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DEVELOPING COMPETENCIES FOR SUSTAINABILITY-DRIVEN ENTREPRENEURSHIP IN HIGHER EDUCATION: A LITERATURE REVIEW OF TEACHING AND LEARNING METHODS

Desarrollo de las competencias para el emprendimiento orientado a la sostenibilidad en la educación superior: una revisión bibliográfica de los métodos de enseñanza y aprendizaje

Développement des compétences pour l'entrepreneuriat axé sur la durabilité dans l'enseignement supérieur: revue de la littérature des méthodes d'enseignement et d'apprentissage

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SUMMARY

The transformation of current economic systems towards sustainable development requires innovative sustainability-driven enterprises with competent owners, managers and staff members. These people should see sustainable development as

of primary value and as an opportunity for strategic renewal of their enterprise as well as being important to society in general. Higher education for sustainability-driven entrepreneurship aims at developing the individual competencies which are required in this context. For creating learning settings in which these competencies can be developed, particular teaching-learning approaches and methods are needed. To date, there is no comprehensive literature review dealing with teaching-learning approaches and methods of higher education for sustainability-driven entrepreneurship. Against this backdrop, a systematic literature review has been carried out to examine the state of the art concerning teaching-learning approaches and methods for sustainability-driven entrepreneurship in higher education. The results form a basis for further structuring the debate on approaches and methods of teaching and learning related to higher education for sustainability-driven entrepreneurship and for identifying future research needs in this area.

Key words: Entrepreneurship education; higher education for sustainable development; higher education for sustainability-driven entrepreneurship; learning outcomes; literature review; teaching and learning methods.

RESUMEN

La transformación de los sistemas económicos actuales hacia el desarrollo sostenible requiere de empresas innovadoras orientadas a la sostenibilidad con propietarios, administradores y miembros del personal competentes. Estas personas deben ver el desarrollo sostenible como valor principal y como una oportunidad para la renovación estratégica de su empresa, así como de la sociedad en general. La educación superior para el emprendimiento orientado a la sostenibilidad apunta a desarrollar las competencias individuales que se requieren en este contexto. Para la creación de entornos de aprendizaje en los que se puedan desarrollar estas competencias se necesitan enfoques y métodos particulares de enseñanza y aprendizaje. Hasta la fecha, no existe una revisión bibliográfica exhaustiva que trate de los enfoques y los métodos de enseñanza y aprendizaje en la educación superior para el emprendimiento orientado a la sostenibilidad. En este contexto, se ha llevado a cabo una revisión bibliográfica sistemática para examinar el estado del arte en torno a los enfoques y métodos de enseñanza y aprendizaje para el emprendimiento orientado a la sostenibilidad en la educación superior. Los resultados constituyen una base para seguir estructurando el debate sobre los enfoques y métodos de enseñanza y aprendizaje relacionados con la educación superior para el emprendimiento orientado a la sostenibilidad y para identificar futuras necesidades de investigación en este ámbito.

Palabras clave: Educación para el emprendimiento; educación superior para el desarrollo sostenible; educación superior para el emprendimiento orientado a la sostenibilidad; resultados del aprendizaje; revisión bibliográfica; métodos de enseñanza y aprendizaje.

SOMMAIRE

La transformation des systèmes économiques actuels en faveur du développement durable exige des entreprises innovantes axées sur la durabilité avec les propriétaires, les gestionnaires et les membres du personnel compétents. Ces personnes devraient voir le développement durable comme une valeur fondamentale et une opportunité de renouvellement stratégique de l'entreprise ainsi que la société en général. L'enseignement supérieur à l'entrepreneuriat axée sur la durabilité vise à développer les compétences individuelles nécessaires dans ce contexte. Pour créer des environnements d'apprentissage qui permet de développer ces compétences des approches et des méthodes particulières d'enseignement et d'apprentissage sont nécessaires. À ce jour, il n'y a pas revue de la littérature globale qui tienne compte des approches et des méthodes d'enseignement et d'apprentissage dans l'enseignement supérieur à l'entrepreneuriat axée sur la durabilité. Dans ce contexte, il a procédé à une revue systématique de la littérature pour examiner l'état de l'art autour des approches et des méthodes d'enseignement et d'apprentissage pour l'entrepreneuriat axée sur la durabilité dans l'enseignement supérieur. Les résultats fournissent une base pour structurer le débat sur les approches et les méthodes d'enseignement et d'apprentissage liés à l'enseignement supérieur à l'entrepreneuriat axée sur la durabilité et pour déterminer les besoins futurs de la recherche dans ce domaine.

Mots clés: L'éducation à l'entrepreneuriat; l'enseignement supérieur pour le développement durable; l'enseignement supérieur à l'entrepreneuriat axée sur la durabilité; les résultats d'apprentissage; revue de la littérature; les méthodes d'enseignement et apprentissage.

1. INTRODUCTION

1.1. *Sustainability-driven entrepreneurship*

Sustainable development asks for new ways to organise economies. The current dominant economic systems do not only cause destruction of nature, climate change, the depletion of resources and various forms of social injustice. They are also vulnerable systems themselves, as economic crises around the world have shown (García-Olivares and Solé, 2015). Instead, a sustainable economy should consist of resilient businesses that contribute to healthy ecosystems and promote social justice. Therefore, sustainability-driven entrepreneurs and intrapreneurs are needed as business owners, managers or staff members who contribute to innovation and change in the economic system – people with the potential to create solutions for the multiple challenges faced in ecological, social, political and financial crises (Lintner *et al.*, under review).

Sustainability-driven entrepreneurship involves the creation and implementation of societal, environmental and institutional sustainability innovations aiming at the mass market, and providing benefit to most of society (Schaltegger and Wagner, 2011). Thus, sustainability-driven entrepreneurs are expected to initiate

and successfully implement such sustainability innovations in the processes of production, services and management (Rammel and van Gabain, 2012). They should be able to see sustainable development as an opportunity and a driver for innovation, creation and strategic renewal – in the whole economic system, but also in particular enterprises (Lans *et al.*, 2014). Therefore, sustainability-driven entrepreneurs are important drivers for a far-reaching, socio-economic transformation towards a (more) sustainable economy (Parrish, 2010; Tilley and Young, 2010) and they can be seen as agents of change towards a post-growth society (Kyrö, 2015; Parrish and Foxon, 2006). By putting social and ecological aspects centre-stage in the purpose of the enterprise (instead of prioritising the economic output), they radically challenge and transform the current understanding of a profit-maximising economy.

Innovative business ideas and models supporting sustainable development stem from open-minded, visionary, creative and proactive individuals (Schaltegger and Wagner, 2011). Their knowledge, skills, values, motivations, and goals – all aspects of entrepreneurial competence – are crucial. While entrepreneurial competence in general can be defined as «the ability to identify and pursue entrepreneurial opportunities within a specific position and context» (Lans *et al.*, 2014, 39), more specific competencies have been distinguished for sustainability-driven entrepreneurs: systems thinking competence, embracing diversity and interdisciplinarity, foresighted thinking, normative competence, action competence, interpersonal competence, strategic management competence, and entrepreneurial self-efficacy (Lans *et al.*, 2014; cf. Bernhardt *et al.*, 2015). One learning setting where these competencies can be developed is higher education.

1.2. *Higher education for sustainable development (HESD)*

Higher education institutions are regarded as key actors in society for fostering sustainable development (Fadeeva and Mochizuki, 2010; Wals *et al.*, 2016; Wyness and Sterling, 2015). They contribute to this process through research, education and transfer. Consequently, higher education for sustainable development (HESD) is described as a driving force for a transformation towards a more sustainable future (Sterling *et al.*, 2013; UNESCO, 1998, 2014; Wals *et al.*, 2016). It aims at facilitating the development of competencies needed for dealing with (un)sustainable development (Barth *et al.*, 2007; Rieckmann, 2012; Wiek *et al.*, 2011, 2016). This is in line with general trends in higher education to move from input-oriented, knowledge-based teaching to output-oriented, competence-based teaching and learning (Kouwenhoven, 2009; Schaeper, 2009; Vila *et al.*, 2012).

In general terms, competencies include content as well as process knowledge (know what and know how), but furthermore they also include skills, values, attitudes, and motivation. Following Rieckmann (2012, 129), competencies are «individual dispositions of self-organization which include cognitive, affective,

volitional [...] and motivational elements»¹. Wiek *et al.* (2016, 242) underline that «competencies [...] accommodate the topical knowledge required for successful problem solving in a particular context». Competencies facilitate self-organised action in various complex situations, dependent on the given situation and context (Weinert, 2001). Key competencies are defined as competencies with a particular significance in order to develop important societal goals concerning a normative framework like sustainability (Rieckmann, 2012; Rychen, 2003). More than domain-specific competencies, key competencies «require a high degree of individual reflexivity» (Rieckmann, 2012, 129). With regard to sustainability, Wiek *et al.* (2011, 204) define key competencies as «essential [competencies] for sustainability that have not been the focus of traditional education». Sustainability key competencies are linked to a context which is highly characterised by complexity, uncertainty, rapid social change, individualisation, diversity, and uniformity (Rieckmann, 2012).

It is crucial that key competencies of sustainability are seen as competencies which enable people to solve problems in a successful way «with respect to real-world sustainability problems, challenges, and opportunities» (Wiek *et al.*, 2011, 204). Therefore, HESD aims at equipping students to not only acquire and generate knowledge, but also to reflect on the further effects and the complexity of real-world behaviour and decisions in a future-oriented and global perspective of responsibility (Barth *et al.*, 2007). HESD offers opportunities and settings for students to try out how to act according to sustainability principles. This action-orientation is critical in HESD in order to facilitate competence development, because competencies cannot be taught, but have to be developed by the learners (Weinert, 2001) – they are acquired during action on the basis of experience and reflection. By developing the learners' sustainability competencies, HESD is meant to empower people to actively participate in shaping a sustainable development of their society and future. This understanding of HESD can be described as an emancipatory educational approach (Vare and Scott, 2007; Wals, 2011, 2015).

Various researchers have identified, listed or summarised key competencies relevant for sustainable development (see Barth, 2015, 64 for an overview). Based on a literature review, Wiek *et al.* (2011) outline five sustainability key competencies: systems thinking competence, anticipatory (or future thinking) competence, normative (or values thinking) competence, strategic (or action-oriented) competence, and interpersonal (or collaboration) competence. Recently, they have added a sixth competence: integrated problem-solving competence, which is described as a 'meta-competence of meaningfully using and integrating the five key competencies for solving sustainability problems and fostering sustainable development' (Wiek *et al.*, 2016, 243). Analogously to HESD focusing on sustainability

1 «Although the terms *skills* and *competencies* are often used interchangeably, a clear difference exists between the two. Competencies are broader in scope. They refer to the ability to use knowledge –understood broadly as encompassing information, understanding, skills, values, and attitudes– in specific contexts and to meet demands» (UNESCO, 2015, 40).

competencies, higher education for sustainability-driven entrepreneurship should develop competencies for sustainability-driven entrepreneurship (Lans *et al.*, 2014; cf. Bernhardt *et al.*, 2015).

1.3. *Competence-based teaching and learning in higher education*

The development of competencies needs a constructive alignment of content, teaching and learning approaches and assessment tasks. Therefore, higher education focusing both on competence development and fulfilling its role as one major driving force for sustainable development, requires a reorientation of learning processes. Curricula have to include sustainability issues and need a pedagogical framework which relates to education for sustainable development (ESD).

A transformation of higher education has already started through the integration of sustainability-related topics into existing curricula (Thomas, 2016). Nevertheless, in many cases these curriculum changes are limited to the question of «what» to teach, but do not sufficiently tackle the related issue of «how» to teach. A new learning culture and new teaching and learning approaches are needed which are learner-centred and facilitate competence development (Barth *et al.*, 2007; Schaeper, 2009; Vila *et al.*, 2012).

Active, collaborative, problem-based and experiential learning as well as interdisciplinary approaches are described as suitable competence-oriented approaches for HESD (Christie *et al.*, 2013). In addition to this, higher education should open up to the world beyond classrooms and laboratories (Lozano, 2007)². Students should learn in real-world settings, steadily researching and integrating needs and perspectives from theory and practice. In this way, students can develop competencies that enable them to solve complex sustainability-problems in their future careers. Examples of approaches integrating real-world issues are inter- and transdisciplinary project work, service-learning or research-based learning (with communities) (Barth *et al.*, 2014; Lehmann *et al.*, 2008; Thomas, 2009).

1.4. *The European CASE project*

Given this theoretical background, the European project «CASE – Competencies for A Sustainable Socio-Economic Development»³ – aims at elaborating a concept for a joint «European Master’s Programme on Sustainability-driven Entrepreneurship». Students studying this Master’s programme will develop relevant competencies

² There is also a political demand to enhance «the role of civil society and other partners» (UNESCO, 2015, 81) in education.

³ The CASE project is implemented in the framework of the EU Programme «Erasmus Plus-Knowledge Alliances» together with 10 universities and business partners from five European countries. See the CASE website for more details: www.case-ka.eu.

for sustainability-driven entrepreneurship. Therefore, besides designing adequate contents, one major focus of the CASE project is to formulate an innovative, inter- and transdisciplinary pedagogical framework, focusing on the development of sustainability competencies in general and competencies for sustainability-driven entrepreneurship in particular. Here, teaching-learning approaches and methods from HESD and higher education for entrepreneurship (HEE) (cf. Lans *et al.*, 2008; Pittaway and Cope, 2007) have to be combined and adapted in order to create learning settings in which such competencies can be developed.

In addition to the framework for defining competencies for sustainability-driven entrepreneurship developed by Lans *et al.* (2014), the CASE project has conducted a needs analysis with practitioners and academics in five European regions, asking them which competencies are needed by sustainability-driven entrepreneurs and hence should be acquired in higher education for sustainability-driven entrepreneurship (Bernhardt *et al.*, 2015). In further analyses of these data, knowledge, skills, motivational drivers and opportunities of sustainability-driven entrepreneurs have been identified (Lintner *et al.*, under review).

1.5. *Research aim*

Many teaching experiences in HESD and HEE have been published as case studies and many pedagogical recommendations – based on theoretical considerations and/or empirical experiences – describe good practice (e.g. Barth *et al.*, 2014; Bliemel, 2013; Brundiens *et al.*, 2010; Chang *et al.*, 2014; Dhliwayo, 2008; Gardiner and Rieckmann, 2015; Lehmann *et al.*, 2008; McCrea, 2010). Nevertheless, to date there is no comprehensive literature review dealing with teaching-learning approaches and methods of higher education for sustainability-driven entrepreneurship. It would be valuable to examine major trends and more frequently-stated recommendations concerning adequate teaching and learning in HESD and HEE, because results of single case studies might be quite context-specific.

That is why a systematic literature review has been carried out to examine the state of the art concerning teaching-learning approaches and methods in HESD and HEE. It aims at reviewing the international research that has been conducted related to innovative forms of teaching and learning in HESD and HEE and providing robust data to identify general trends and assumptions in the two discourses, as well as specific approaches and inconsistencies and gaps.

The results address questions like: What is described and analysed in the articles – from whole study programmes to specific methods? Which approaches and methods of teaching and learning are used in HESD and HEE? How frequently are external partners involved in teaching and learning in the two fields? What are differences between HESD and HEE concerning dominant teaching and learning approaches? How are learning outcomes related to competence frameworks and how are they assessed? Furthermore, the review shows trends in the field concerning the geographical background of authors, the disciplines involved in the two

educational fields, and the most important journals for publishing about teaching and learning in HESD and HEE.

Thus, this paper gives a broad overview of how sustainability and entrepreneurship are taught and learned in higher education. These insights will help to choose, use and further develop the most appropriate teaching-learning approaches and methods for educating sustainability-driven entrepreneurship at universities – in particular, in the «European Master's Programme on Sustainability-driven Entrepreneurship». Last but not least, the paper facilitates new conversations and academic debate between the two quite separate⁴ discourses and communities of HESD and HEE.

2. METHODOLOGICAL DESIGN

As the aim was to create a valid overview of teaching and learning approaches and methods used and recommended in the two educational fields relevant for sustainability-driven entrepreneurship, a systematic literature review has been conducted. Systematic reviews in educational science represent a typical way of mapping the field and tracing recent developments (Petticrew and Roberts, 2006). From being a rather vague «catch phrase» for a preparatory step prior to the actual research, this has developed into a systematic method of investigation in its own right (Hart, 1998; Light and Pillemer, 1984; Littell *et al.*, 2008; see Foster and Hammersley, 1998 for a meta-review). In the present study we follow the systematic review approach outlined in Fink (2014). By following that approach we intended to provide a systematic and replicable search and analysis strategy which is fully documented and transparent. By going through the steps of (1) data collection, (2) data processing and coding and (3) data analysis, a bibliometric overview of the research field on teaching and learning in HESD and HEE has been produced.

The study includes all peer-reviewed articles available in English referenced in two major data bases (ERIC, Web of Science) in August 2015. For searching the databases the following key words were used:

- a) «higher education» OR «university» OR «tertiary education» OR «college»;
- b) «education for sustainable entrepreneurship» OR «education for sustainability management» OR «education for sustainable business» OR «education for sustainability» OR «education for sustainable development» OR «sustainability education» OR «entrepreneurship education» OR «entrepreneurial education»;
- c) «didactic*» OR «pedagog*» OR «method*» OR «interdisciplinary method*» OR «interdisciplinary learning» OR «transdisciplinary method*» OR «transdisciplinary learning» OR «experiential learning» OR «experience-based learning» OR

⁴ «To date, dialogue between the two camps [entrepreneurship education and education for sustainability education] remains extremely limited with virtually no exchange of knowledge or expertise» (Wyness *et al.*, 2015, 835).

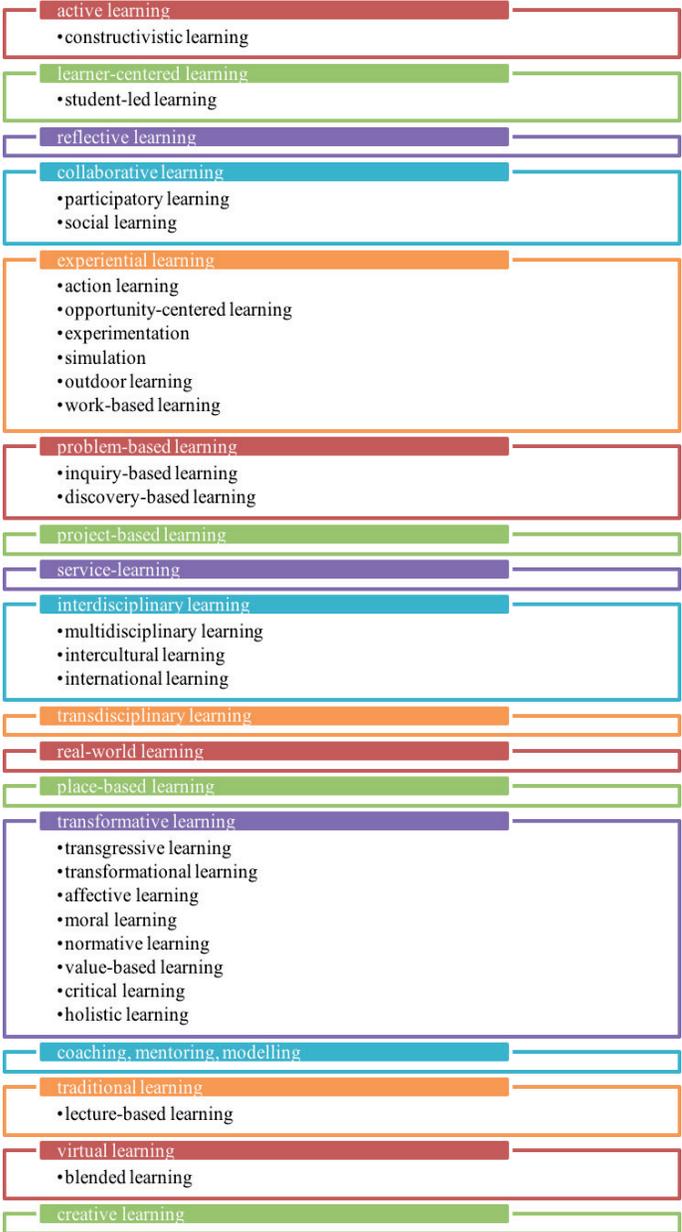
«participatory learning» OR «self-directed learning» OR «problem-based learning» OR «collaborative learning».

These key words yielded 690 articles in total: 327 from the data base Web of Science and 363 from ERIC. Some articles were available in both data bases. Duplicates were deleted from the sample. Processing the data further, all articles were excluded that were not written in English or did not focus on presenting and analysing approaches and methods of teaching and learning in HESD or HEE. Three further articles had to be excluded as it was not possible to get access to the full papers. A sample of 183 articles remained: 104 of the 183 articles are available in the database «ERIC», 61 in «Web of Science», 18 in both.

Each of the 183 articles was coded by one research assistant (in total four different research assistants contributed to the coding) and one researcher using a system of categories. The categories for coding among others are: authors' name, gender, geographic background and disciplinary affiliation, name of the journal, year of publication, key words, educational focus (HESD or HEE), paper type (conceptual paper, case study, empirical study), scope of the teaching and learning (from whole study programmes to specific methods), teaching-learning approaches, aspects of interdisciplinarity and cooperation with external partners in teaching and learning, analysis of learning outcomes and reference to competence frameworks. Based on the abstract and the full text, for each variable, every article was coded following pre-defined coding instructions.

Concerning the teaching-learning approaches, we coded and counted them when they are explicitly mentioned by the authors themselves (e.g. «the course was designed as an experiential learning opportunity») or when the descriptions of courses or methods are clearly related to a specific teaching-learning approach (e.g. «intensive group discussion» was coded as «collaborative learning»). Synonyms for one approach were coded as the same (e.g. «problem-based learning» and «problem-oriented learning»). The coding scheme for the teaching-learning approaches is illustrated in Figure 1. To analyse the codes, absolute and relative frequencies were counted in each category providing descriptive statistics.

FIGURE 1
CATEGORIES FOR CODING THE TEACHING-LEARNING APPROACHES



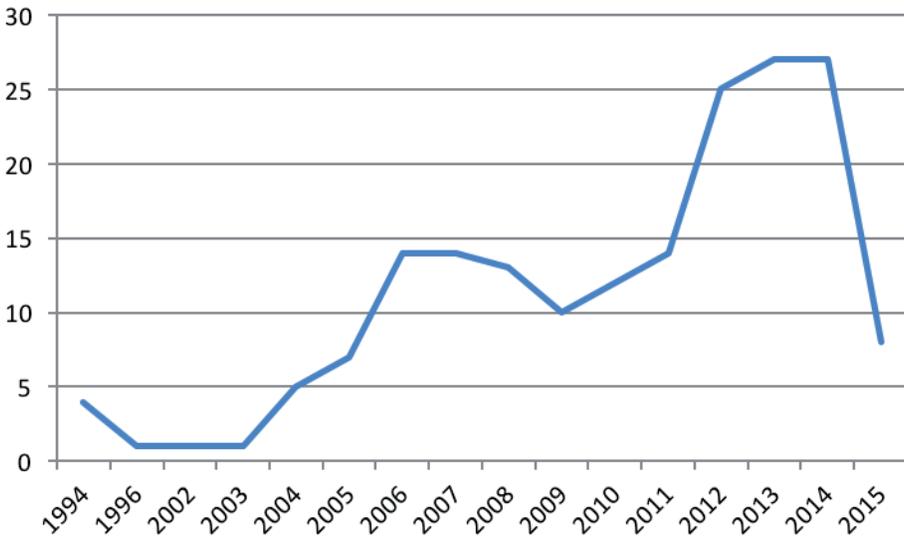
3. RESULTS

The results of the review provide, first, data concerning the number of articles over time, the most relevant journals and the authors' attributes in the literature sample. Second, the content of the articles is characterised by the keywords, educational focus, paper type, and the description of the teaching and learning. Third, teaching-learning approaches that are described, analysed or recommended in the articles are quantified – with regard to differences between HESD and HEE. Fourth, results concerning interdisciplinarity and the cooperation with external partners in HESD and HEE are reported. Fifth, descriptive statistics show how learning outcomes are addressed by the articles and to which competence frameworks they are related.

3.1. *Number of articles over time, relevant journals and authors' attributes*

The number of articles addressing teaching and learning in HESD and HEE has risen over the last twenty years. While only seven articles were published during the decade 1994-2003 (the oldest articles in the sample are from 1994), a total of 141 articles were published between 2004 and 2013. Figure 2 gives a publication timeline showing a steadily increasing number of publications (The lower number in 2015 is due to the literature search in August 2015).

FIGURE 2
PUBLICATION TIMELINE (FROM 1994 TO AUGUST 2015)



Most articles of the sample, namely one in five articles (20.8%), have been published in the *International Journal of Sustainability in Higher Education*, followed by the journal *Education + Training* (11.5%) and the journal *Industry and Higher Education* (8.7%). Further important journals with absolute frequencies above five are *Environmental Education Research*, *Sustainability*, *Journal of Education for Sustainable Development* and the *Australian Journal of Environmental Education*. 43.3% of the articles have been published in diverse other journals (less than five articles per journal). See Table 1 for more details.

TABLE 1
MOST IMPORTANT JOURNALS

JOURNAL	N	%
<i>International Journal of Sustainability in Higher Education</i>	38	20.8
<i>Education + Training</i>	21	11.5
<i>Industry and Higher Education</i>	16	8.7
<i>Environmental Education Research</i>	9	4.9
<i>Sustainability</i>	8	4.4
<i>Journal of Education for Sustainable Development</i>	6	3.3
<i>Australian Journal of Environmental Education</i>	6	3.3
Other	79	43.3
Total	183	100.0

In total 396 different authors contributed to the articles in the sample. 25 authors have contributed to at least two articles; but the majority of 371 authors have published only one article. Three in four articles have been written in co-authorship of two (40.4%) and up to twelve authors. 26.2% of the articles have been written by a single author. To evaluate the diversity of the authors, their gender and geographic as well as disciplinary background have been analysed. Gender distribution is slightly favouring male authors with 55% being male and 45% being female. Europe and North America are the dominating world regions in the literature sample. Nearly half of all authors (47%) work at a European institution and 30% at a North American one. Oceania is represented with 12%, Asia with 9%, and Africa as well as the Middle East with 1% of the authors. South America is not represented at all. Authors most often work in English-speaking countries. Analysing the national background of the authors, 112 articles have been written or co-authored by researchers from the United States, followed by the United Kingdom (92) and Australia (49). In total 31 countries are represented. More details on the national background of the first authors are provided in Table 2.

TABLE 2
GEOGRAPHICAL BACKGROUND – COUNTRY OF THE FIRST AUTHORS' UNIVERSITY

COUNTRY OF AUTHORS' UNIVERSITY	N	COUNTRY OF AUTHORS' UNIVERSITY	N
USA	112	India	4
UK	92	Malaysia	4
Australia	49	South Africa	4
Canada	15	Israel	3
Spain	15	Latvia	3
Ireland	13	New Zealand	3
Japan	13	Taiwan	3
Denmark	12	Turkey	3
Finland	10	Egypt	2
Germany	10	Hong Kong	2
China	9	Italy	2
Netherlands	9	Singapore	2
Norway	9	Austria	1
France	8	Thailand	1
Sweden	6	Ukraine	1
Estonia	5		

The authors work at 225 different institutions, mainly universities. 97 of the institutions are represented at least twice in the sample. The most prominent institutions are the Arizona State University (11), the RMIT University (10), the Aarhus University (9), the Tokyo University of Marine Science (9) and the University of Limerick (8).

Regarding the disciplinary background, with 36%, most authors have a background in business, economics and entrepreneurship, 26% in environmental and sustainability science, 18% in education, 7% in natural and technical sciences, 7% in social and cultural sciences, 3% in other disciplines (like land planning and tourism), and for 3% of the authors the disciplinary background could not be identified (see Table 3).

TABLE 3
DISCIPLINARY BACKGROUND OF THE AUTHORS

AUTHORS' DISCIPLINARY BACKGROUND	N	%
Business, economics, management, entrepreneurship	152	36.0
Environmental and sustainability sciences	111	26.3
Education	76	18.0
Natural, technical, computer and engineering sciences	31	7.3
Humanities, social, political and cultural sciences	30	7.1
Other	11	2.6
Not identified	11	2.6

3.2. Content of the articles: Keywords, educational focus, paper type, description of the teaching and learning

The 821 keywords of the articles were analysed by counting the most frequent ones, visualised as a word cloud (see Figure 3), and by clustering them into 15 categories (Table 4). This analysis confirms the searching strategy and selection process showing that most keywords address learning methods, (higher) education, sustainable development and entrepreneurship. The analysis further reveals that a broad range of other disciplines is involved in this research and learning field, that a diversity of learning aims is addressed and that many authors highlight the geographical (mostly national) context of their teaching and learning research.

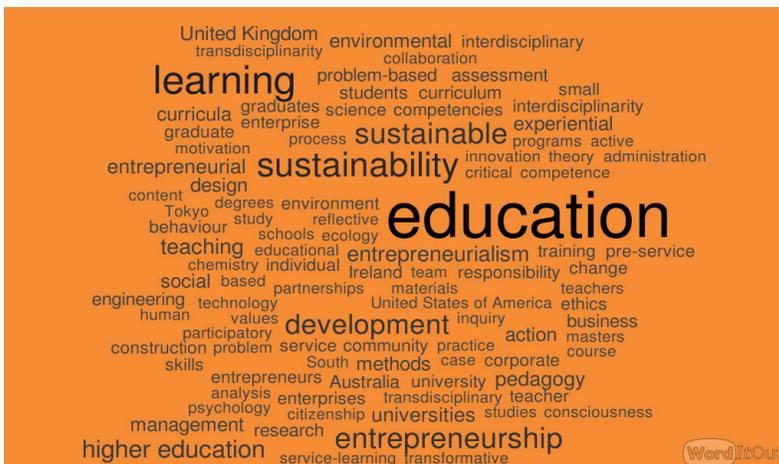
FIGURE 3
WORD CLOUD OF KEYWORDS

TABLE 4
 TOTAL FREQUENCIES AND PERCENTAGES OF THE KEYWORDS CLUSTERED INTO 15 GROUPS

GROUPS OF CLUSTERED KEYWORDS	N	%
Learning methods	158	19.2
Education, teaching and curricula	128	15.6
Sustainability and sustainable development	110	13.4
Entrepreneurship	98	11.9
Further disciplines	59	7.2
Further learning aims	49	6.0
Geographic information	48	5.8
Management and business	32	3.9
Institutions and organisations	30	3.7
People	20	2.4
Research	18	2.2
Production methods and products	15	1.8
Nature and environment	13	1.6
Cooperation and transdisciplinarity	12	1.5
Other	31	3.8
Total	821	100.0

Furthermore, the articles were categorised as addressing teaching and learning in HESD or in HEE. 53.6% of the articles stem from the field of HESD, and 41.5% the field of HEE. 4.9% of the articles were coded as being at the interface of HESD and HEE (dealing equally with ESD and business education). Also a more detailed coding of the educational field was conducted, distinguishing special focusses in HESD and HEE such as ESD for teacher students or HEE for engineers. These results are provided in Table 5.

TABLE 5
EDUCATIONAL FOCUS

EDUCATIONAL FOCUS, DETAILED		N	%
HESD	HESD	74	40.4
	ESD in teacher education	10	5.5
	ESD in engineering education	10	5.5
	ESD for design, architecture and construction	4	2.2
HEE	Entrepreneurship education	65	35.5
	Education for social entrepreneurship	5	2.7
	Business, economics, management education	2	1.1
	Entrepreneurship education for engineers, technology transfer	4	2.2
HESD + HEE	ESD in/and business education (equally important)	9	4.9
Total		183	100.0

Mainly, the articles describe and analyse one teaching and learning method through a case study approach (43.7%) (see Table 6). Further 7.7% of the articles refer to or compare multiple case studies. One in four articles is a conceptual/theoretical paper with 15.8% of the articles being purely conceptual papers and 9.8% referring anecdotally to experiences. One in five articles (21.3%) applies an empirical approach. Three articles have been categorised as consisting equally of a conceptual and an empirical part. A major difference in research approaches between articles focussing on HESD or on HEE can be observed regarding the use of case studies: While half of the HESD articles (50%) analyses one teaching and learning method in a case study approach, only one third of the HEE articles (34.2%) does so.

TABLE 6
PAPER TYPE

PAPER TYPE	N	%
Case study	80	43.7
Empirical data	39	21.3
Purely conceptual	29	15.8
Conceptual with some experiences	18	9.8
Multiple case studies	14	7.7
Conceptual and empirical	3	1.6
Total	183	100.0

Moreover, whether an article focuses on the description and analysis of a whole study programme, a single course, a specific teaching method or a teaching-learning approach (see Table 7) has been distinguished. Most often, a single course

is analysed (33.9%), followed by teaching-learning approaches (32.8%), and specific teaching methods (24.6%). In eight articles (4.4%) the main focus is on a whole study programme. A further eight articles deal with other teaching and learning settings like a pre-incubation programme, a summer school or a programme involving the whole university. While HESD researchers most often describe and analyse single courses (42.9%), HEE researchers most often do so with teaching-learning approaches (42.1%).

TABLE 7
SCOPE OF THE DESCRIBED TEACHING AND LEARNING

LEVEL OF THE DESCRIBED TEACHING AND LEARNING METHOD	N	%
Single course	62	33.9
Teaching-learning approach	60	32.8
Specific teaching method	45	24.6
Study programme	8	4.4
Other	8	4.4
Total	183	100.0

Half of the articles (50.3%) describe in detail the method presented. 40.4% of the articles provide a rather short overview of the method analysed and 9.3% of the articles do not provide any description of the method.

3.3. *Teaching-learning approaches*

The number of codes for teaching-learning approaches per article varied from one to eight. In total, 832 teaching-learning approaches were coded (see Table 8). The most prominent teaching-learning approaches, named in almost 20% of the articles, are collaborative learning and experiential learning, followed by problem-based, learner-centred, project-based learning and transformative learning.

TABLE 8
TEACHING-LEARNING APPROACHES DESCRIBED IN THE ARTICLES

TEACHING-LEARNING APPROACHES	N	%
Collaborative learning	161	19.4
Experiential learning	157	18.9
Problem-based learning	63	7.6
Learner-centred learning	60	7.2
Project-based learning	59	7.1
Transformative learning	51	6.1
Real-world learning	38	4.6
Reflective learning	36	4.3
Place-based learning	34	4.1
Active learning	30	3.6
Coaching, mentoring, modelling	26	3.1
Service-learning	24	2.9
Interdisciplinary learning	23	2.8
Traditional learning	22	2.6
Virtual learning	14	1.7
Transdisciplinary learning	11	1.3
Creative learning	9	1.1
Others	14	1.7
Total	832	100.0

Analysing the frequency of the approaches in HESD and in HEE separately, reveals some major differences between the pedagogies in those two educational fields (see Table 9). Authors describing and analysing teaching and learning in HESD (compared to HEE) on the one hand, refer much more to transformative learning (8.8% versus 1.8%), place-based learning (5.5% versus 2.4%), service-learning (4.2% versus 1.2%) and problem-based learning (9.1% versus 5.0%). On the other hand, in HEE (compared to HESD), authors more often refer to experiential learning (25.5% versus 14.8%), real-world learning (6.5% versus 2.9%) and coaching, mentoring or modelling (6.8% versus 0.7%).

TABLE 9
TEACHING-LEARNING APPROACHES IN HESD AND HEE

TEACHING LEARNING APPROACHES	HESD*		HEE*	
	N	%	N	%
Collaborative learning	95	21.0	60	17.8
Experiential learning	67	14.8	86	25.5
Problem-based learning	29	6.4	30	8.9
Learner-centred learning	29	6.4	26	7.7
Project-based learning	40	8.8	6	1.8
Transformative learning	13	2.9	22	6.5
Real-world learning	18	4.0	14	4.2
Reflective learning	25	5.5	8	2.4
Place-based learning	19	4.2	10	3.0
Active learning	3	0.7	23	6.8
Coaching, mentoring, modelling	19	4.2	4	1.2
Service-learning	16	3.5	4	1.2
Interdisciplinary learning	41	9.1	17	5.0
Traditional learning	13	2.9	7	2.1
Virtual learning	8	1.8	5	1.5
Transdisciplinary learning	7	1.5	3	0.9
Creative learning	4	0.9	5	1.5
Others	7	1.5	7	2.1
Total	453	100.0	337	100.0

* As 9 articles are classified as the interface of HEE and HESD, the sum of the total frequencies for HESD and HEE does not equal that of the whole sample.

3.4. *Interdisciplinarity and cooperation with external partners*

As interdisciplinary teaching and learning and cooperation with external partners are of particular interest for the CASE project, the implementation of these two aspects was coded separately (in addition to interdisciplinary, transdisciplinary and real-world learning as teaching-learning approaches mentioned by the authors themselves) (see Tables 10 and 11).

29.0% of the methods described work with both interdisciplinary classes and interdisciplinary teacher teams. In addition, in 20.8% of the cases, only students are mixed in respect to their discipline, while in 3.8% of the articles this is the case only for the teachers. In 8.2% of the articles, the authors make other references with respect to interdisciplinarity, e.g. by recommending it or by involving knowledge and methods from different disciplines in the curriculum and course design. In 38.3% of the articles, teaching and learning in HESD and HEE without any interdisciplinary aspects are described or analysed. In articles focussing on teaching

and learning in HESD, interdisciplinarity involves students and teachers more often, in comparison with articles on HEE (38.8% versus 17.1%), whereas many more teaching-learning approaches do not include any interdisciplinary aspects in HEE than in HESD (50.0% versus 31.6%).

TABLE 10
USE OF INTERDISCIPLINARITY

INTERDISCIPLINARITY	N	%
Students and teachers	52	28.4
Only students	37	20.2
Only teachers	8	4.4
Other	13	7.1
None	73	39.9
Total	183	100.0

Half the described teaching and learning methods in the sample include cooperation with external partners. In 8.2% of the articles, the authors recommend or intend to design a teaching-learning situation involving a partnership. A further 7.1% of the described teaching and learning was coded as «other» when the setting was open for cooperation, e.g. cooperation was initiated by the students themselves when interviewing experts in a market research project. Comparing articles on HESD and HEE shows different preferences for cooperation formats between the two fields: HESD generally uses fewer cooperation formats than does HEE (63.3% versus 71.1%). The preferred method is service-learning (8.2% in HESD versus 1.3% in HEE). HEE uses guest lectures to a great extent (30.3% in HEE versus 5.1% in HESD). However, many articles report a mixture of cooperation formats (27.6% in HESD and 18.4% in HEE).

TABLE 11
COOPERATION WITH EXTERNAL PARTNERS IN TEACHING AND LEARNING

COOPERATION WITH EXTERNAL PARTNER	N	%
Yes	93	50.8
None	62	33.9
Recommended or intended	15	8.2
Other	13	7.1
Total	183	100.0

Having a closer look at the collaboration partners reveals that most frequently the partners come from more than one area (22.4%) or from businesses only (17.5%). Less often, partners are communities (3.8%), the university and its campus (2.2%), non-governmental organisations (NGOs) (1.6%), schools (1.6%), or entrepreneurs (1.6%). 13.7% of the articles report other cooperation partners or generally recommend working with partners. The comparison between HESD and HEE reveals very different preferences for cooperation partners. Details regarding cooperation formats and partners are provided in Table 12 and 13.

TABLE 12
COOPERATION FORMATS IN TEACHING AND LEARNING WITH EXTERNAL PARTNERS

FORMAT OF TEACHING-LEARNING COOPERATION	N	%
Mixture	43	23.5
Guest lecture	30	16.4
Service-learning	9	4.9
Internship	4	2.2
Other (also includes recommendations)	34	18.6
None	63	34.4
Total	183	100.0

TABLE 13
PARTNERS OF COOPERATION

PARTNERS OF COOPERATION	TOTAL		HESD		EE	
	N	%	N	%	N	%
Mixture	41	22.4	26	26.5	15	19.7
Business	32	17.5	3	3.1	26	34.2
Community	7	3.8	7	7.1	0	0.0
University (campus)	4	2.2	4	4.1	0	0.0
NGO	3	1.6	0	0.0	2	2.6
School	3	1.6	3	3.1	0	0.0
Entrepreneurs	3	1.6	0	0.0	3	3.9
Other (also includes recommendations)	25	13.7	17	17.3	8	10.5
None	65	35.5	38	38.8	22	28.9
Total	183	100.0	98	100.0	76	100.0

3.5. Learning outcomes and competence frameworks

Concerning learning outcomes, many articles provide theoretical considerations of what can and should be learned with the presented teaching and learning (35.5%), followed by qualitative empirical results of learning outcomes (24.0%) (see Table 14). 16.4% of the articles provide a mixture of qualitative and quantitative analyses of learning outcomes. 13.7% of the articles provide quantitative analysis of learning outcomes. 10.4% of the articles do not report learning outcomes.

TABLE 14
TYPE OF LEARNING OUTCOMES

TYPE OF LEARNING OUTCOMES (LO'S)	N	%
Conceptual/theoretical thoughts on LO's	65	35.5
Qualitative empirical analysis on LO's	44	24.0
Mixture of qualitative and quantitative empirical analysis on LO's	30	16.4
Quantitative empirical analysis on LO's	25	13.7
None	19	10.4
Total	183	100.0

As there is a rich discussion about competence-orientation in higher education in general, but also specifically in the two fields of HESD and HEE, coding was also carried out on whether the authors refer to any competence frameworks or concepts in the theoretical background or in the specified learning outcomes of their article (see Table 15). Only 27.9% of the articles refer to a defined set of competencies or a competence framework. Some authors (6.8%) refer to general competence frameworks; most prominently to Bloom's (1956) taxonomy of cognitive skills or to general definitions of the competence concept, as encompassing knowledge, skills, attitudes, values and behaviour. Authors writing about teaching and learning in HESD preferably select and define their own sets of competencies (partly derived as an individual synthesis from other competence frameworks in [H]ESD). Most prominently HESD studies feature Wiek *et al.*'s (2011) set of sustainability competencies, followed by sustainability literacy (Parkin *et al.*, 2004), action competence (Jensen and Schnack, 2006; Mogensen and Schnack, 2010) and Rieckmann's (2012) set of competencies for ESD. In HEE, authors again prefer to select and define their own sets of competencies (partly derived as an individual synthesis from other competence frameworks in [H]EE) or they refer to different papers of Gibb (1993, 2002). Other competence frameworks for HESD (e.g. 'Gestaltungskompetenz' as defined by de Haan, 2006) or HEE (e.g. aspects of entrepreneurial mind-sets as defined by Fayolle and Gailly, 2008) are cited only by single articles. In both areas, but more often in HESD, few authors refer to political documents published by international or national organisation, e.g. UNESCO.

TABLE 15
 COMPETENCE FRAMEWORKS AUTHORS REFER TO

COMPETENCE FRAMEWORKS		N	%
General	Bloom's taxonomy of cognitive skills	6	3.2
	General definition of competence	4	2.1
	Other general competence frameworks	3	1.6
HESD	Authors' selection of competencies for ESD	7	3.7
	Wiek <i>et al.</i> 's sustainability competencies	5	2.6
	Parkin <i>et al.</i> 's sustainability literacy	4	2.1
	Schnack <i>et al.</i> 's action competence	4	2.1
	Political documents for ESD (UNESCO ...)	3	1.6
	Rieckmann's competencies for ESD	2	1.1
	Other competence frameworks for ESD	5	2.6
HEE	Authors' selection of competencies for EE	5	2.6
	Gibb's entrepreneurship skills	4	2.1
	Other competence frameworks for EE	5	2.6
Other	Political document for engineering education	1	0.5
None		132	69.5
Total		190	100.0

* The total number is more than the sample size as some articles refer to more than one competence framework.

4. DISCUSSION

The results of the systematic literature review allow a discussion of general trends in the two educational fields of HESD and HEE, evaluation of the body of knowledge on teaching and learning in HESD and HEE and identification of gaps, problems and inconsistencies regarding research in the two fields.

4.1. General trends in HESD and HEE

Two clear trends show up in the sample: First, authors from English speaking and European countries dominate the international literature on teaching and learning in HESD and HEE. This has already been observed by Barth and Rieckmann (2016) as well as by Karatzoglou (2013) in the field of HESD. Remarkably, no author from Latin America is present in the sample. Whether authors from Latin America do publish in journals not included in the two data bases used, or whether they do not publish on teaching and learning in these two areas, might be a question for further research. In this context, it is worth stressing that a clear limitation of the study is its focus only on articles published in English. Including articles published in Portuguese and Spanish, for instance, would probably make visible a much

stronger contribution of researchers from Latin America. Nevertheless, that the international scientific discourse is mainly dominated by the English language, has to be considered. Thus, although it would be important to include articles in further languages in future literature reviews, it remains true that a stronger participation of non-Western researchers in the HESD and HEE discourses is important (cf. Barth and Rieckmann, 2016).

Second, a strong growth in the number of published articles addressing teaching and learning in HESD and HEE can be observed. This trend has also been observed for research in HESD in general (Barth and Rieckmann, 2016). It is in line with the general steady increase of scientific publications, but may also mirror the development of two young academic disciplines and educational fields, that may have focussed on learning objectives and contents in the early stages, but then later became increasingly interested in approaches and methods of teaching and learning to give effective focus on the content and to achieve the learning objectives.

4.2. *The body of knowledge in HESD and HEE – and what they can learn from each other*

For the last twenty years, many contributions have been made in the two educational fields of HESD and HEE. The diversity of the authors concerning their disciplinary background seems to be a rich and fruitful resource. Different paradigms, ways of thinking, approaches and methods, stemming from all kind of disciplines linked to (higher education for) sustainable development and entrepreneurship allow for innovation in teaching and learning in HESD and HEE, resulting in a great variety of innovative and creative methods or course designs. These might serve as inspiration for other academics and practitioners. Many authors, being lecturers and researchers at the same time, have studied their own teaching experiences and have documented them well, and with detail, in the articles; thus disseminating and sharing them with the wider academic community. The huge amount of case studies in the sample, but also other paper types, report many details of teaching and learning experiences in HESD and HEE, so that readers get a clear understanding and helpful guidance on how a specific course design, a single teaching method or a general teaching-learning approach works and might be implemented. Again academics as well as practitioners can learn from these experiences.

Both educational fields recommend and use competence-oriented teaching-learning approaches. Principles and activities of active, learner-centred and reflective learning, recommended as the basic principles for developing competencies, are represented throughout the articles, although not always mentioned explicitly. In particular, the need for learning together (collaborative learning) and through experience (experiential learning) is underlined by the articles. These two teaching-learning approaches seem to be the most relevant in HESD and HEE, even more so, as other teaching-learning approaches also include notions of collaborative and

experiential learning (e.g. inter- and transdisciplinary learning, social learning, service-learning or project-based learning).

Furthermore, the literature review revealed that HESD and HEE integrate different disciplinary and stakeholder perspectives in the teaching and learning itself. More than half of the articles describe teaching and learning that involves interdisciplinary aspects as well as cooperation with external partners, thus opening teaching and learning settings in HESD and HEE to the world by integrating real-world problems and letting students apply their knowledge in real-life situations. Major differences emerged between HESD and HEE concerning the extent of cooperation, the cooperation format used and the external partners involved in the cooperation. While HESD should integrate cooperation with external partners more often in its teaching and learning, HEE should diversify the cooperation formats used and also the cooperation partners. In particular for sustainability-driven entrepreneurship, partners from various societal stakeholder groups may add value to the learning. The two educational fields may profit from an exchange in order to adapt cooperation formats to their educational field and to share contacts to different stakeholders in society.

4.3. *Gaps, problems and inconsistencies regarding research in HESD and HEE*

The systematic literature review reveals a gap regarding research papers addressing teaching and learning for sustainability-driven entrepreneurship – there is none in the sample. Overall, the overlap between HESD and HEE is quite small: Only nine articles were coded as relating equally to HESD and HEE, namely addressing ESD in business education. This confirms empirically Wyness *et al.*'s (2015) statement that the two discourses are quite separate.

Although a thorough and systematic coding strategy has been applied, sometimes coding was quite difficult, because the ways in which the teaching-learning approaches and the related learning outcomes are reported and assessed are very diverse. Idiosyncratic designations, the inaccurate use of pedagogical terms or ill-defined concepts emerged as a problem for the research on teaching and learning in HESD and HEE. This applies especially for teaching-learning approaches and learning outcomes in terms of competencies. This confusion of terms might partly be due to the disciplinary variety of academics contributing to the research body, as they might not always be that familiar with the pedagogical concepts and the educational literature.

Concerning the paper types, it became apparent that case studies dominate, while in less than a quarter of all articles, empirical data is used. Case studies can offer important, context-sensitive insights that might not be achieved with other approaches, but therefore they need to meet the necessary quality standards (Kyburz-Graber, 2016). The problems around this sort of research, especially in environmental education and ESD have been discussed from early times (Corcoran *et al.*, 2004) and strong calls for more rigour and comparative research have been raised (Barth 2015; Barth and Thomas, 2012).

Two further gaps or inconsistencies can be observed in the sample. First, in many papers there is neither a coherent link between teaching-learning approaches and learning outcomes nor between learning outcomes and competence frameworks. Although the literature review shows that the teaching-learning approaches that are currently recommended as best-practice are competence-oriented, connections between teaching-learning approaches on the one hand and competence-based learning outcomes on the other hand are rarely made explicit. The results show that very little research on teaching and learning is linked to learning outcomes and the debate of competencies; for example, neither learning outcomes nor competencies are frequent key words. While there is notable qualitative empirical research on learning outcomes, quantitative empirical research plays only a minor role.

Secondly, authors seem to arbitrarily choose learning outcomes intended to be achieved by a specific teaching-learning approach. When learning outcomes are defined or measured, they are mostly described on a level of dispositions or sub-competencies, not of whole competencies. This might be due to the scope of the teaching and learning described, since most articles present courses or single teaching and learning activities and not a whole study programme. A whole study programme might be perceived as more suitable for developing comprehensive sustainability and entrepreneurial competencies, compared to a specific method or a single course. Nevertheless, it would be useful to have an idea of which single courses or methods specifically contribute to developing a particular, more comprehensive competence.

5. CONCLUSION

In conclusion, the results of this literature review show the huge interest in and abundance of studies in competence-based teaching and learning in the HESD and HEE academic communities. The results form a basis for further structuring the debate on approaches and methods of teaching and learning in HESD and HEE and for identifying future research needs. In particular, more emphasis should be given to the following three areas in future research:

- *The research on teaching-learning approaches and methods in HESD and HEE is characterised by a Western dominance:* There is a clear need for more research in this area from non-Western researchers as well as for more research in non-Western countries. Conducting more research in the – so far underrepresented – non-Western regions will help to improve understanding of the relevance of different contexts, as well as general drivers and barriers for teaching and learning in HESD and HEE.
- *HESD and HEE are still very separate discourses and there is very little research on higher education for sustainability-driven entrepreneurship:* More research on teaching-learning approaches for developing competencies in

the area of sustainability-driven entrepreneurship is needed. The CASE project is already contributing to closing this research gap and to facilitating new conversations and academic debate between the two quite separate discourses and communities of HESD and HEE.

- *The research on teaching-learning approaches and methods in HESD and HEE is dominated by case studies:* There is still more empirical, and comparative, research to be done, to contribute to the clarification of the linkages between teaching and learning on the one hand and actual learning outcomes and competence development on the other hand.

The literature review helps to provide better understanding and to systematise the academic discourse on teaching and learning in HESD and HEE. It illustrates the breadth of existing and possible future research directions. In addition, the results provide insights into good teaching and learning practices. This information can be used for inspiration in designing or modifying courses and whole study programmes in the area of sustainable development and entrepreneurship, such as the «European Master's Programme on Sustainability-driven Entrepreneurship» which is developed in the CASE project.

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