the winter term 2020, 22 students out of 24 submitted the assignments, as did all 37 students in the summer term 2021. When offered the opportunity to publish their academic poster in OA, most students (50 out of 59) value the possibility and express strong arguments in favor of OS. Most of the students (27 out of 37) were willing to publish their teaching materials as OER, but making this decision before engaging in the actual process negatively impacts the students' confidence in the worth of their work. Finally, we find that the publication of work-in-progress with a personal component is subject to more restrictions and is less often considered necessary to be shared.

### **Publishing a Scientific Poster in OA: Willingness Overrides Doubts**

A vast majority of the students chose to publish their poster in OA (18 out of 22 students in the winter term, and 32 out of 37 in the summer term). The main reasons for agreeing to publish encompass connection (i.e., contributing to the academic dialogue), accessibility (of knowledge, data, and materials), and the reward for hard work. In this section, we address the enthusiasm generated by the idea of making the posters available in OA, but also the participants' apprehensions in terms of visibility and exposure, thus leading to an increased feeling of vulnerability.

### ***Arguments in Favor of OA Publication: Sense of Belonging and Personal Reward***

For students in favor of OA, sharing data and preliminary results contributes to advancing research in their respective fields and fostered solidarity within research communities. The focus on research-in-progress allows students to participate in the research process, which, in turn, can foster a feeling of belonging and of community, as it "promotes the feeling for science—What's behind it all?" (student participant).

Importantly, publishing an academic poster in OA is viewed as being part of a bigger collaborative project, and related to the accessibility of research to practitioners. Making scientific results available brings linguistic research to the classroom and serves to scientifically underpin public discourse, democratize knowledge, and challenge unfounded claims about language change and anti-scientific attitudes. Availability does not equal accessibility; for research to enter the classroom or the public discourse in a meaningful way, it must be presented comprehensively and transparently. In order to be useful for teachers, the posters need to be readily usable or adaptable.

More than a quarter of the participants (17 out of 59) explicitly draw motivation, reward, and a sense of purpose from the opportunity to publish their work after having invested time and energy into the scientific posters. Sharing one's work retroactively gives participants a sense of visibility and of belonging. However, the novel online visibility brought by the publication of a poster in OA is also perceived as an argument against OA.

### ***Arguments Against OA Publication: Resisting Visibility, Fearing Vulnerability***

While most participants express enthusiasm for publishing their research, they also express their concerns and fears. The main reasons not to publish their work encompass apprehensions concerning uncontrollable (online) visibility (e.g., anonymity and data protection), and their feelings of vulnerability (e.g., the relevance and value of their work). The participants' uncertainties are fundamentally rooted in the realization that visibility entails accountability, thus opting for an anonymous publication.

In order to maintain control over their online persona, 6 out of 59 students express their willingness to publish their academic poster anonymously, arguing that the release in OA could have negative effects beyond the seminar and harm the participants' careers in state educational institutions, "as the Internet never forgets" (student participant). Others concede that anonymously published materials are unlikely to be reused. Being cautious about one's data privacy does not mean that the poster should be published anonymously: six students explicitly name transparency, authorship attribution, and accountability as key academic values.

In addition to future-oriented apprehensions, about a quarter (13 out of 59) of the participants grapple with the switch from their role as students during the seminar to their role as researchers. We describe these uncertainties under the umbrella term *vulnerability*. The need to publish a poster "free of errors in terms of content" (student participant) pertains to basic scientific standards and reflects the willingness to implement a round of revisions. Even so, it often becomes the locus of self-doubts regarding the relevance and worth of their work, as well as their status, as "transparency can highlight and amplify the vulnerabilities" (Pownall et al., 2021, p. 4). Concerns about the quality of materials are sometimes expressed in general terms: ensuring the quality of teaching, not spreading false information, and avoiding "pointlessly cluttering up" (student participant) the OER hub.

More frequently however, concerns about scientific standards are attached to personal qualification or the students' perceived status of their work as being "largely based on our own thoughts and elaborations, which are not necessarily correct" (student participant). The two most frequently cited arguments about the possible inaccuracy of the poster pertain to the lack of scientific literature and the small size of the corpus.

While at first glance, this line of reasoning seems to apply to usual academic standards, it actually shows more profound concerns about the quantity of information students assess as adequate in order for their work to be considered sufficiently scientific.

Students who voted against publishing the poster use the non-representativeness of the corpus as an argument against the publication of the preliminary results in OA even when it is “understood only as a stage of development—an open beta if you will—that preceded our term papers” (student participant). Importantly, being aware of the small size of the dataset does not necessarily mean that the analysis does not deserve to be published:

I think it is important that the findings are well-founded or, if not, that this is indicated (as in our case). Smaller datasets are of course not as valid as large-scale studies and their findings should be considered in a differentiated way. (student participant)

For students in favor of publishing their poster in OA, the limited scope of their research project is not seen as a disadvantage, but as an integral part of the research project. Limitations of the poster are not seen as compromising its scientific quality if they are recognized and made transparent.

### **Publishing Teaching Materials as OER: Between Collaboration and Resistance**

Similar to the enthusiasm towards publishing the poster in OA, most students (27 out of 37) chose to publish their teaching materials as OER. The main argument pertains to a culture of collaboration among peers. Collaboration is part of the code category *connection* (i.e., the desire to contribute to academic work and to be part of a community of practice). While 17 out of 59 students express concerns regarding the small size of their dataset or the lack of references in their poster—even when agreeing to its publication in OA—they are more confident in their role as prospective teachers. As most arguments in favor of publishing teaching materials overlap with those presented above, we focus in this section on two new aspects. The first is the collaboration component, and the second is the difficulty of taking a stance for or against publishing teaching materials as OER before the materials have been produced.

#### ***Arguments in Favor of OER Publication: Fostering a Culture of Collaboration***

As for the academic posters, the desire to publish teaching materials as OER is motivated by a sense of belonging and personal reward. A new aspect is that of collaboration, both within academia and between academia and schools. As prospective teachers, participants acknowledge the value of OER for early-career educators who may gain inspiration. Moreover, OER can create a novel, low-threshold permeability between research and school practitioners. Established teachers can easily access “up-to-date subject knowledge, and modern teaching concepts that go beyond the curriculum, competency standards, and textbooks” (student participant). In this sense, OER offer a medium for inter-generational exchange and collaboration.

In addition to teachers, students are also thought to benefit from the publication of teaching materials as OER. One particularly interesting aspect is the integration of scientific methods and OS practices into the classroom. In their teaching concepts, participants often model their own experiences with the scientific method and develop immersive learning environments that should allow their students to conduct their

own studies and to develop a critical understanding of their own language use. Aspects of collaboration thus permeate all levels of the production and use of the OER. Teaching materials are produced collaboratively within the seminar, designed to be used and further developed in collaboration with teachers, and foster collaboration among students.

### ***Arguments Against OER Publication: Not Deciding Too Early***

The specificity of the arguments against a publication is that they do not pertain to a refusal of OS principles altogether. Rather, the arguments against publishing OER are the result of uncertainty regarding the process, especially as students had to decide if they wanted to make their teaching materials as OER before they produced them. The argument pertains to two aspects. First, the need for supervision: students want feedback and quality control before publishing materials as OER. Second, 10 out of 37 are skeptical about the value of their work before it is complete. Importantly, looking for feedback and quality control does not only mean looking for external sources of validation. Rather, the students need to be satisfied with the result—independently from its assessment by the peers or the lecturer—in order to consider publishing it.

### **Publishing Personal Reflections in OA: A More Mixed Picture**

Due to COVID-19 restrictions, participants during the winter term 2020–2021 did not develop teaching materials. Instead, they were offered the opportunity to reflect on the experience of their collaborative research project. Here, we offer insights on why more than half of the students (13 out of 22) voted against publishing their reflections in OA.

### ***Arguments Against OA Publication: Personal Thoughts do not Deserve to be Shared***

The main argument against publishing personal reflections in OA is apparent in this participant's statement: "These are 'only' my thoughts and feelings. This is nothing generalizable and therefore it is only limitedly suitable for further use." The importance of meeting scientific standards that are reproducible, intelligible, and distinct from personal opinions, thus appears central in the students' understanding of OS.

The assignment was conceived as a point of entry into the participants' learning process and aimed at keeping track of one's own positioning towards a certain topic at a given time. The decidedly personal nature of the assignment precisely renders its publication irrelevant for most participants. "What is helpful and useful to others?", one participant asks. This shows an acute awareness of the necessity to add value, although they recognize that they cannot determine alone what is useful to others. "Perhaps everyone should be able to decide for themselves what is helpful information for them and what is not", concludes another participant.

Such findings show the need for a discussion about who feels legitimate to engage in OS, as there is still a "limited discussion about . . . whose participation is valued" (Koyama & Page-Gould, 2020; cited by Pownall et al., 2021, p. 4). Participants unwilling to publish personal reflections establish a clear distinction between what counts as scientific and may thus deserve proper recognition through OA publishing, and what does not.

### ***Arguments in Favor of OA Publication: Inspiring Others Through One's Journey***

Among the 8 out of 22 participants who are in favor of publishing their reflections in OA, half highlight the relevance of thematizing their own learning journey to inspire others. Being aware of their own biases towards digital literacy, the students map out the potential of research-based teaching for experiencing a shift in perspective. The participants in favor of publishing their reflection in OA believe in the potential of the research process for making them change their opinion. They recognize the possibility for the data to tell another story than the one they would have suspected. Crucially, the openness regarding the outcome of the research process and their initial shortcomings are reflected in their willingness to transparently and critically share their reflections with others. In these cases, research is conceptualized as a process.

With their reflections, the participants pursue different aims than with the publication of the poster in OA, notably having an impact helping people “recognize themselves” in the testimonies of others, especially regarding bias towards digital practices. Often, the imagined audience is conceived widely; texts should be “accessible for a broader mass and also understandable” (student participant).

Such findings invite us to investigate the relationship between self-reflection and commitment to OS. To what extent do participants who describe a shift in how they perceive their own digital writing practices also are willing to make this process visible to others? Combining auto-ethnographic reflections with research-based explorations in teaching may open up new avenues regarding whether and how the willingness to map one's personal journey is linked with an openness towards OS practices.

## **Limitations**

As this qualitative study is based on a small sample of students (59), it could be complemented by larger-scale studies concerning other disciplines. Moreover, the assignments differed from semester to semester; while all groups submitted reflections on OS regarding publishing a poster, one group produced teaching materials, and the other wrote personal reflections. As our investigation is based on an extensive cluster of the arguments brought forward by the participants (see Table 2), we were able to correlate types of materials participants are willing to publish in OA or as OER.

Finally, it would be interesting to link the findings with biographic and social variables such as the age, gender, or students' previous experience with OS. Collecting sensitive information within the context of a university seminar where the assignments are linked to the students' identities would not be in compliance with data protection policies.

## **Recommendations for Lecturers: How to Achieve OEP in the Classroom?**

Based on the qualitative analysis of the students' positioning towards OS, we formulate four recommendations for lecturers who wish to implement OEP in higher education.

## **Make the Collaborative Research Process Central**

Our experience with both groups shows that OEP encourage students to explore new ways of learning research by doing research. Based on their willingness to publish posters in OA, among the participants who consider research as a process, we hypothesize that integrating openness practices into the classroom relates to concepts of research-based learning. In contrast to other forms of research-oriented learning, research-based learning (*forschendes Lernen*) focuses on the research process itself (Huber, 2014). As a teaching concept, this means that the participants themselves actively go through the essential phases of this process—collecting data, developing research questions and hypotheses, and presenting the results (see Truan & Dressel, 2021). We argue that collaborative work simulates a community of researchers. When the students experience a sense of belonging, they are ready to move beyond the course in the form of an OA publication, as they become confident that through their research they potentially achieve “results that are interesting for third parties” (Huber, 2014, p. 25; our translation, 2022). We thus invite further teaching projects and academic contributions to explore the relationships between research-based teaching and the implementation of openness. Our findings indeed suggest that the focus on the research process—rather than the output—fosters willingness to engage with OS.

## **Let the Students Decide (After They Have Worked on a Topic)**

One central lesson was the importance of timing; participants' insecurities and apprehensions came about when the prospect of publication was raised too early, as was the case for the teaching concepts. While this was a conscious choice in our seminar, these issues can be avoided or mitigated through an approach that scaffolds the production and publication of OER in a way that creates an early awareness of OEP in participants and guides them through the entire process.

## **Show the Students How They are Contributing to a Bigger Project**

As our data suggests, students fundamentally appreciated the novel types of connection and participation that OEP can provide. They were most positive about contributing their artifacts when they had a clear sense of purpose and utility (i.e., when they knew who would benefit) and when they had a strong sense of belonging (i.e., when they could identify with the role they assumed in the production of the artifact). It is important to create spaces for critical discussions about target audiences and implications on the design and distribution of OER.

## **Build on the Students' Previous Experiences**

Our data shows that previous experiences with research processes in making a decision are central to the participants' readiness to publish their work. Early and regular exposure to the principles of OS across the curriculum increases the students' willingness to engage in OS practices going forward. We thus recommend building groups where students familiar with OS principles can play the role of ambassadors and initiate a fruitful debate with peers.

## Conclusion

This paper contributes to the under-researched field of students' attitudes towards and experiences with OEP. It outlines our research-based linguistics seminar *Grammar in the Digital Age* that introduced two groups of students to OS practices and OEP in a hands-on, process-oriented, and highly collaborative way. In order to gain insight into how students feel about publishing artifacts from the seminar, we collected data through written assignments and analyzed the results within the methodological framework of grounded theory. The data suggests that students are fundamentally in favor of the ideals and values of OS and have a positive attitude towards creating and using OER. Apprehensions to publish their own work were contingent on the nature of the artifacts in question. The prospect of publishing their teaching concepts as OER was met with overall approval whereas publishing academic posters in OA was met slightly more hesitantly and revealed insecurities about the quality of their research and their role of students versus so-called real researchers. Finally, the majority of participants disagreed with publishing their personal reflections on the research process, arguing that such artifacts are of little to no value for third parties.

Our findings suggest that while OEP have great potential to foster a culture of collaboration within and beyond academia, they also demonstrate the importance of guiding students carefully through the complex process of creating and publishing their work in OA or as OER.

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