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Development of a holistic method for assessing success of renewable energy study programs

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ABSTRACT

Quality monitoring and success assessment of academic study programs is beneficial to satisfy the needs of students, lecturers and employers of the graduates. However, the diversity of processes involved (e.g. coaching, competence development or further training for lecturers) among the main actors (educational institutions, learners and professionals) make quality assessment on study program level a complex and challenging task. The integration of different stakeholders' views onto a quality assessment mapping is desirable for allowing a holistic understanding on the main success factors of a study program.

In this paper a methodology, originally proposed to measure success of the implementation of Solar Home Systems amongst various stakeholders is applied to develop a first approach for assessing quality and success of Renewable Energy (RE) higher education programs.

When summarizing this paper by focusing on success factors, contrastive views get apparent: lecturers highlight *lecturers' characteristics*, students refer to *hands on experience* and experts spot *students' education* (in terms of the curriculum, state of the art course content and course assignments) as the most important success factors in study programs.

1. Introduction: the necessity of a holistic assessment framework

Quality monitoring and success assessment of academic study programs is beneficial to satisfy the needs of students, lecturers and future employers of the graduates. Extensive literature exists on the definition of "academic success" and its operationalization for assess-ment (Jacobi, 1991, Dai and Song, 2016, York et al., 2015). Definitions of the term are often broad and complex, reflecting the complexity of processes and stakeholders involved (York et al., 2015). In this paper, the theoretically grounded definition developed by York et al. (2015) is taken as a starting point for developing a conceptual frame for understanding success drivers for higher education programs (HEP) in the field of Renewable Energy (RE).

Six key components are comprised in their definition of "academic success": academic achievement, satisfaction, acquisition of skills and competencies, persistence, attainment of learning objectives and career success (York et al., 2015). This definition, as most of others present in literature, is mainly student-centred: success is defined with respect to the student's performance, achievement and development during his or her university studies. Students are indeed key actors in the context of "academic success". However, they are not the only ones involved when discussing the success of study programs. So is, for instance, career success often defined in terms of job offers or salary. Nevertheless, these indicators say little about the performance of a RE graduate in particular tasks, which might be of utmost importance in that professional field, such as problem solving or facing complex systems solutions. In addition, precisely a graduate's performance on these tasks would define the "success" of a university program from an employer's perspective.

The challenge in this context is to develop a multi-perspective method for understanding the most relevant outcomes and factors influencing HEPs' success and quality in the RE field. Such a method would enable key-stakeholders involved to get feedback on paths leading to success or failure and to understand main driving success factors of an RE educational program.

In this paper a methodology, originally proposed to measure success of the implementation of Solar Home Systems (SHS) amongst various stakeholders is applied to develop a first approach for assessing quality and success of RE higher education programs (Holtorf, 2016). To ensure a multi-perspective approach, students, lecturers (faculty) and professional experts have been considered as main stakeholder groups involved.

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Nomenclature

Abbreviations

EP	Engineering Physics https://www.uni-oldenburg.de/en/ep/
FAHS	Fachausschuss Hochschule (expert committee higher education of the German Solar Energy Association)
HE	Higher Education (Master studies or beyond)
HEP	Higher Education Program
m. & p.	methods & problem
PPRE	Postgraduate Programme Renewable Energy www.ppre.de
RE/RET	Renewable Energy/Renewable Energy Technology
SEM	Sustainability, Economics and Management https://www.uni-oldenburg.de/en/sem/
SSG	Self-Set Goal
UOL	University of Oldenburg, https://www.uni-oldenburg.de/

2. Methodology

Three different stakeholder groups were addressed: educational institutions, learners and professionals. Since the aim of our study was to get a first holistic mapping of success factors and expected program outcomes from the stakeholders, guidance based surveys were used as a research approach. The qualitative methods of data collection can be used on an explo-rative manner, allowing the generation of first hypothesis on a research topic. Here the infor-mation was sought by workshops with stakeholders and by questionnaires sent to the research participants, refer to Fig. 1.

Guided interviews were conducted on an individual basis for the professionals' stakeholder group by means of an open questionnaire. 28 experts both from companies and the academia working in the RE field were addressed. The students and lecturers were approached by means of guided interviews in separate workshops. Students from the EP, PPRE and SEM programs of the University of Oldenburg (UOL) were addressed. The results of this group of respondents is prone to a selection bias as solely the views of students of the UOL was sought. Interviewed lecturers come from 21 universities in German-speaking countries offering RE programs. They are engaged in the FAHS. 30 out of the 120 members of FAHS contributed to this paper. (Brudler and Holtorf, 2017).

The guided interview addressed the following topics:

- Self-set goals regarding the graduates and the program
- Related importance of those goals
- Success factors influencing the identified goals
- Possible measurement criteria and scales for the achievement of the self-set goals.

3. Results

The following sections present the results of the participants' answers.

3.1. Self-set goals

Fig. 2a–c shows the self-set goals of the stakeholder groups *junior experts* (less than 3 years of professional experience) (Fig. 2a), *senior*

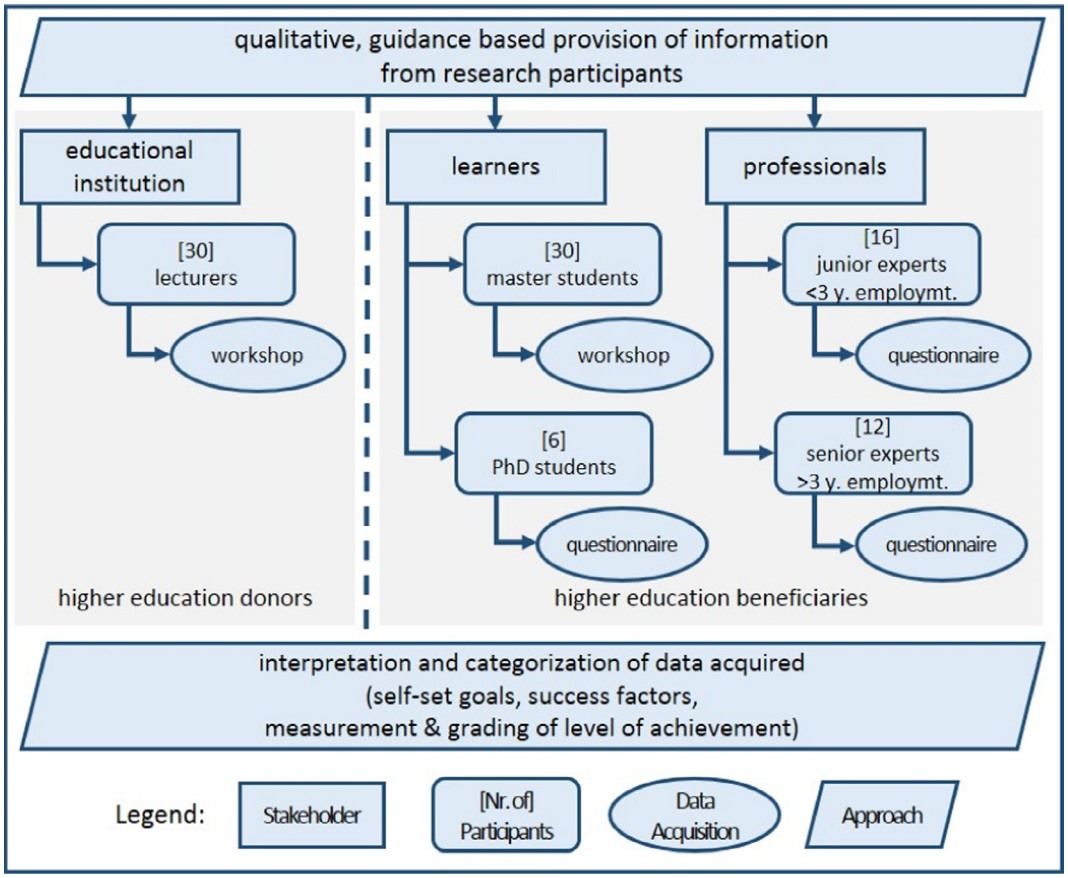

Fig. 1. Methodology of the research.