ARTICLE

Framing Open Educational Practices from a Social Justice Perspective

Maha Bali*, Catherine Cronin[†] and Rajiv S. Jhangiani[‡]

OEP (open educational practices), inclusive of open pedagogy, is often understood with respect to the use of OER (open educational resources) but can be conceived with more expansive conceptualisations (see Cronin & McLaren 2018; DeRosa & Jhangiani 2017; Koseoglu & Bozkurt 2018). This article attempts to build on existing OEP research and practice in two ways. First, we provide a typology of OEP, giving examples of practices across a continuum of openness and along three axes: from content-centric to process-centric, teacher-centric to learner-centric, and practices that are primarily for pedagogical purposes to primarily for social justice (Bali 2017). Second, we employ Hodgkinson-Williams and Trotter's (2018) conceptual framework, which builds on Fraser's model of social justice, to critically analyse the ways in which the use/impact of OEP might be considered socially just, with a particular focus on expansive, process-centric OEP. We analyze for whom and in which contexts OEP can (i) support social justice along economic, cultural and political dimensions, and (ii) do so in transformative, ameliorative, neutral or even negative ways. We use the typology and framework to analyse specific process-centric forms of OEP including collaborative annotation, Wikipedia editing, open networked courses, Virtually Connecting, public scholarship, and learner-created OER. Analysing specific practices highlights diversity across the axes and subtle differences among them, such as when a particular practice is considered good pedagogy and how it can be modified to be more oriented towards social justice. We discuss limitations of each practice not just from its discourse and design, but also how it works in practice.

Keywords: Open educational practices; social justice; open education; open pedagogy

Introduction

We understand open educational practices (OEP) to refer to practices that may include the use of open educational resources (OER) in education, but that encompass multiple forms of openness beyond or even without OER. As noted in the Cape Town Open Education Declaration (2007), open education is not limited to OER alone: "It also draws upon open technologies that facilitate collaborative, flexible learning and the open sharing of teaching practices" (p. 4). Openness can also be conceived of as an attitude or worldview which includes making oneself vulnerable, narrating one's own practice and sharing one's incomplete scholarship openly, practices which may or may not involve use of technology (Bali & Koseoglu 2016).

Conceptualisations of OEP vary widely, "ranging from those centred primarily on the creation and use of OER to broader definitions of OEP, inclusive of but not necessarily focused on OER. The latter... expansive definitions of OEP, encompass open content but also allow for multiple entry points to, and avenues of, openness" (Cronin & MacLaren 2018: 128) such as open pedagogy and open sharing of teaching practices (Cronin 2017). For OEP, as compared with OER, the emphasis is on process as opposed to content (Koseoglu & Bozkurt 2018). Definitions of OEP consistently focus on fostering learner activity and agency. Geser (2007) defined OEP as involving students in "active, constructive engagement with content, tools and services in the learning process, and promot[ing] learners' selfmanagement, creativity and working in teams" (p. 37). Knox (2013) noted the need to focus on "open processes" which he defined as "active engagement of learners in participation and dialogue, as well as further critical explorations of the relationships between technology and education" (p. 21). And DeRosa and Jhangiani (2017) define open pedagogy as "an access-oriented commitment to learner-driven education and a process of designing architectures and using tools for learning that enable students to shape the public knowledge commons of which they are a part" (para. 14).

In this article, we focus on expansive conceptualisations of OEP that center on process more than content. We offer a typology to help illuminate the variety of practices that can be considered OEP within institutions, institutional

Corresponding author: Maha Bali (bali@aucegypt.edu)

^{*} American University Cairo, EG

 $^{^\}dagger$ National Forum for the Enhancement of Teaching and Learning in Higher Education, IE

[‡] Kwantlen Polytechnic University, CA

frameworks, and/or classroom/course contexts. We build on Bali's (2017) work to suggest that each application of OEP can be understood along three main axes. The first part of this article defines the typology of OEP, illustrated with examples. The second part builds on the work of Hodgkinson-Williams and Trotter (2018) to analyse specific, expansive, process-centric forms of OEP with respect to their social justice implications in practice.

A Typology of OEP

OEP can be considered to range across three broad dimensions, including some sub-dimensions, as follows:

- 1. From content-centric to process-centric;
- 2. From teacher-centric to learner-centric;
- 3. From primarily pedagogical to primarily social justice focused. If primarily social justice focused, we can consider the degree to which it addresses:
 - a. Economic and/or
 - b. Cultural and/or
 - c. Political injustice

Regarding the first axis, ranging from content to process centricity, we consider OEP whose main purpose is to produce or create OER to be content-centric; however, if the main purpose is a focus on processes of interaction amongst participants, then it is more process-centric. Obviously, any learning material has a process behind it before content is produced, and any learning process includes some content, but our analysis is based on which one is the main focus. For example, many Massive Open Online Courses (MOOCs) are designed in ways that center content. However, connectivist MOOCs contain content but the focus is on the production and sharing of content by participants, in their interactions with each other, rather than pre-created by teachers. This design is built on connectivist principles which foreground the value of diverse opinions from network members contributing to the construction of knowledge in dynamic ways, keeping learning current via maintaining and nurturing online networks (Siemens 2004). Examples are explored below.

The second axis, ranging from teacher to learner centricity, depends on the extent to which the process of openness is performed by teachers with other teachers, or by learners supported by teachers. For example, a teacher adapting an OER textbook for use in the classroom can be considered teacher-centric, while students creating their own OER can be considered learner-centric OEP, depending on the role of the teacher. Similarly, students blogging publicly is a learner-centric example of OEP.

Regarding the third axis, pedagogical to social justice primary focus, the definition of social justice interventions uses Fraser's (2005) framing. Paraphrasing Hodgkinson-Williams and Trotter (2018: Table 1) who describe the application of this framework to OEP, a practice may address:

• Economic injustice if it involves giving access to those who could not otherwise access the learning

- experience, while leaving the learning experience unchanged i.e. *redistributing* who has access, or going further and *restructuring* to address the root causes of economic maldistribution.
- Cultural injustice if it involves giving access to those who could not otherwise access the learning experience, while redesigning the learning experience with those minorities in mind, *recognizing* their culture in it, or going further to address the root causes of cultural misrecognition with *re-acculturation*.
- Political injustice if it goes beyond giving access to those who could not otherwise access the learning experience; it might involve those normally without access in the redesign or overhaul of the learning experience, emphasizing equitable *representation* and "parity of participation" or it might go further to address root cases of political misrepresentation through *re-framing* and *parity of rights*.

The OEP typology enables analysis and comparison of different OEP by considering the three axes simultaneously, as in the following examples:

- · A teacher using open textbooks in class is a teachercentric, content-focused OEP, addressing economic injustice by offering students free open textbooks. It may venture into addressing cultural injustice if the open textbook is offered in different languages or adapted to integrate culturally-relevant content. It may venture into addressing political injustice if marginalized groups have equal decision-making power in creating and adapting these OER (see Hodgkinson-Williams & Trotter 2018), or if the fact that the OER is free enables the teacher to bring in multiple perspectives (as opposed to otherwise having to purchase multiple textbooks to provide that diversity of perspectives). However, it may have a negative political social justice impact if the teacher assumes that all students own computing devices to gain access to the open textbooks in digital formats.
- Open collaborative web annotation (the process of putting comments on a document that are visible to others, and where interaction around the content on its margins is possible, e.g. via Hypothes. is) is a student-centric, process-focused OEP with a pedagogical purpose to promote deep, critical reading. This may also have a social justice purpose if intentionally used to discuss texts on social justice issues or written by marginalized authors, for example.
- Crowdsourced, collaborative knowledge creation such as in Wikipedia is both content and process-focused, since this creation of knowledge involves conducting research and working with others who are editing the content, including using discussion/talk pages (e.g. Wikipedia) or commenting features (e.g. Google docs) to negotiate knowledge with others. If learners are engaged in creating knowledge in this way, this is student-centric. The economic impact of a free online encyclopedia is clear. The pedagogical purpose

of students editing Wikipedia can be to promote information literacies and research skills while contributing to the public good. However, it may have a negative cultural social justice impact if the majority of content and editors reproduce dominant views of knowledge (currently the case at least for Englishlanguage Wikipedia). However, one can use Wikipedia editing to redress cultural and political injustice if individuals from underrepresented and/or marginalised groups become editors, or when edit-a-thons are organized with the express purpose of adding or enriching content about women or other minorities or underrepresented groups.

• The demarcation between content-centric and connectivist MOOCs is not always clear. However, open online courses on MOOC platforms such as EdX, Coursera, FutureLearn and Edraak tend to be content-centric and teacher-centered (with some notable exceptions including University of Edinburgh's *E-Learning and Digital Cultures* MOOC (Ross et al. 2014) and University of Cape Town's *Education for All* and *Introduction to Social Innovation* (Czerniewicz & Walji 2017)). Connectivist-type open courses tend to be more process-centric and learner-centered, whether the learners are educators or students (see Bali et al. 2015). They have pedagogical intentions and address economic injustice, but whether they address cultural or political injustice varies.

Table 1 uses this typology of OEP to compare a variety of types of OEP, highlighting specific examples and categorizing each along the three broad dimensions and sub-dimensions.

A Critical Analysis of Social Justice Implications of Some OEP

In this section, we employ Hodgkinson-Williams and Trotter's (2018) conceptual framework, building on Fraser's model of social justice, to critically analyse the ways in which the use/impact of OEP might be considered socially just. Hodgkinson-Williams and Trotter (2018) analyse OER-focused OEP, which are often content- and teacher-centric. We extend this work to consider expansive forms of OEP, particularly more process and learner centric OEP, analysing for whom and in which contexts these practices (i) can support social justice from economic, cultural and political dimensions, and (ii) do so in transformative, ameliorative, neutral or even negative ways. Transformative refers to addressing systemic/structural roots of injustice, affirmative/ameliorative refers to addressing surface injustice, neutral refers to not having a social justice impact, and negative means reproducing or even exacerbating injustice. It is imperative to consider the full range of potential impacts because OEP do not necessarily result in positive effects, whether ameliorative or transformative. Despite what may be the best of intentions of advocates and practitioners, any OEP may neglect to consider factors that can maintain or even widen the digital divide (such as digital redlining, see Gilliard and

Culik 2016), they may ignore issues related to accessibility, and/or disregard data privacy. In so doing, OEP may perpetrate harm upon the very groups whom advocates and practitioners seek to serve (Jhangiani 2019).

Table 2 summarizes where various OEP may lie along the spectrum of social justice effects, from negative to neutral, ameliorative or transformative. Following this summary, we delve into the details of specific OEP to highlight diversity across the axes and subtle differences among them.

Some OEP have an explicit social justice orientation and some are good pedagogical or professional practice in general, social justice being secondary or only implicit. Engaging in such practices remains valuable as it openly enhances access to these pedagogical practices so that others may learn from or reapply them.

In the following section, we analyse a selection of the OEP mentioned in Tables 1 and 2, using specific examples and explaining how the typology can be applied to these in practice. In-depth examples include renewable assignments (e.g. student-created quiz questions), open connected courses (e.g. Equity Unbound), public scholarship by/for educators (e.g. Open Pedagogy Notebook) and learners (e.g. Domain of One's Own), Virtually Connecting, Wikipedia editing (e.g. feminist edit-a-thons), and collaborative web annotation (e.g. Marginal Syllabus).

Renewable assignments (e.g. student-created quiz questions)

If successfully answering well-crafted multiple-choice questions requires content mastery, then authoring multiple-choice questions surely requires even greater content mastery. That is the premise of a renewable assignment that Jhangiani (2017) first integrated within a Social Psychology course. At first the class of 35 undergraduate students wrote one plausible distractor each for four near-complete multiple-choice questions. However, as the course progressed they wrote two, and then all three distractors for four questions each week, eventually along with the question stem and the correct response. In addition to the steady increase in the difficulty and scope of their task, the assignment design included weekly double-blind peer reviews of questions written by three classmates, reflecting that peer reviewers often learn more from providing than from receiving feedback (Ludemann & McMakin 2014).

By itself, this assignment carries obvious pedagogical value that may be enhanced further through learner engagement and motivation when the highest rated questions from each week are included in the course's summative assessments. Not coincidentally, this latter practice also serves to subtly challenge classroom hierarchies.

The intersection of the assignment with OEP becomes clear when the questions authored by the students map onto an open textbook, and deepens further when the bank of student-authored questions (all 1400 of them) eventually constitute an ancillary resource that enables other educators to reuse the open textbook with their own students, ameliorating economic injustice. Of course, the

_	
\Box	
OEP	
Ţ	
of.	
logy	
ㅎ	
ğ	
A Typol	
⋖	
• •	
_	
Table	
3	

Category of OEP	Examples	Addresses economic, cultural, political and/or pedagogical issues	Content or Process centric (primary focus)	Teacher- or Learner- centric (primary focus)
OER-enabled teacher-centric	Use, adapt or create OER for teaching.	Economic and pedagogical;	Content	Teacher
	MOOCs on platforms such as EdX, Coursera	may have cultural or political effects (see Hodgkinson-Williams & Trotter 2018). Teachers may be disempowered if centrally designed by institution staff		
OER-enabled student-centric	Student-created textbooks and OER	Pedagogical and economic; may not necessarily address cultural or political issues unless learners are explicitly asked to include content from marginalized groups or are themselves from such groups	Process which produces content	Learner
Renewable or non-disposable assignments: when students produce assignments that have value/use beyond the classroom (e.g. student-created quiz questions, op ed pieces, instructional videos, etc.).	When assignments have value beyond the classroom, often shared as OER	Pedagogical	Process but produces content	Either/both
Learner-created assignment/assessments	DS106, students creating quiz questions	Pedagogical mainly	Process	Learner
Open syllabus, open teaching process, open courses: this is when a teacher's syllabus is open publicly for other teachers to view or comment on, but may also entail a syllabus where students are able to comment or modify the contents	Connectivist MOOCs (cMOOCs), and open connected courses, e.g. NetNarr, Equity Unbound, DigPINS,CCK08, CLMOOC, rhizo14, rhizo15	Pedagogical mainly, unless explicit social justice orientation (e.g. Equity Unbound)	Mostly process, although some may include more content (e.g. Equity Unbound)	Either/both
Public work/scholarship e.g. blogging (learners and teachers/educators), video creation	Domain of One's Own (DoOO), NOBA Project Student Video Award	Pedagogical mainly but without necessarily addressing social justice for marginalized populations for whom this may be negative	Process (which eventually produces content)	Either/both
Public networking/scholarship (learners and teachers/educators)	Twitter chats, Twitter slow chats and activities, collaborative annotation e.g. Marginal Syllabus, Virtually Connecting, online learning communities in general	Pedagogical mainly unless has an explicit social justice approach such as Marginal Syllabus and Virtually Connecting. The latter two address economic, cultural and political dimensions of social justice	Process	Either/both
Collaborative knowledge creation	Wikipedia editing (see Univ. Edinburgh Wikimedian in Residence Project resources, 500 Women Scientists, crowdsourced syllabi	Mainly pedagogical but topics can be intended to redress injustice (e.g. feminist edit-a-thons of Wikipedia; crowdsourced Black Lives Matter syllabus)	Content & process because the process of editing and collaboration is often emphasized rather than just the product.	Learner

(Contd.)

tive.	
pect	
Pers	
ce	
ısti	
=	
cial	
So	
B	
mo.	
f	
EP	
\circ	
9	
sed (
cused (
nsed (
ss-focused (
cess-focused (
rocess-focused (
ocess-focused (
1g Process-focused (
1g Process-focused (
dering Process-focused (
dering Process-focused (
sidering Process-focused (
: Considering Process-focused (
2: Considering Process-focused (
le 2: Considering Process-focused (
e 2: Considering Process-focused (

0EP	Contexts for which it may be neutral or negative	Contexts for which it may be ameliorative	Contexts for which it may be transformative
Student-created OER/content	Negative if content available publicly or openly is dominated by one perspective	Ameliorative if content created or adapted to increase representation of diverse identities	Transformative if marginalized students have power of decision-making over content,
	Negative if exploiting student labor	and marginalized groups	process and epistemological frameworks
	Neutral if highly structured and teacher-directed		
	Negative if without student agency		
Renewable assignments (e.g. student-created quiz questions, op ed pieces, instructional videos, etc.); may co-occur with	Negative if without student agency, if teacher- centric instructions, and/or if reproduces hegemonic knowledge	Ameliorative if introduces previously scarce cultural knowledge (with appropriate permission) into open spaces	Transformative if students from marginalized groups fully involved in decision-making of what and how this will happen
student-created OER/content	Negative if students are coerced into leaving this digital footprint, or if at-risk students put at further risk by working openly		
	Negative if students not appropriately informed on how to engage in open practice and its risks		
Open syllabus (challenges student-teacher hierarchy)	Negative/neutral if only students from dominant cultural backgrounds participate in modifying the syllabus	Ameliorative if students' changes are their own choices, but not necessarily challenging hierarchy or promoting justice	Transformative if challenges power in classroom not just between teacher and students, but among students of different backgrounds, such that students of marginalized backgrounds are able to make decisions and modifications
Content-centric MOOCs (e.g. those on most MOOC platforms) Connectivist, process-centric MOOCs (e.g.	Negative for those without minimal digital literacies and internet access, or for those who do not speak English (language of the majority of MOOCE)	Economic ameliorative value for those who cannot access this kind of learning but have good infrastructure	Transformative when marginalized groups design the content and processes
CLMOOC, rhizo14, rhizo15 and original cMOOCs CCK08 & CCK11) Open connected courses (e.g. Equity Unbound, NetNarr, DigPINS)	Neutral for privileged groups who receive additional learning for free	Cultural ameliorative value when content is OER and can be adapted or translated	
Public scholarship by students (e.g. Domain of One's Own)	Negative for those without minimal digital literacies and internet access	Ameliorative if website owner has some control over what they place online vs if using	Transformative if marginalized groups make decisions on how, what and where, and
	Negative for people who cannot afford to pay for domain after graduation	proprietary software (also control over their data)	challenge the hegemony of what counts as academic knowledge

OEP	Contexts for which it may be neutral or negative	Contexts for which it may be ameliorative	Contexts for which it may be transformative
	Negative for those whose public online presence can make them more vulnerable (e.g. political surveillance, personal safety, witness protection)	Ameliorative for groups whose knowledge is often not found online and public scholarship gives them voice	
	Negative if students are coerced into leaving this digital footprint		
Public scholarship by/for educators (e.g. blogging, tweeting, Open Faculty Patchbook, Open Pedagogy Notebook)	Negative without minimal digital literacies and internet access, and more difficult before communities are formed	Ameliorative by addressing economic injustice and making scholarship generally accessible to populations who would not be able to afford	Transformative by challenging structural academic gatekeeping in more traditional scholarly venues which may prevent certain
	Neutral if blogging or tweeting without being part of a supportive community	them otherwise	scholars or ideas from getting published (discipline context is important here) – additional considerations: may delay publication if urgent work, does not provide avenues for interaction among scholars
Virtually Connecting	Neutral for people who are shy or don't have bandwidth to join conversations (but can watch and benefit later)	Ameliorative when non-dominant groups participate in sessions in silent ways (so continue to listen to dominant)	Transformative when non-dominant virtual participants (e.g. Global South, POC, contingent academics) participate in the
	Negative for people who do not have internet access at all	Ameliorative when conversations repeat the conference's main line of thinking without challenging it	conversation as equal partners (especially it this later gets mentioned in the conference offline)
	won't work (Note: neutral because time zones differ so it's not always a disadvantage and sessions will almost always work for two broad	Ameliorative when dominant voices are amplified and other participants don't get room to speak or challenge	Transformative when conversations center marginal voices or challenge the dominant discourse, and especially when decisionmaking is done by marginalized groups.
	time zones)	Ameliorative as it reduces carbon footprint for some who are able to learn at conferences with less travel	
Wikipedia editing	Negative if insufficiently prepared learners are exposed to edit wars and online abuse	Ameliorative if content is created or adapted to increase representation of diverse identities and marginalized groups	Transformative if more representation in leadership (not just content) and if epistemology is challenged, i.e. what counts as credible sources?
Collaborative annotation (e.g. Marginal Syllabus)	Neutral if annotating dominant canonical texts, and those annotating are privileged groups	Ameliorative if content chosen with a social justice intent or represents a variety of perspectives including marginalized groups and/or in different languages	Transformative if decision-making over which texts to annotate and process of annotation comes from or involves marginalized groups
	harassment of authors when annotating their texts, or abuse in comments around texts	Economically ameliorative as it provides a free way to participate in global academic conversations using low-bandwidth, asynchronous technology	

creation of an ancillary resource that supports the wider adoption of OER is not the primary goal of the assignment. Nor are the questions themselves openly-licensed, given the fears of faculty about the integrity of exam questions. Yet the assignment undeniably transcends the boundaries of the classroom, lives beyond the semester, and has a greater impact than traditional, "disposable" assignments (Seraphin et al. 2019), while primarily being about deeper learning and authentic assessment. And perhaps most importantly, it elevates student expertise to a level where faculty would gladly draw on it. This assignment is thus a process-oriented and student-centered OEP with a clear pedagogical purpose of promoting student learning and ownership and agency over the learning process. It can be considered to have an economic social justice impact because it helps create assessments for open textbooks, encouraging their wider adoption. It may address political injustice if the students creating the questions are themselves from marginalized populations not usually represented in creation of assessments for the subject, or it may address cultural injustice if the work focused on creating questions that were accessible to or that recognize the cultures of minority learners.

Open connected courses (e.g. Equity Unbound)

Open courses built with connectivism and connected learning in mind typically focus on process rather than content, and are often more learner than teacher centered. Such open connected courses have a pedagogical purpose of facilitating the process of students learning from one another as well as with others outside the borders of their classroom. Open connected courses can be considered to have an economic social justice impact in the sense that they provide free resources and learning experiences to some people who would otherwise not have access to them, whether learners or teachers. But unless such courses have explicit design elements that include marginalized views or involve marginalized populations in the course design, they would not have cultural or political social justice impact. For example, DS 106 allows anyone to submit an idea for an assignment, and thus, if individuals who are marginalized contribute assignments from a perspective not previously included, some recognitive or representational justice could occur.

An example of an open connected course that was explicitly designed with social justice principles in mind is Equity Unbound: "an emergent, collaborative curriculum which aims to create equity-focused, open, connected, intercultural learning experiences across classes, countries and contexts" (Equity Unbound, undated). The curriculum is based on social justice focused themes and topics including identity, empathy, bias, equity, algorithms, privacy, fake news and data politics. The open connected course aims to address cultural injustice by including primarily authors and speakers from diverse populations and designing activities that are accessible across a range of diverse populations and time zones. In terms of process and pedagogy, Equity Unbound uses a critical digital pedagogical approach, i.e. focusing on learner empowerment and development of critical consciousness (Zamora et al. unpublished).

The curriculum is open and networked in multiple ways, connecting learners and educators, individuals and groups, and formal classrooms and informal participants across the globe. The three facilitators of the first iteration of Equity Unbound were from Egypt, Ireland and the US, and the second iteration included educators from Iran (based in Japan), Canada and Italy. A variety of technologies are used in order to enable all participants to communicate, network and participate, both synchronously and asynchronously. This has included syndicated blogs, Twitter chats and slow chats, Hypothes.is annotation, and synchronous video conversations (which are recorded). It has also meant extending an "always open" invitation to share and adapt materials while growing the network with new participants (both educators and students). Network activities and open learning materials were developed with an eye for both revision and remix, with the goal of remaining open to thoughtful, networkgenerated critique and new insights.

In the sense of economic injustice, Equity Unbound makes a range of curated learning resources and activities accessible to anyone for free, and addresses cultural injustice and political injustice in the choices of materials, guests and facilitators, as well as themes. In one sense, it challenges what traditional university limitations are on transnational collaborative courses, and so its impact may be transformative for those who are able to benefit from it, but may be negative for those whose institutions would not permit them to benefit. Some elements of it which use the open web, such as Twitter, may have negative impact on vulnerable populations who may be harmed by working in public, and synchronous video conversations may be inaccessible or inconvenient for some populations (more on this in the future sections).

Public scholarship by/for educators (e.g. Open Pedagogy Notebook)

Public scholarship can take many forms, including general use of blogs, social networking tools like Twitter, and participating in connectivist MOOCs. Most forms of public/open scholarship are process-oriented, can be teacher or student centric, and usually have a pedagogical purpose in the sense of building on connectivist/connected learning principles (Siemens 2004; Ito et al. 2013) in order for participants to share knowledge openly and learn from each other. Some forms of public scholarship are organized in one space to focus on a particular topic, such as the Open Faculty Patchbook, the Open Learner Patchbook, and The Open Pedagogy Notebook (OPN), showing the results of the process as curated content. The OPN is a digital space where both educators and students can share their experiences with OEP, a library of activities and strategies, and a place from which to draw pedagogical inspiration. As a website and blog, the OPN could easily focus solely on pedagogical content contributed by teachers. Yet, the content itself is process-centric and laced with generous insights into the values, methods, and hopes of its authors. The reflections on the OPN blog are often personal, and treated with the same respect whether they are authored by teachers or students. And while many of the practices described in the OPN draw on OER in ways that bring economic benefits for learners, it is evident that the contributors seek to push beyond these benefits in order to also address cultural and even political injustices.

The OPN highlights a tool to help consider the openness of learning experiences and a community 'patchwork' of teaching skills and experiences. It includes specific course assignments like zines and student-created worksheets but also broader forms of OEP such as collaborative syllabus design. It includes an essay arguing for empathy in the classroom and another arguing against productbased learning. It is home to a post by a student reflecting on how she felt empowered through her experience with OEP and another by an instructor reflecting on how his efforts to embrace OEP fell flat. By making the hidden processes of open pedagogy transparent, it supports readers in reimagining their own practices more openly. It provides a framing for Open Pedagogy but acknowledges that definitions of this concept are emergent and diverse. It is "like all of Open, a work in progress, powered by the diversity of teachers and learners who participate" (Jhangiani & DeRosa 2018, para. 6).

Public scholarship by students (e.g. Domain of One's Own)

Domain of One's Own (or DoOO) is OEP that aims at empowering students by having institutions offering students their own web domain on which to create blogs or whatever else they chose to do. It originated at the University of Mary Washington, where Martha Burtis describes it as a way for students to own their data for as long as they want it - versus having it in a Learning Management System which may keep or delete it, or a commercial platform that may monetize it without permission or close it down without notice (Burtis 2016). Burtis commented on Bali (2016) that "people deserve to have spaces on the Web over which they have as much control as we can give them. They deserve to own their data, to take it with them when they need to, and to delete it when they want to" as part of developing their digital citizenship.

DoOO is therefore a process-centric, student-centric practice means to empower students, and has a social justice purpose of avoiding placing students' data in the hands of exploitative commercial platforms. It would have a cultural and political social justice impact if it gives voice to marginalized students to express themselves freely.

However, DoOO's empowerment potential is partial, since students never truly "own" their domain, they are still placing their data on a shared hosting server, usually owned by a commercial entity (Bali 2019). Even though universities pay for the hosting and domain registration when they implement DoOO, once the student graduates, they have to pay annually for the domain hosting and registration if they wish to retain it, which would have a negative economic impact on students for whom this is not financially feasible – which may be the case for less privileged students (Bali 2016). Similarly, certain student populations are more vulnerable to surveillance, and so having a public voice on a public domain may be more threatening than empowering for them: Tanya Dorey-Elias

gives examples of abuse victims, Robin DeRosa gives the example of someone in the witness protection program, and Maha Bali highlights the risk of imprisonment and torture in autocratic regimes for political bloggers (cited in Bali 2019). This reiterates the need for truly informed choice and also suggests a need to allow learners to move "incrementally towards openness", starting in private before deciding to go public (Paskevicius & Irvine 2019). It is also important to recognize what then-student Andrew Rikard (2015) wrote: "we cannot say a student owns their domain when instructors grade what's on it and tell students how to use it - this does not challenge the power dynamics of educational institutions". We also need to recognize that there are many systemic limitations on freedom and freedom of expression that something like DoOO, as a technological solution, cannot overcome (Bali

Virtually Connecting (VC)

VC is a process-centric, social justice oriented OEP that goes beyond the limited and unidirectional access to livestreamed/recorded presentations that conferences typically provide, and instead focuses on inviting and facilitating conversations between those who attend a conference and those who cannot. The intention is that these conversations are equitable in nature, as we know that conversations (even when mediated by technology) often reproduce existing power dynamics. If VC merely gave access to conference conversations, it would ameliorate economic injustice, but it goes beyond this because its founders and many of its volunteers, those who have political power to choose the process from start to finish, belong to marginalized groups in academia: women, Global South scholars, unaffiliated scholars, graduate students, etc.

VC creates a parallel mode of developing social capital, one that is not only accessible to people previously marginalized, but where those marginalized individuals became the designers of the experience. It has had transformative political impact for some, such as graduate students (see Bali, Caines, Hogue, DeWaard & Friedrich 2019) who note that VC has allowed them to "have equitable conversations with high-profile conference participants" (see quotes in Bali et al. 2019) in an informal manner and to see these people "unplugged", while the graduate students "become heard, gain confidence, and develop reciprocal relationships with them over time, which empowers them as scholars" (see Bali et al. 2019). Others have spoken of how it reminds the more privileged who are at conferences of who is not present and gives them an opportunity to listen to different views, thus having a cultural social justice impact (Bali et al. 2019).

However, VC can have a negative impact on those without stable internet/electricity infrastructure, those who do not speak English, those with hearing disabilities, and/or those who are shy or nervous about speaking publicly in a live streamed and archived video conversation. In the latter case, the social justice impact is economic, but can have a cultural social justice impact if the conversations follow Intentionally Equitable Hospitality (IEH). IEH suggests that

in order for a practice to be equitable, "we [must] intend our practice to challenge power structures that contribute to unfair access and opportunities, in favor of emulating different power structures that promote greater equity" and "continually assess whether our processes and outcomes actually do this" (Bali et al. 2019, para 1). IEH recognizes that VC conversations can reproduce power and exacerbate inequality if, for example, most participants are from dominant groups, or if conversations themselves are dominated by the more privileged participants (Bali et al. 2019). IEH purposefully centers marginalized groups in the decision-making of which conferences to participate in, which onsite guests to invite, and whose voices to amplify during the session, both virtually and onsite. Representational justice requires "facilitation to ensure quiet and minority views have equal air-time in open online discussions" (Lambert 2018: Table 1). This is not possible for every event but is an aspiration VC is sometimes able to achieve. VC ameliorates injustice for those with financial, social, logistical or health obstacles that prevent them from attending conferences, even though it may not challenge culture or power at conferences. Beckingham (2018) has written of the importance of the choice for different levels of participation in VC, from organizer to participant to spectator, giving agency to people to choose how they benefit from VC.

VC, like Twitter, creates academic hierarchies outside traditional ones (Stewart 2015). Volunteers and participants develop social and cultural capital within the community (Bali et al. 2019) which also sometimes translates into more traditional hierarchies, such as keynote invitations and job offers. VC's existence still valorizes the importance of conferences, as sessions are centered around them, thus it may be considered to be ameliorative rather than transformative. However, VC challenges the importance of the formal scheduled sections of conferences and elevates an alternative element of informal hallway conversations. While VC can, for some participants and conversations, challenge academic gatekeeping and redress epistemic injustice, this is not always the case (Bali et al. 2019) and a long-term transformative effect cannot be predicted, but is aspirational (Bali & Caines 2018).

Wikipedia editing (e.g. feminist edit-a-thons)

Wikipedia promotes economic justice, in the sense that it is a free encyclopedia of similar quality to legacy encyclopedias such as Britannica, but with more articles and articles of greater currency. Because Wikipedia can be edited by anyone, theoretically it can be used as a tool for cultural and political justice, since there isn't a small group of experts who would limit the topics covered or present their limited views on a topic.

However, a closer look at the workings of Wikipedia reveals inequalities. First, in terms of representation, the majority of editors and contributors to English Wikipedia are white men. This imbalance may reflect the gender bias in computing fields, as many Wikipedia editors came on board before the visual editor became available (Simonite 2013), or even those with the privilege of time to spend. The gender imbalance in editors translates into a gender

imbalance in topics: this is evident in the number of biographies of women relative to men, and topics of general interest to women versus men (Greenstein & Zhu 2014; Reagle & Rhue 2011). Second, article validation processes, or what kind of knowledge Wikipedia considers credible, mean that some forms of indigenous knowledge are not recognized by its editors as credible. Third, some women and minorities have spoken out against the aggression and harassment that often takes place behind the scenes in the discussion of new or amended articles. Fourth, the requirement for consensus-seeking for each article means that when there are alternate views of topics, usually the most dominant view is what remains on the site (Greenstein & Zhu 2014). This is why, for example, Wikipedia pages in different languages often tell different stories about history, depending on what the dominant view is in that language/culture.

One way to assert social justice more intentionally in Wikipedia editing has been to hold what are called feminist edit-a-thons (see, for example, Women in Red¹) and training participants on how best to find sources to create quality biographies of women and others who do not currently have a Wikipedia page. This is a more transformative approach towards social justice as feminists learn about how to work with Wikipedia, and they contribute towards recognitive justice by adding more material on women. Similar edit-a-thons occur in various countries and can help to increase content on local topics in local and other languages. As Greenstein and Zhu (2014) assert:

A diverse set of potential contributors to an article can help increase its likelihood of including facts and opinions that experts dismiss, and may present a rather different discussion of competing viewpoints. Benefitting from the efforts of many contributors, an article is also more likely to present controversial content in an unbiased way: thus diversity may help reduce content bias. (p. 14)

What remains a challenge for systemic injustice in Wikipedia is the question of who gatekeeps and sets the rules for what counts as credible knowledge. This is, of course, a broader epistemic injustice challenge beyond Wikipedia. However, it reminds us that although Wikipedia provides a more democratic space for the construction of knowledge, it inevitably continues to reproduce much of the hegemonic knowledge structures shaped by Western societies.

Collaborative web annotation (e.g. Marginal Syllabus)

Digital annotation has clear potential pedagogical benefits as the act of annotation itself enhances deep reading. Doing so openly and collaboratively, as with the open source Hypothes.is tool, brings the additional pedagogical benefits of engaging learners in co-construction and critique of knowledge (Zamora & Bali in press). On its own, this practice does not address social injustice. However, if we compare it to an in-class discussion, this asynchronous form of discussing a text creates room for different

participants, including socially inhibited and marginalized voices, to contribute without being interrupted or excluded by others. It is also important to note the value of anyone in the world with an internet connection being able to participate; the technology is open-source, free and low-bandwidth, and Marginal Syllabus organizers ensure that all articles included are available open access. Some people have no access in their local contexts to groups of peers with whom to critically discuss texts and annotating publicly may not be comfortable for some people. Hypothes.is allows for public, individually private, and closed group annotations, with all public annotations having a default CCO license. So while users have agency over whether to make their annotations public, it is important to be aware of this default license.

Annotation as a pedagogy can potentially have a negative social justice impact, for example, if it is used to annotate canonical texts by privileged authors or if it is used to uncritically engage with texts. It may also have negative or dangerous effects on students from historically marginalized populations (see Brown & Croft, 2002). However, Marginal Syllabus is an example of a project that explicitly centers social justice focused texts (Kalir & Perez 2019), and as such, has a cultural social justice purpose. Collaborative web annotation can have a political social justice purpose if the choice of articles to annotate are crowdsourced by participants from marginalized groups (see Bali & Caines, 2018). One way Marginal Syllabus has tried to enhance diverse participation in "annotatathons" was to change from hour-long sessions (found to be unfriendly for certain time zones and not helpful for deep, slow reading) to sessions taking place over several days, opening up participation across time zones and for people with less flexible schedules and allowing more room for give and take among participants (Kalir 2018).

Kalir and Perez (2019) remind us that using technology to connect still has political and equity implications. Audrey Watters' (2017) decision to block annotation from her personal website provides a salutary example: while annotation can be used to engage in critical dialogue, it can also be used to abuse, troll or bully an author in ways outside their control, thus having a negative social justice effect. The Hypothes.is tool has a process for reporting abusive annotations, but this requires time and affective labor that some who are marginalized cannot afford.

Conclusion

This article has discussed a wide variety of OEP: content to process-centric, teacher to student-centric, and those ranging from primarily pedagogical and to primarily social justice focused. It has also unpacked the nuances of when a particular OEP may redress injustice for particular groups but not others, and how some OEP can be redesigned to better redress injustice. Building on the social justice framework developed by Hodgkinson-Williams and Trotter (2018), we have shown how process-centric OEP often go beyond redressing economic injustice and can redress cultural and political injustice.

While many OEP have a primarily pedagogical rather than social justice focus, those that aim to empower learners may have a positive impact on social justice in at least two ways: firstly, when used with individuals in marginalized populations, and secondly, in the long term development of students as citizens who learn how they might empower others when they are in a context to do so. Although many of the OEP discussed here initially do not have transformative effects, their openness in itself may begin to affect mindsets and cultures to facilitate transformative change. For example, although Virtually Connecting works with existing conferences, the practice can help us collectively to reimagine the nature and possibilities of a virtual conference (see Bowles 2019).

Many OEP can have negative effects where economic maldistribution exists, such as when educators and learners do not have the digital infrastructure or bandwidth to participate fully, or even at all. OEP also often takes place in English, thus limiting those who can access and benefit from it. Creators of OEP do not necessarily have the means or social capital with which to address the root causes of these injustices, but may have the potential to make their work more accessible to those with lower bandwidth (e.g. by deemphasizing high quality video and synchronicity, or at least providing recordings or transcripts) and by creating work that is translatable or translated. Open educators can also work on enhancing the participation of marginalized groups in their work.

OEP, as with OER, does not necessarily redress social injustice. By applying a social justice framework to analyze different types of OEP along its various axes, we hope to demonstrate how this approach to pedagogy may be deliberately oriented towards justice. We conclude with this powerful reminder from Okuno (2018: final para):

Equity isn't for all. Equity is for those farthest from justice, and if we are working towards true equity those farthest from justice can define for themselves what they need to be whole, healthy, and in just relations with others.

In the same vein, projects that emphasize "open for all" may not necessarily meet the needs of those farthest from justice. Each of us can rethink, continually, how we approach OEP if our goal is to promote social justice.

Note

https://en.wikipedia.org/wiki/Wikipedia: WikiProject_Women_in_Red.

Competing Interests

The authors have no competing interests to declare.

References

Bali, M. 23 August 2016. I don't own my domain, I rent it #DoOO. *Reflecting allowed* [online]. Available from: https://blog.mahabali.me/educational-technology-2/i-dont-own-my-domain-i-rent-it-dooo/.

Bali, M. 14 June 2019. The other side of student empowerment in a digital world #FOEcast – join me June 24 to chat. *Reflecting allowed* [online]. Available from: https://blog.mahabali.me/uncategorized/the-other-

- side-of-student-empowerment-in-a-digital-world-foe-cast-join-me-june-24-to-chat/.
- **Bali, M.** April 2017. What is open pedagogy anyway? *Year of open* [online]. Available from: https://www.yearofopen.org/april-open-perspective-what-is-open-pedagogy/.
- **Bali, M** and **Caines, A.** December 2018. A call for promoting ownership, equity, and agency in faculty development via connected learning. *The International Journal of Educational Technology in Higher Education*. DOI: https://doi.org/10.1186/s41239-018-0128-8
- **Bali, M, Caines, A, Hogue, RJ, DeWaard, HJ** and **Friedrich, C.** 2019. Intentionally equitable hospitality in hybrid video dialogue: The context of Virtually Connecting. *eLearning Mag* (special issue). DOI: https://doi.org/10.1145/3329488.3331173.
- **Bali, M, Crawford, M, Jessen, RL, Signorelli, P** and **Zamora, M.** 2015. What makes a cMOOC community endure? Multiple participant perspectives from diverse MOOCs. *Educational Media International*, 52(2): 100–115. DOI: https://doi.org/10.1080/09523 987.2015.1053290
- **Bali, M** and **Koseoglu, S.** 26 August 2016. Self as OER. *The Chronicle of Higher Education ProfHacker* [online]. Available from: https://www.chronicle.com/blogs/profhacker/self-as-oer-selfoer/62679.
- **Beckingham, S.** 2018. Using Social Media to Learn from Conferences. In: Popovic, C (ed.), *Learning from Academic Conferences*. Leiden: Brill|Sense. DOI: https://doi.org/10.1163/9789004373013_010
- **Bowles, K.** 10 April 2019. A quilt of stars: time, work and open pedagogy. *OER19: recentering open* [online] Available from: https://oer19.oerconf.org/sessions/welcome-from-the-co-chairs-and-keynote-by-kate-bowles/#gref.
- **Brown, M** and **Croft, B.** 2020. Social Annotation and an Inclusive Praxis for Open Pedagogy in the College Classroom. *Journal of Interactive Media in Education*, 2020(1): 8, pp. 1–8. DOI: https://doi.org/10.5334/jime.561
- **Burtis, M.** 16 August 2016. Making and Breaking Domain of One's Own: Rethinking the Web in Higher Ed. *Hybrid pedagogy* [online]. Available from: http://hybridpedagogy.org/making-breaking-rethinking-web-higher-ed/.
- Cape Town Open Education Declaration. 2007. *Cape Town open education declaration: Unlocking the promise of open educational resources.* Retrieved from http://www.capetowndeclaration.org/read-the-declaration.
- **Cronin, C.** 2017. Openness and praxis: Exploring the use of open educational practices in higher education. *The International Review of Research in Open and Distributed Learning*, 18(5). DOI: https://doi.org/10.19173/irrodl.v18i5.3096
- **Cronin, C** and **MacLaren, I.** 2018. Conceptualising OEP: A review of theoretical and empirical literature in open educational practices. *Open Praxis*, 10(2). DOI: https://doi.org/10.5944/openpraxis.10.2.825
- Czerniewicz, L and Walji, S. 2017. MOOCs, community orientation and reclaiming the social justice agenda. In: de los Arcos, B (ed.), *GO-GN: Global OER Graduate Network* [online]. Available from http://go-gn.net/

- webinars/webinar-moocs-community-orientation-and-reclaiming-the-social-justice-agenda/.
- **DeRosa, R** and **Jhangiani, R.** 2017. Open pedagogy. In: Mays, E (ed.), *A Guide to Making Open Textbooks with Students. Rebus Community for Open Textbook Creation*. PressBooks. Available from: https://press.rebus.community/makingopentextbookswithstudents/.
- **Equity Unbound.** Undated. *About* [online]. Available from: http://unboundeq.creativitycourse.org/about/.
- **Fraser, N.** 2005. Reframing justice in a globalizing world. *New Left Review*, 36, Nov/Dec. Available from: https://newleftreview-org.libproxy.aucegypt.edu/issues/II36/articles/nancy-fraser-reframing-justice-in-a-globalizing-world.
- **Geser, G.** (ed.) 2007. *Open educational practices and resources: OLCOS roadmap 2012.* Salzburg, Austria: Salzburg Research & EduMedia Group. Available from http://www.olcos.org/cms/upload/docs/olcos_roadmap.pdf. DOI: https://doi.org/10.7238/rusc.v4i1.295
- **Gilliard, C** and **Culik, H.** 24 May 2016. Digital redlining, access, and privacy. *Common sense education* [online]. Available from: https://www.commonsense.org/education/articles/digital-redlining-access-and-privacy.
- **Greenstein, S** and **Zhu, F.** 2014. Do experts or collective intelligence write with more bias? Evidence from Encyclopædia Britannica and Wikipedia. White paper, Harvard Business School.
- Hodgkinson-Williams, CA and Trotter, H. 2018. A social justice framework for understanding open educational resources and practices in the Global South. *Journal of Learning for Development*, 5(3): 204–224. https://jl4d.org/index.php/ejl4d/article/view/312.
- Ito, M, Gutiérrez, K, Livingstone, S, Penuel, B, Rhodes, J, Salen, K, Schor, J, Sefton-Green, J and Watkins, C. 2013. *Connected learning: An agenda for research and design*. Irvine, CA: Digital Media and Learning Research Hub. Available from: http://eprints.lse.ac.uk/48114/.
- **Jhangiani, RS.** 12 January 2017. Why have students answer questions when they can write them? [online]. Available from https://thatpsychprof.com/why-have-students-answer-questions-when-they-can-write-them/
- Jhangiani, RS. 2019. Delivering on the promise of open educational resources: Pitfalls and strategies. In: Zhang, K, Bonk, CJ, Reeves, TC and Reynolds, TH (eds.), *MOOCs and open education across emerging economies: Challenges, successes, and opportunities*, 56–62. New York: Taylor & Francis. DOI: https://doi.org/10.4324/9780429398919-7
- **Jhangiani, RS** and **DeRosa, R.** 2018. Welcome to the open pedagogy notebook [online]. Available from http://openpedagogy.org/.
- **Kalir, J.** 2018. Equity-oriented design in open education. *International Journal of Information and Learning Technology*, 35(5): 357–367. DOI: https://doi.org/10.1108/IJILT-06-2018-0070
- **Kalir, J** and **Perez, F.** 2019. The marginal syllabus: Educator learning and web annotation across sociopolitical texts and contexts. In: Reid, A (ed.), *Marginalia in*

- *modern learning contexts*. Hershey, PA: IGI Global. DOI: https://doi.org/10.31219/osf.io/6axnk
- **Knox, J.** 2013. The limitations of access alone: Moving towards open processes in education technology. *Open Praxis*, 5(1): 21–29. DOI: https://doi.org/10.5944/openpraxis.5.1.36
- **Koseoglu, S** and **Bozkurt, A.** 2018. An exploratory literature review on open educational practices. *Distance Education*, 39(4): 441–461. DOI: https://doi.org/10.1080/01587919.2018.1520042
- **Lambert, SR.** 2018. Changing our (dis)course: A distinctive social justice aligned definition of open education. *Journal of Learning for Development*, 5(3). Available from: https://jl4d.org/index.php/ejl4d/article/view/290/334.
- **Ludemann, PM** and **McMakin, D.** 2014. Perceived helpfulness of peer editing activities: First-year students' views and writing performance outcomes. *Psychology Teaching & Learning*, 13: 129–136. DOI: https://doi. org/10.2304/plat.2014.13.2.129
- **Okuno, E.** 16 November 2018. Equity doesn't mean all. *FakeQuity* [online]. Available from: https://fakequity.com/2018/11/16/equity-doesnt-mean-all/.
- **Paskevicius, M** and **Irvine, V.** 2019. Practicalities of implementing open pedagogy in higher education. *Smart Learning Environments*, 6(23). DOI: https://doi.org/10.1186/s40561-019-0110-5
- **Reagle, J** and **Rhue, L.** 2011. Gender bias in Wikipedia and Britannica. *International Journal of Communication*, 5(2011): 1138–1158. Available from: https://ijoc.org/index.php/ijoc/article/view/777.
- **Rikard, A.** 10 August 2015. Do I own my domain if you grade it? *EdSurge* [online]. Available from: https://www.edsurge.com/news/2015-08-10-do-i-own-my-domain-if-you-grade-it.
- Ross, J, Sinclair, C, Knox, J, Bayne, S and Macleod, H. 2014. Teacher experiences and academic identity: The missing components of MOOC pedagogy. *MERLOT*

- *Journal of Online Learning and Teaching*, 10(1): 56–68. http://jolt.merlot.org/vol10no1/ross_0314.pdf.
- Seraphin, SB, Grizzell, JA, Kerr-German, A, Perkins, MA, Grzanka, PR and Hardin, EE. 2019. A conceptual framework for non-disposable assignments: Inspiring implementation, innovation, and research. *Psychology Learning & Teaching*, 18(1): 84–97. DOI: https://doi.org/10.1177/1475725718811711
- **Siemens, G.** 2004. Connectivism: A learning theory for the digital age. *International Journal of Instructional Technology and Distance Education*, 2(1). Available from: http://www.itdl.org/journal/jan_05/article01. htm Republished here: https://lidtfoundations.pressbooks.com/chapter/connectivism-a-learning-theoryfor-the-digital-age/ [Last accessed 3 December 2018].
- **Simonite, T.** 22 October 2013. The decline of Wikipedia. *MIT Technology Review* [online]. Available from: https://www.technologyreview.com/s/520446/thedecline-of-wikipedia/.
- **Stewart, B.** 14 April 2015. In public: The shifting consequences of Twitter scholarship. *Hybrid Pedagogy* [online]. Available from: https://hybridpedagogy.org/in-public-the-shifting-consequences-of-twitter-scholarship/.
- **Watters, A.** 26 April 2017. Un-annotated. [online] Available from: http://hackeducation.com/2017/04/26/no-annotations-thanks-bye.
- **Zamora, M** and **Bali, M.** In press. Network. Digital Pedagogy in the Humanities: Concepts, Models and Experiments, Modern Language Association (MLA). First draft, with open peer review comments. Available from: https://digitalpedagogy.mla.hcommons.org/keywords/network/.
- **Zamora, M, Bali, M, Mehran, P** and **Cronin, C.** No date. Equity Unbound as critical intercultural praxis. In: Koseoglu, S, Veletsianos, G and Rowell, C (eds.), *Critical Digital Pedagogy Broadening Horizons, Bridging Theory and Practice.* Athabasca University Press.

How to cite this article: Bali, M, Cronin, C and Jhangiani, RS. 2020. Framing Open Educational Practices from a Social Justice Perspective. *Journal of Interactive Media in Education*, 2020(1): 10, pp. 1–12. DOI: https://doi.org/10.5334/jime.565

Submitted: 15 December 2019 Accepted: 21 February 2020 Published: 11 May 2020

Copyright: © 2020 The Author(s). This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC-BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited. See http://creativecommons.org/licenses/by/4.0/.