Handbook of Research on Transnational Higher Education

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Chapter 15
Quality Assurance in Transnational Education Management:
The Developmental "Global Studies" Curriculum

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ABSTRACT

This chapter deals with quality assessment for interdisciplinary university curricula. As a case study, it analyses the recently established "Global Studies" (GS) developmental curriculum at Graz University, Austria. After reviewing literature on concepts of quality for curricula, key concepts for multi-disciplinarity, inter-disciplinarity, and trans-disciplinarity, approaches for their monitoring, and necessary ingredients for multi-paradigmatic inputs, processes, and outputs, this chapter applies these criteria to the ethically and globalization-oriented curriculum Global Studies at Graz University, Austria. A practical set of criteria assessing quality in curricula and in courses is identified, a list of assessment exercises that have been performed so far is provided, and assessment of academic performance and suggestions for future improvements are given. Recommendations focus on the implementation of inter-paradigmatic mutual understanding and include setting up a regular, peer-oriented discourse among all stakeholders and founders of the curriculum and the inclusion of expertise into the curricula commission. All such concrete measures shall underpin the key capability of inter-paradigmatic studies, namely to see complex phenomena as perceived by other stakeholders, friend or foe.

INTRODUCTION

The worldwide integration of higher education, curricula and their quality criteria, as well as practice in international projects and experiences in academic education didactics, suggest the necessity for transnational collaboration among universities such as clarification of success criteria and subsequently possibly even joint degrees. Higher education management involves governance, self-responsibility and courageous steps in quality assessment that may also be inspired by cutting-edge cases of already implemented developmental curricula that target ethical questions of globalization.

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This paper has a double target:

1. Explain and analyze the necessity for Quality Assessment (QA) of curricula, especially in so-called trans-disciplinary, inter-professional and multi-paradigmatic cases such as developmental and Global Studies (GS); followed by assessment strategies proposed in literature.
2. Undertake to measure practice of GS against (1) GS curriculum, (2) international practice, (3) feedback received to date.

As a basis for writing and contextualizing, this paper dwells on both

1. A theoretical literature analysis that scanned ~1000 peer reviewed articles (making use of the Scopus literature reference system) of which ~100 were taken into consideration and ~10 considered as very suitable (among which are Aboelela et al. 2007, Brennan & Shah 2000, Lantis 2004, Fischer et al. 2011, Lattuca et al. 2004, McFadden et al. 2011, Peterson & Wittstrom 2011, Ried 2011, Spelt et al. 2009, Wagner et al. 2011)[1].
2. The concrete involvement and practical experience of the author, in co-founding and implementing the GS curriculum at Graz University and lecturing in practically all courses established specifically for GS, as well as in other inter-paradigmatic curricula.

WHY QA FOR CURRICULA?

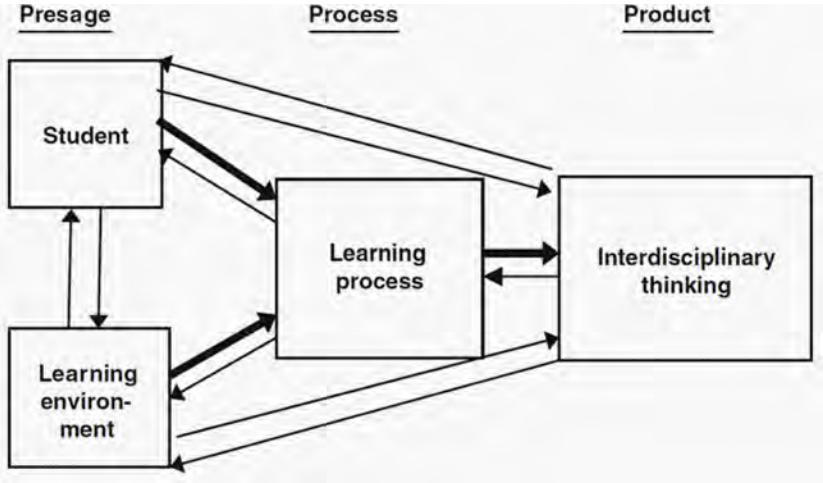
The importance of Quality Assessment (QA) during curricula development and subsequent regular quality improvement is widely debated and confirmed in literature for all modes of education (Bernhard 2011a, 2011b; 2012a, 2012b), on both national and supranational levels. On OECD level, various initiatives attempt to strengthen cross-country compatibility of education management and QA—e.g., IHME (2012), AHELO (2012), IHERD (2012)—often promoted via large international conferences.

Reeves et al. (2012) and Vilgats and Heidmets (2011) provide an overview of key developments in the past three decades. In particular, medical and health care studies already have a long tradition in QA, for which Simmons and Wagner (2009) find that "although inter-professional education and continuing inter-professional education are becoming established activities…, assessment of learners continues to be limited." The present paper, however, includes such initiatives of learner-centered assessment, e.g. undertaken by Bader and Zotter (2012).

The necessary broad scope of assessment for inter-professional education and scholarship is highlighted by Reeves (2009) who names seven key trends leading to higher quality: "conceptual clarity, quality, safety, technology, assessment of learning, faculty development, and theory". Evidently, QA is more than merely counting the impact points of lecturers or the political honors of administrators. Grossman et al. (2001) propose a collaborative model of teacher community in the workplace based on mutual respect and professional criteria-orientation: such is ultimately demanded here also, both as a general recommendation and for the case study of GS after literature and bibliometric analyses.

The mentioned extensive literature analysis of hundreds of peer-reviewed papers brought the review framework for interdisciplinary and trans - disciplinary curricula taken from Biggs (1993, 2003), and cited in Spelt et al., 2009 (Figure 1) that embraces input, process and output (from left to right) as suggested by practically all the in-depth papers analyzed. For quality learning at university, Biggs (2003) "analyzes the nature of good teaching and provides a framework for reflective practice". He" proposes the 'constructive alignment' model whereby the curriculum,

Figure 1. Conceptual review framework for interdisciplinary curricula, also applicable to transdisciplinary and multi-paradigmatic curricula. Source: Spelt et al. (2009, p. 368), adapted from Biggs (2003), compatible with Brennan and Shah (2000, p. 335), and closely resembling the working model suggested by Wagner et al. (2011, p. 17).



teaching method assessment procedures and general institutional environment should all be in alignment with the societally desired output to promote deep learning.

Inspiringly, Figure 1 simultaneously combines the perspectives and perceptions from three different roles of co-citizens: studying, teaching/training, and working in practice (from left to right). Their collective views on higher education provide the full picture.

What is Quality in Curricula and in Higher Education?

Necessity and Effect of QA in Higher Education

A study by Brennan and Shah (2000) on QA and institutional change based on experiences from 14 countries "presents a conceptual model of institutional change in higher education implied by quality management.…" The programme for Institutional Management in Higher Education (IMHE) of the Organization for Economic Co-Operation and Development (OECD) has sponsored a project entitled 'Quality Management, Quality Assessment, and the Decision-Making Process' that considers the impact of quality assessment in terms of

- Rewards/Incentives
- Policies/Structures
- Cultures of institutions

Evidently, any successful quality management approach in higher education should not neglect to follow *all three* paths; especially the latter two institutional and corporate culture ones. A refreshingly sober and realistic outlook should provide a promising start:

Drawing on the work of the sociologist Max Weber, Finch (1997: 152-153) has drawn a distinction between 'naked power' and 'legitimate authority' with regard to decision-making in higher education. (…) What was necessary was the conversion of naked power into legitimate authority. (…) Legitimacy in higher education is commonly thought

to be achieved through adherence to values and standards which are a part of the cultures of academic disciplines (Finch 1997), i.e. a reasonably clear collective understanding between academics in a given discipline that a particular piece of work counts as good and something else as less good. (…) Thus, for Finch, the role of peer review is central to the achievement of legitimacy for quality assessment processes and the decisions reached on the basis of them. (Brennan & Shah 2000: 347).

Brennan et al. (1994) refers:

To the 'moral' authority of peers in contrast to the 'bureaucratic' authority of quality [i.e. administrative] bodies. This is why virtually all quality bodies make peer review a central part of their assessment processes. (…) We conclude, therefore, that the introduction of external quality assessment systems in most European countries, as well as in many other parts of the world, over the past decade has been associated with a shift in the distribution of power within higher education.

The author of the present paper is very keen to emphasize the importance of peer review and a spirit of partnership, whilst at the same time being oriented on previously jointly agreed and common criteria for academic quality as well as didactics and pedagogy. This aspect of power relation analysis (Fischer & Hödl 2007) will be addressed during bibliographic analysis (see section Applying bibliographic criteria to GS).

In the same vein, Rowlands (2012) diagnoses the shifting roles and self-conceptions of university senates more towards peer review and audit-driven accountability mechanisms. On the other hand, Harvey and Williams (2010) critically analyze fifteen years of (traditional) QA in higher education: internal quality assurance with assessments of the impact of quality assurance brought improvements in learning and teaching to a varying degree:

Quality assurance has become an international concern and procedures have become increasingly standardized across national boundaries. Significantly, the consumerist approach to higher education quality that is driven by governments and senior management, has not met with enthusiasm (…) and there appears to be a strong commitment to autonomy and academic freedom. However, (…) academia is prone to inertia and compliant indifference. Ultimately, (…) it is still not clear that, even after 15 years, quality assurance systems have really enhanced higher education.

As one possible approach in this dilemma, Stensaker (2003) highlights the *structural importance of organizational change*, entitled "Trance, Transparency, and Transformation: The impact of external quality monitoring on higher education". He discusses

The impact of External Quality Monitoring (EQM) on higher education, and identifies areas in higher education where changes have taken place as a result of such external initiatives. Of special interest is the question whether quality improvement actually is the result of the many EQM systems implemented. By interpreting available data an ambiguous answer is provided, highlighting some of the typical side-effects of current EQM systems at the institutional level. The paper argues that lack of effects directly related to quality improvement should not be conceived as an EQM design error alone but as a misconception of how organizational change actually takes place. In the conclusion, it is claimed that a more dynamic view on how organizations change, highlighting the responsibility of the institutional leadership as 'translators of meaning', may contribute to a more useful process.

Carr et al. (2005) investigate the influence of external quality audits (EQA) on university performance and find that "evaluations have a stronger foundation when the combined effects

of university governance, management initiatives and government initiatives are examined together with EQA."

QA for Global Developmental Studies: Discourse as Procedural Strategy for Quality

Curricula on global and developmental studies (Schuurman 1993; Bernstein 1973, Fischer2009) necessitate especially high levels of both disciplinary and interdisciplinary academic quality (Ahamer 2011, 2012; Ahamer et al. 2011). Given their complex fact base and epistemological landscape, such curricula require a wider range of quality criteria than do curricula of a purely disciplinary nature, given the inapplicability of any concept of "absolute truth" in multi-stakeholder and multi-perspectivistic issues in the framework of global change. Hence, global developmental studies constitute the cutting edge of academia in this respect.

A very elucidating paper on ethics and foreign policy was written by an American educator who had students discuss contemporary issues of conflict resolution (e.g. Kosovo, Iraq) while using structured debate with preparative essay writing (Lantis 2004). Gorton and Havercroft (2012) successfully use historical simulations and Socratic debates to teach political theories. Haller and Ressler (2006) studied the meanings and interrelationships of national and European identity as well as cultural identities in the face of globalization (Haller & Ressler, 2007). Osborne (2005) argues that the use of debate in a core world history course can foster both authentic learning in the discipline and progress toward intellectual and ethical maturity. In fact, academic culture in general is a culture of argumentation, and democracies are societies in which debate is central. Yet such a criteria-based culture of argumentation and peer review might be initially alien to most students and even lecturers who have grown up in a culture of personal loyalties.

Thus, any QA has to take the dialogic element of debate and discourse into account. Web based discourse in GS is described by (Ahamer 2012).

As a consequence, the concept of quality in higher education is shifted from "suitable content" (i.e. truths that can be learned) towards "suitable processes" and constructed consensus (Ahamer 2005, 2006) in multi-stakeholder issues such as global development. A didactic approach using dialogic, debate-oriented, and collaborative learning and inquiry (Becher & Trowler, 2001) shows more promise than in a purely disciplinary science.

Debate as an instrument (Doody & Condon 2012) and the power of in-class debates leads stakeholders to change their roles (Kennedy 2009). Omelicheva & Avdeyeva (2008) tested the effectiveness of traditional versus active learning methods of debate for teaching graduate students (Moody-Corbett 1996).Koklanaris et al. (2008) propose debate preparation and participation as an active, effective learning tool; Gokhale (1995) finds that collaborative learning enhances critical thinking – even in technological education. Crone (1997) used panel debates to increase student involvement in an introductory sociology class. Healey (2012), convinced by the power of debate, reflects on the potential of debates for engaging students in critical thinking about controversial geographical topics. Rocca (2010) provides an extended literature review on student participation in the college classroom.

Personal cooperation is an essential strategy: Wuchty et al. (2007) and Grossmann et al. (2001) highlight the increasing dominance of teams in the production of knowledge. Vanasupa et al. (2012) reflect on cases of faculty members' failure to collaborate as the main challenges in trans-disciplinary projects. Baba et al. (2004) studies the efficacy of globally distributed teams as vehicles for knowledge sharing. Cant and Kulik (2009) emphasized the necessary targets and ethics in university teaching when developing and implementing an ethical decision-making framework for an integrated business curriculum.

For peace education and international economics, Kumpfmüller (2007, 2009) utilizes decades of professional experience in team building, continuing inter-professional education and andragogy and, after consistently excellent student feedback, was nominated by GS students for the university's lecturer prize recently (GS site 2010).

Structural Strategies for Quality in Interdisciplinary Curricula

Interdisciplinary and intercultural education needs structural and organizational transformation strategies because traditionally discipline-oriented hierarchies are not always appropriate to cope with the issues of globalization. Braun & Schubert (2007) surveyed the growth of research on inter- and multi-disciplinarity within scientific and social science papers. Spelt et al. (2009), in an intriguing paper, systematically reviewed teaching and learning in interdisciplinary higher education.

Lattuca et al. (2012) identified "eight dimensions of interdisciplinary competence that emerged from [their] extensive literature review:

1. Awareness of disciplinarity
2. Appreciation of disciplinary perspectives
3. Appreciation of non-disciplinary perspectives
4. Recognition of disciplinary limitations
5. Interdisciplinary evaluation
6. Ability to find common ground
7. Reflexivity
8. Integrative skill."

Lattuca et al. (2004: 35) ask if inter-disciplinarity promotes learning in higher education. "Constructing meaning in the classroom," they argued, "means developing multiple perspectives and demonstrated young adults' increasing capacity to contend with and choose among multiple perspectives." A very practical example, comparable with the author's edited reports on practicals in environmental systems science (USW 2012; Ahamer 2005), is that of Lattuca et al. (2004: 36), with their report on an interdisciplinary lecturer:

He presents a broad set of ideas across various disciplines and fields. During the first week of the course, he provided an overview of ecosystems and introduced questions about human nature and culture. In the next week, the discussion turned to classical economic concepts, like markets, and how these impact on the environment. Once that background was laid, the class considered problems like energy use and alternative energy, pollution of water and air, agriculture, and food supplies. The focus was on quantitative analysis and technical issues, which the instructor juxtaposed against the philosophical foundations laid in the first week of the course. In the next section of the course, students scrutinized developed and developing nations and discussed issues like sustainable development, industrialization, alternatives to industrialization, and demography. Finally, the course moved to an examination of politics, geopolitics, and policy.

The questions proposed (Lattuca et al. 2004: 36)"focus on how interdisciplinary courses and the instruction practiced by instructors in these courses might (a) forge connections to students' prior knowledge and experience; (b) assist students in developing complex understandings in particular subject areas; (c) promote the development of sophisticated views of knowledge and learning; (d) influence thinking skills; (e) build students' capacity to recognize, evaluate, and use differing (multiple) perspectives; (f) engage student interest and increase motivation; and (g) enact constructivist and active learning strategies."

Interdisciplinary strategies act as transformative change in higher education (Holley 2009). For successful reorganization, she poses "two research questions: 1) For this subset of inter-paradigmatic curricula, what change strategies are utilized by administrators to support interdisciplinary work

on campus? 2) To what extent does the effort to facilitate interdisciplinary change extend across the institution?" and provides a table with answers for the following strategies (p. 337): Senior administrative support, collaborative leadership, flexible vision, faculty/staff development, and visible action.

Earlier examples of administrative reorganization at Graz University include the concept of the "interfaculty basic module" (Ressler 2007) and the successful generation of an interfaculty curriculum "Environmental Systems Sciences" (USW 2012) a decade ago; also the developmental curriculum "International Development (IE 2012; Fischer & Hödl 2007) at Vienna University. Organizational strengthening was also provided by a joint position paper on GS (2012).

Qualities in Inter-Disciplinarity

Even if it may not be necessary to consider interdisciplinarity as a target in itself, the fundamental argument is that reality as such is not limited to any of the disciplinary lenses institutionalized at universities and hence needs the critical evaluation of expert opinions (i.e. of such opinions that consider themselves to have sufficient expertise). Real-life problems are ill-structured problems without single clear answers (Lattuca et al., 2004, p. 33) but demand multiple and balancing paradigms for understanding. The more the learning paradigm advances from behaviorist to cognitive and constructivist (Ahamer, 2010), the more self-responsible learning strategies become appropriate (Lattuca et al., 2004: 35):

Reflecting on 25 years of research on college students' epistemological beliefs, Michael Paulsen and Charles Wells (1998: 367) noted that studies have consistently found that 'as students advance in their coursework and experience other aspects of the academic environment over the years of college (and graduate school), they develop more sophisticated epistemological beliefs'. Most studies of epistemological development owe a debt to William Perry (1968) who theorized that in late adolescence individuals move through several different views of knowledge; they progress from simplistic views (things are right or wrong, good or bad, true or false; knowledge comes from authorities) to multifaceted ones (there are multiple opinions and perspectives in the world).

Definitions for Varying Degrees of Inter-Disciplinarity

All too often a curriculum is called interdisciplinary when it is actually multi-disciplinary: Multiple perspectives are presented without any support for the integration of disciplinary knowledge throughout the curriculum.… In addition, curricula that aim to develop interdisciplinary thinking on a broad scale are likely to experience more difficulties than curricula that aim to develop interdisciplinary thinking on a narrow scale" (Spelt et al. 2009: 366).

Motivated by the above introduction that clearly highlights the confusion of concepts, and given the strategic importance of inter-disciplinarity that has long since gained credibility in science, we adopt suitable definitions, concepts and implementations of inter-disciplinarity in literature and practice. What is inter-disciplinarity? First is presented a clear definition of the three key concepts in growing degree of integration (Table 1).

According to Klein (2008) and Wagner et al. (2011: 15), this "most widely used schema for defining interdisciplinary research (IDR) (i.e. the three definitions in Table 1: multidisciplinary, interdisciplinary, trans-disciplinary) derives from a typology presented at the first international conference on interdisciplinary research and

Table 1. Definitions of key terms used in most literature: multi-, inter-, trans-disciplinarity. Sources: Wagner et al. (2011, p. 16) and Stokols et al. (2003), adapted.

Multi-	disciplinary approaches juxtapose disciplinary/professional perspectives, adding breadth and available knowledge, information, and methods. They speak as separate voices, in encyclopedic alignment, an ad hoc mix, or a mélange. Disciplinary elements retain their original identity. In short, the multidisciplinary research product is no more and no less than the simple sum of its parts
Inter-	disciplinary approaches integrate separate disciplinary data, methods, tools, concepts, and theories in order to create a holistic view or common understanding of a complex issue, question, or problem. The critical indicators of interdisciplinarity in research include evidence that the integrative synthesis is different from, and greater than, the sum of its parts.
Trans-	disciplinary approaches are comprehensive frameworks that transcend the narrow scope of disciplinary worldviews through an overarching synthesis. More recently, the term has also connoted a new mode of knowledge production that draws on expertise from a wider range of organizations, and collaborative partnerships for (social, economic, environmental) sustainability that integrate research from different disciplines with the knowledge of stakeholders in society. Here too, the transdisciplinary product is greater than the sum of its parts, though the scope of the overall effort is more comprehensive and the parts may be more diverse.

teaching in 1970." These definitions encompass a new way of knowing that grows out of shifts in:

- Epistemics
- Institutional structure
- Culture

For Klein (1996), inter-disciplinarity is "notable for conflicting meaning". The author looks back on decades of tedious university experiences that indeed corroborate such theorizing.

Table 2 splits up single characteristics for the above three degrees of integration. It includes in the 3rd column the importance of the "paradigm" (i.e. thinking model) being utilized; the 4th column hints towards a spectrum of the social behavior of scientists that might range from using the same coffee machine to actually working together, and the relevance of the 5th column will become apparent when interpreting bibliometric results in section Applying bibliographic criteria to GS. The importance of true "translation" of meaning (Wolf 2011) is referred to in the last grid cell below right.

Table 2. Characteristics of multidisciplinary, interdisciplinary, and transdisciplinary research. Source: Aboelela et al. (2007, p. 340).

	Participants/ Discipline	**Problem Definition**	**Research Style**	**Presentation of Findings**
Multidisciplinary	Two or more disciplines	Same question but different paradigm *or* different but related questions	"Parallel play" by individuals	*Separate* publications by participants from each discipline
Interdisciplinary	Two or more distinct academic fields	Described/defined in language of at least two fields, using *multiple models* or intersecting models	Drawn from more than one, with *multiple* data sources and varying analysis of same data	*Shared* publications, with language intelligible to all involved fields
Transdisciplinary	Two or more distinct academic fields	Stated in *new* language or *theory* that is *broader than any one discipline*	Fully *synthesized* methods, may result in new field	Shared publications, probably using at least some new language developed for *translation* across traditional lines

In Which Sectors Inter-Disciplinarity Emerges First: An Evolutionist View

When searching for consistent and pioneering analysis of inter-disciplinarity, clinical and health sciences assume a leading role (Larson et al. 2011; Gebbie et al. 2008; Peterson and Wittstrom 2011; Ried 2011; McFadden et al. 2011; Kurz 2003). A reason for this observation might of course be a high inclination (or rather pressure) to be innovative in this cutting-edge sector (having the highest impact journals when measuring by sheer ISI impact factors).Also, the leading role of the economic sector "medical and other health services" exhibits an ever increasing GDP share in all world regions, as displayed by the author's Global Change Data Base GCDB (Ahamer 2001; UNSTAT 2003). Figure 2 at top shows time series for the growing share of GDP generated by the medical sectors in eleven world regions.

The GCDB analyzes graphically the global techno-socio-economic trends and (to a certain degree) supports the impression that different regions might be on a similar path during economic evolution. From this perspective, evolutionary leaders are the sectors most prone to inter-disciplinarity, succeeding through high paradigmatic and epistemological interconnectedness (in Ancient Greek language: ἐπιστήμη = episteme = understanding).

Similarly, the economic sector of educational and teaching services shows an increasing trend in its contribution to overall GDP in the economies of all regions (Figure 2 at right).

Whereas in Figure 2 the GDP shares have been displayed as time series for the eleven world regions defined for the IPCC reports and the Global Energy Assessment (GEA 2012; Ahamer 2013),Figure 3 shows such economic sectors as a function of GDP/capita. At left in Figure 3: such a swarm of countries apparently moving in similar direction indicates that all countries in the world are increasing their efforts to provide community-related, social, and personal services, including the subsectors of medical and educational services mentioned above. At right in Figure 3: framing this service sector within all sectors of the economy shows that these community, social, and personal services grow fastest (together with financial and similar sectors in yellow); this impression is corroborated further when displaying not the shares, but the *growth rates* of these shares in Figure 4. The author's underlying concept of "blossoming evolution" is further explained in Ahamer (2008); countries are considered to move from left to right on the horizontal axes during economic evolution.

To sum up, the contribution of the health sector to overall economic output is continuously growing in all world countries and regions – as does that of the educational sector. As shown in Figure 4 at right, the growth rate of these sectors is highest in already advanced economies which can be interpreted as these activities having a high potential for further (not only economic but presumably also epistemological) strengthening of civilizational achievements and being likely to employ cutting-edge paradigms such as trans-disciplinary paradigms.

Cases of Interdisciplinary Collaboration from Health Education and Other Branches

Evidently, according to literature interdisciplinary cooperation is highly necessary among various health and medical disciplines. Larson et al. (2011) build interdisciplinary research models: A didactic course prepares interdisciplinary scholars and their faculty for clinical science. Aboelela et al. (2007: 336)"reviewed 14 definitions of inter-disciplinarity, the characteristics of 42 interdisciplinary research publications from multiple fields of study" employing divergent paradigms of interdisciplinary research, positivist vs. constructivist. Pharo and Bridle (2012: 78) ask if "interdisciplinarity exists behind the façade of traditional disciplines" and require that "inter-

Figure 2. Time series for share of medical, dental, other health, and veterinary services (top) and educational services (bottom), two out of the approximately 40 sectors of the UN statistical data series (UNSTAT, 2003). Data incompleteness for recent years in several countries is responsible for the only seemingly decreasing trend at the right end of the curves. Source: Global Change Data Base GCDB, Ahamer (2001).

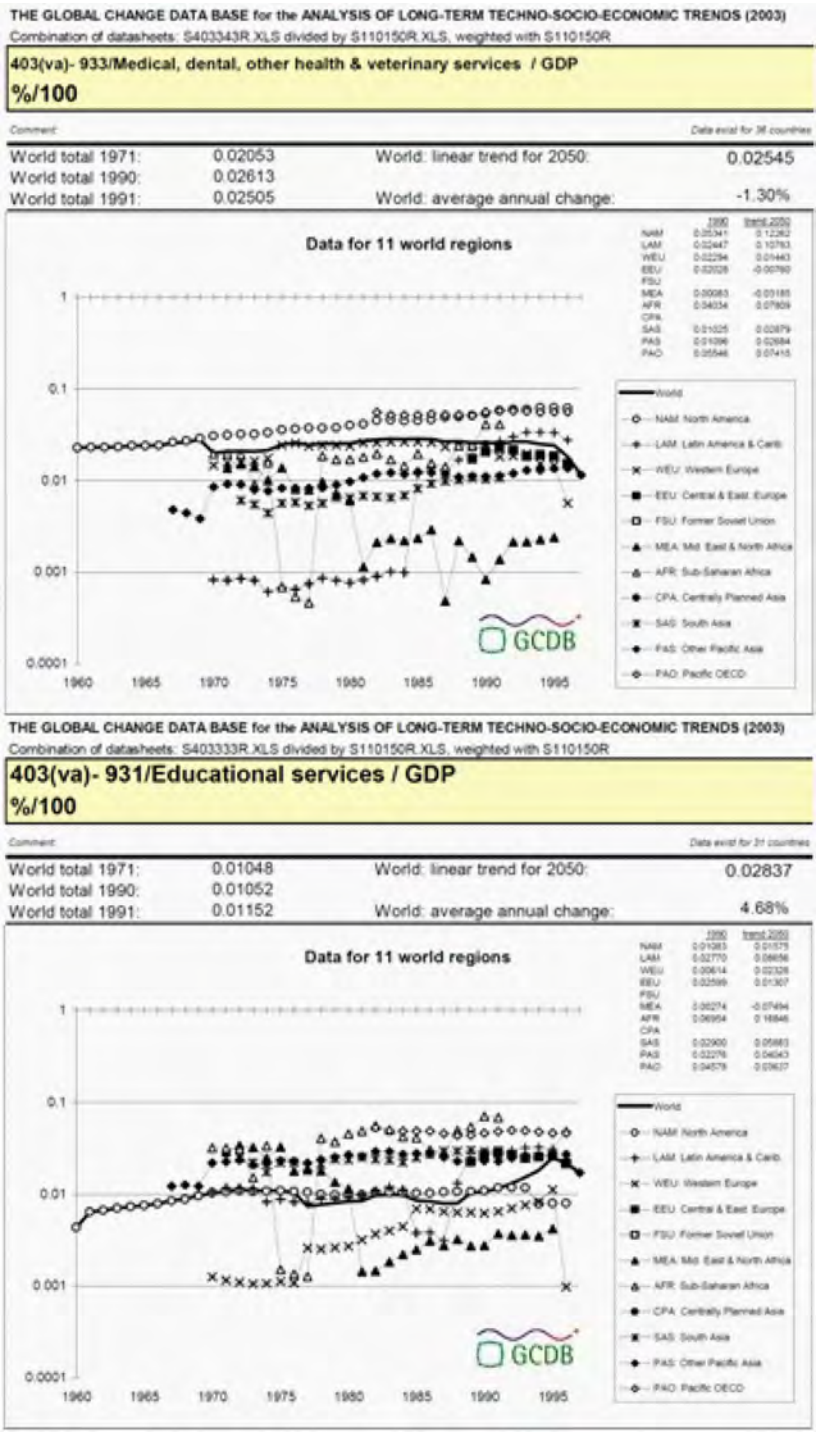


Figure 3. Display of analogous GDP shares for "community, social, and personal services" as a function of the countries' GDP/capita (a proxy for economic development). At left: for all single ~200 countries, at right for eleven world regions in pink, contrasted with the shares for the eight other economic sectors (other colors).GDP/capita values range from 10$/year at far left until 100,000$/year at far right on the horizontal axis.

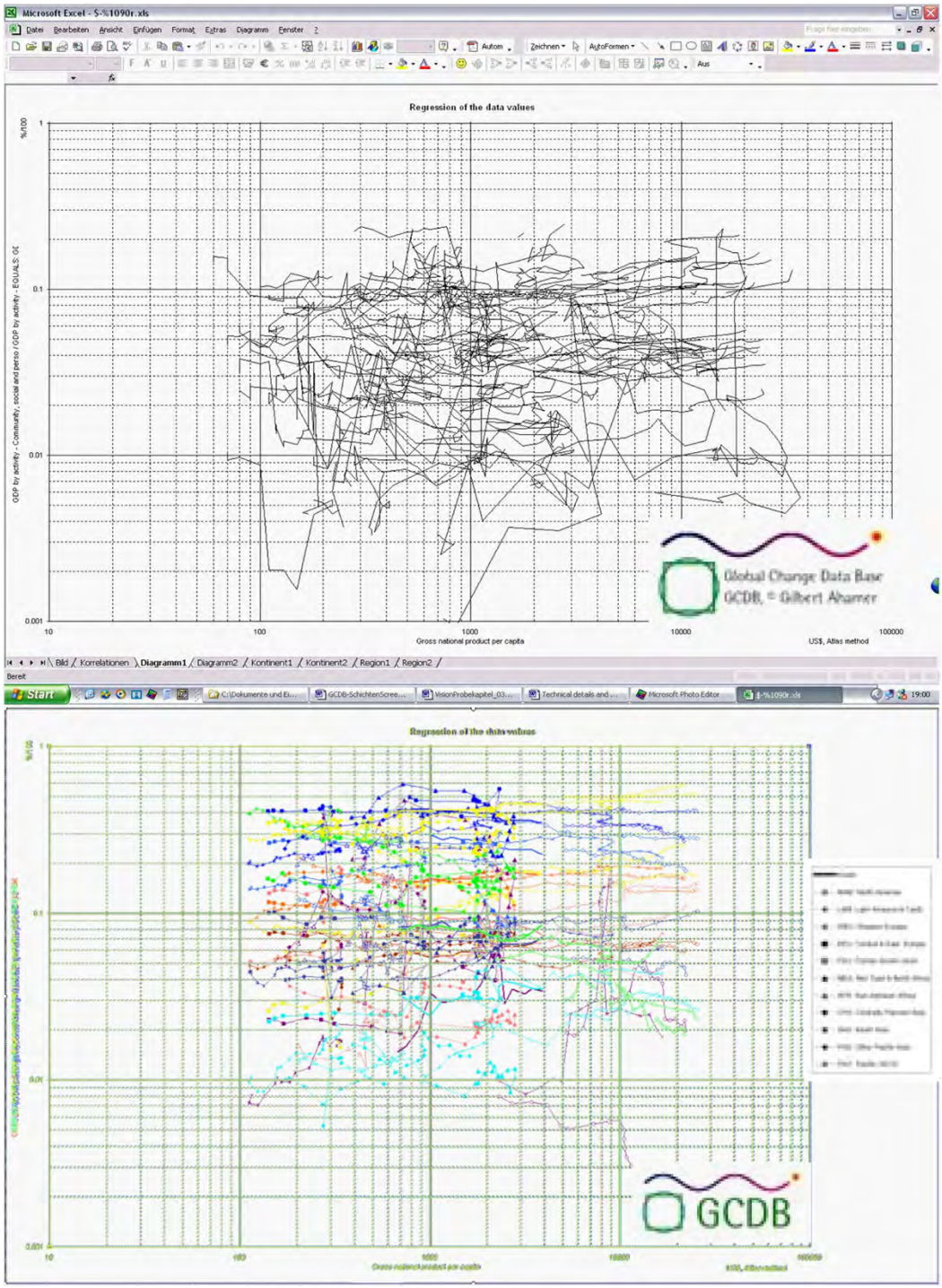
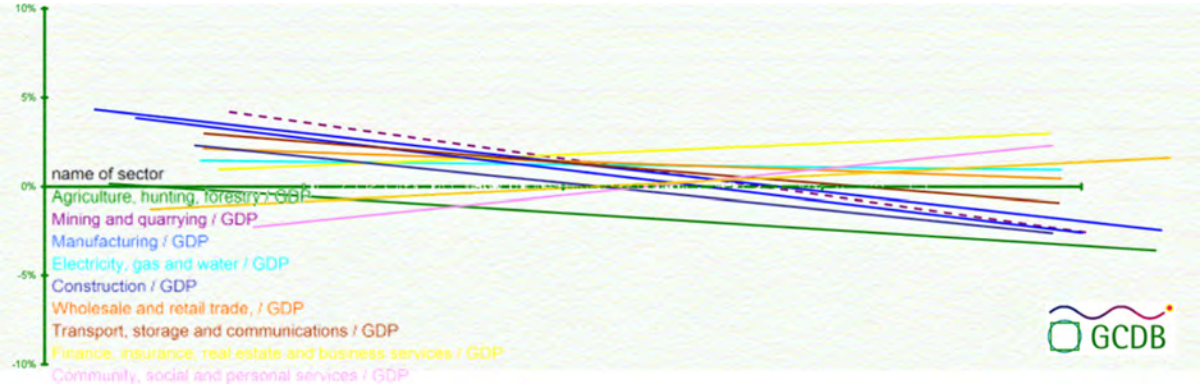


Figure 4. Annual growth rates for share of "community, social, and personal services" as a function of GDP/capita, change rates for the other sectors.



disciplinary teaching takes into account multiple ways of seeing the world" also in natural resource management teaching.

Concepts of inter-disciplinarity for Aram (2004) are *configurations of both knowledge and action*. Nissani (1997) expresses "ten cheers for interdisciplinarity" and claims that his "article presents the only self-contained, comprehensive defense of interdisciplinary knowledge and research." White (1999) uses academic topographies for a network analysis of disciplinarity among communication faculty.

Fischer et al. (2011: 341) review collaboration between the natural and social sciences:

Across disciplines, it became clear that such a community should deal with (1) difference between paradigms in the current sciences; (2) creation of skills and competences of the involved scientists; (3) scarcity of institutions sympathetic to collaborative research; and (4) the internal organization of collaborative projects.

He ranks *mutual esteem* among disciplines highly and analyzes on page 350: "*Lack of respect* may stem from scientists considering their science as the *central* way to discover the truth, and therefore *dominant* in any collaboration".

Interdisciplinary, Intercultural, and Inter-Paradigmatic Modes of Science

The following paragraphs define three "scientific modes" that add to the above, quite common, definitions. In addition to common-sense inter-disciplinarity that uses different (let us call their number "n") disciplinary lenses to look onto and to understand one specific real-world problem (at right in Figure 5, first line in Table 3, and above right in Table 4), the present paper proposes the notion of "interculturality" which shall mean here to take a standpoint of perception (i.e., not a lens) depending on one's own real-world position and involvement in the given real-world problem. An example would be to look on the Nagorno-Karabakh conflict in the Caucasus from an Armenian or Azerbaijani standpoint.

In this sense, "interculturality" means in this text an individual's ability to take several ("m") standpoints (second line in Table 3 and Table 4) that are likely to result in different weighing and assessing of single partial arguments. Other meanings of "culture" in the usual sense (e.g. Wolf 2011) remain of course untouched by the above definition.

The combination of both inter-disciplinarity ("n") and inter-culturality ("m") in the above-mentioned sense is called "inter-paradigmatic"

Figure 5. The importance of perspectives in developmental and global studies. Perspectives are world-views, symbolized by the person at right, resembling Leonardo da Vinci's human called 'Vitruvian Man.' Looking at realities is graphically symbolized by the looking angle or wedge starting out from the observer and ending at the globe which symbolizes the real-world's global change and globalization. At left: in its academic manifestation, this same entirety is symbolized by the Greek temple with six columns standing for the six modules of the "Global Studies" curriculum at Graz University having six departments; the GS logo is placed on the tympanum.

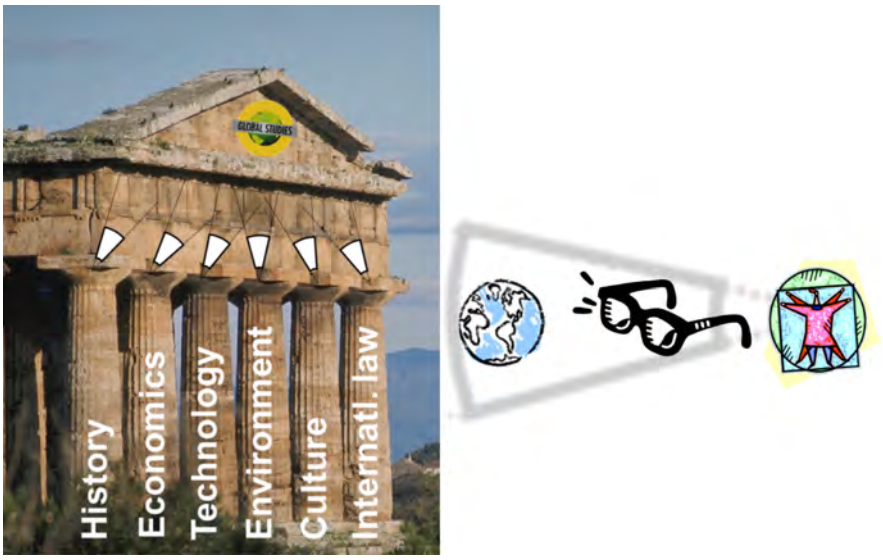


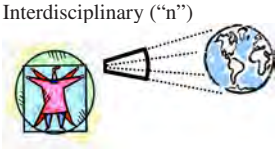
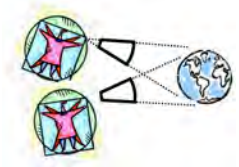
Table 3. Concise explanation of interdisciplinary, intercultural, and interparadigmatic scientific modes

Scientific Mode as Defined Here	Explanation	Likely Substrate of Perception and Cognition
interdisciplinary ("n-fold")	The observer uses n lenses from 1 standpoint to perceive the real world.	element
intercultural ("m-fold")	The observer uses 1 lens from m standpoints to perceive the real world.	interaction
interparadigmatic ("m×n-fold")	The observer uses n lenses from m standpoints to perceive the real world.	perspective

in this text and means a "m×n" combination of both n viewing lenses and m viewing standpoints (second line in Table 3 and at the bottom of Table 4), hence the ability to use diverse paradigms and epistemologies for thinking and assessing realities. According to Lattuca et al. (2004: 35) and Perry (1968), the ability to employ various epistemologies and paradigms increases during individual biography.

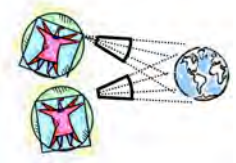
As can be seen from the architecture of Figure 5 at left, the curriculum "Global Studies" (and the bundle of electives GS) endeavors to build such

Table 4. Typologies of interdisciplinary research (sources: Aboelela et al., 2007, pp. 337; combined with Pharo & Bridle, 2012, p. 67) compared to science mode definitions of interdisciplinarity, interculturality, and interparadigmatic approach (Ahamer et al., 2011, pp. 17-18)

Degree of Synthesis	Typology	Compares to Science Modes
Least: Disciplinarity	A community of scholars with their own theories, content, methods, history and culture into which members are trained and socialized such that they are able to carry out distinctive intellectual tasks and skills (Becher 1981)	Disciplinary ("1")
Informed disciplinarity	Disciplinary questions may be informed by concepts or theories from another discipline (Lattuca 2001) where they focus primarily on a single discipline but call upon other disciplines to illuminate content (Lattuca et al. 2004)	Interdisciplinary ("n")  "n" facets of viewed facts
Cross-disciplinarity	Variably defined depending on the context; often used to mean informed disciplinarity where a single discipline remains dominant (Lattuca 2001, Davies & Devlin 2007)	
Instrumental interdisciplinarity	Bridge building between fields. Problem-solving activity, does not seek synthesis or fusion of different perspectives (Klein 1996)	
Synthetic disciplinarity	Questions that link disciplines (question either belongs to both or neither disciplines) (Lattuca 2001)	
Moderate: Multidisciplinary	Coexistence of more than one discipline side by side in a way that accumulates knowledge without integration. Connection between disciplines may not be apparent. Often confused with interdisciplinarity (Petrie 1976, Spelt et al. 2009). Teams work in parallel or sequentially from their specific disciplinary base to address a common problem (Rosenfield 1992)	
Synthetic interdisciplinarity	Two or more teachers combine theories, concepts and methods from different disciplines but contributing disciplines remain clearly identifiable, revealing relatively bounded content areas and perhaps distinctive methods of inquiry (Lattuca 2001, Lattuca et al. 2004)	
Interdisciplinary	Integration of two or more disciplines that may range from simple communication of ideas to the mutual integration of organizing concepts and practices in a fairly large field (Klein 1990, Lattuca 2001, Spelt et al. 2009). Teams work jointly but still from a discipline-specific base to address a common problem (Rosenfield 1992)	
Conceptual interdisciplinarity	Explores perspectives on learning from different disciplines and involves critique of the disciplinary theories and methods (Lattuca et al. 2004). Questions without a compelling disciplinary basis (Lattuca 2001)	
Epistemological interdisciplinarity	Restructuring an earlier approach to defining a field (Klein 1996)	
Great: Transdisciplinary	The application of theories, concepts, or methods across disciplines with the intent of developing an overarching synthesis (Lattuca 2001). Focuses on dissolving disciplinary boundaries by focusing on questions that see disciplines as irrelevant. While interdisciplinarity explicitly critiques the disciplines, transdisciplinarity de-emphasizes disciplines (Lattuca 2001, Lattuca et al. 2004, Max-Neef 2005, Vilsmaier, 2011). A movement toward a coherence, unity, and simplicity of knowledge field (Klein 1996).	
Greater		Intercultural ("m")  "m" perspectives by viewing actors

continued on following page

Table 4. Continued

Degree of Synthesis	Typology	Compares to Science Modes
Greatest: Including, but beyond inter-, multi-, trans-disciplinarity		Interparadigmatic ("n × m")  "n" facets of viewed facts × "m" perspectives by viewing actors

combined, inter-paradigmatic view of globalization and global development by including the "cultures of thinking" stemming from ("m") different cultural positions of students and faculty with the ("n") lenses of the disciplines history, economics, technology, sociology and culture, and international law as constituting perspectives and essential epistemologies. Figure 5 symbolically proposes the wedge of perception as a cognizable entity.

The evolution of "substrates of cognition" along the three modes is depicted in the rightmost column of Table 3: elements – interactions – perspectives. Evidently, any strategy in global politics and developmental cooperation needs to deal with diverging perspectives as substrata of assessment – rather than dealing merely with sheer facts; as does, for example, physics (the author's initial discipline).

The combined Table 4 emphasizes that the above three modes of science clearly go beyond the degrees of multi-, inter- and trans-disciplinarity that are common in literature: all these three degrees of integration across the disciplines gather within the first mode. However, intercultural thinking and inter-paradigmatic thinking include the position of the *reflective agent* within the self-referenced total of perceiving and influencing global change and globalization. The curriculum of "Global Studies" at Graz University clearly defines an *inter-paradigmatic approach* (GS 2010: 2).

Competencies for Inter-Disciplinarity

After the enlargement of the conceptual framework in the above subchapter, competencies and other requirements identified for inter-disciplinarity in literature are understood to be also applicable to an inter-paradigmatic approach.

The initial definition of inter-disciplinarity includes "the capacity to integrate knowledge and modes of thinking in two or more disciplines to produce cognitive advancement" (Spelt, et al., 2009: 366) and "builds on a performance view of understanding, meaning that individuals understand a concept when they are ready to apply it accurately and flexibly in novel situations" (Boix Mansilla, et al., 2000).

As a consequence of the above-mentioned requirements for the increasing levels of inter-disciplinarity, Spelt et al. (2009: 366) consider "the ability to *synthesize or integrate* as a beneficial learning outcome of interdisciplinary higher education". As an example, a didactic procedure for such integration was provided by the negotiation game "Surfing Global Change" (Ahamer, 2005, 2006).

Highlighting the importance of perspectives (Table 3 right) as substrata of reasoning and cognizing, Wagner et al. (2011: 16) and Miller and Mansilla (2004) assume a "social process along four phases of increasing integration:

- **Mutual Ignorance:** Of other disciplinary perspectives
- **Stereotyping:** That may have significant misconceptions about the other's approach
- **Perspective-Taking:** Where individuals can play the role of, sympathize with, and anticipate the other's way of thinking
- **Merging of Perspectives:** Has been mutually revised to create a new hybrid way of thinking."

Core competencies for interdisciplinary research are listed in Table 5; it notably includes categories such as esteem and respect for other disciplines, and equitable dealing with peer scientists without considering oneself superior to others and their perspectives.

In the framework of the European Neighborhood Partnership Initiative ENPI, the author was instrumental in designing, planning and setting up several 1.2M€ projects, one of them to develop a curriculum for vocational education for agriculture in a difficult multicultural environment (Rosenzweig & Ahamer, 2009). It was particularly interesting to practically observe how respectful partnership and the principle of mutual esteem were essential for the acceptance of any future step during all phases of collaboration.

Organizational Structures for Inter-Disciplinarity

According to Holley (2009: 337), universities need positive examples of transformational change linked to interdisciplinary initiatives; these can be facilitated by senior administrative support, collaborative leadership, flexible vision, staff development and visible action. Table 6 lists barriers and opportunities for such transformational change.

As a result of the above barriers and opportunities, a regular schedule of meetings among the stakeholders of an initiative such as GS is appropriate, as was implemented by the respectful open meetings of the steering committee GS in earlier years (SC GS 2010).

Table 5. Core competencies for interdisciplinary research identified in a Delphi survey. Source: Larson et al. (2011, p. 39) and Gebbie et al. (2008).

Major Area	Competencies
Conducting research	• Use theories and methods from multiple disciplines in developing integrated theoretical and research frameworks. • Integrate concepts and methods from multiple disciplines in designing interdisciplinary research protocols. • Investigate hypotheses through interdisciplinary research. • Draft strategies and research proposals in partnership with scholars from other disciplines. • Author publications with scholars from other disciplines.
Communication	• Advocate interdisciplinary research in developing initiatives within a substantive area of study. • Express *respect* for the perspectives of other disciplines. • Read journals outside of his or her discipline. • *Communicate* regularly with scholars from multiple disciplines. • Share research from his or her discipline in language *meaningful* to an interdisciplinary team. • Modify his or her own work or research agenda as a result of interactions with colleagues from fields other than his or her own.
Interacting with others	• Engage colleagues from other disciplines to gain their *perspectives* on research problems. • Interact in training exercises and university lectures with scholars from other disciplines. • Attend scholarly presentations by members of other disciplines. • Collaborate *respectfully* and *equitably* with scholars from other disciplines to develop interdisci plinary research frameworks.

Table 6. Listing of barriers and opportunities in interdisciplinary science collaboration. Source: Fischer et al. (2001, p. 349), adapted.

Barriers	Opportunities
Culture and Paradigms in the Sciences	
Fundamental differences between cultures of understanding in branches of science limits the relevance of approaches to be exchanged.	Complementary approaches may provide answers to problems previously outside of the scope of the field.
Make the scientific paradigms the most important aspect of research.	Make the real world goal the most important aspect of research.
Skills and Competences of Scientists	
Mutual misunderstanding of subject-specific jargon.	Select scientists with good interpersonal skills.
Lack of respect.	Select scientists willing to collaborate.
Context of the Research	
Academia is organized along disciplinary lines, making the establishment of collaboration between sciences more difficult than within disciplines.	Creation of interdisciplinary journals with high impact provides collaborative research a podium that is valued in the current evaluation criteria.
Academic institutions reward disciplinary work, and publication in high impact disciplinary journals.	
Tenure track criteria are largely organized along disciplinary lines.	
Evaluation of academic institutions and grant proposals largely follows disciplinary lines.	

How to Measure Quality in Curricula?

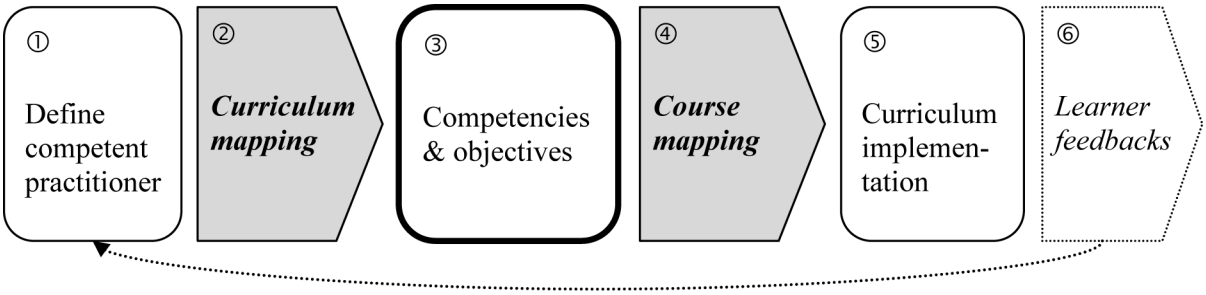
Given the above theoretical deliberations on criteria for inter-paradigmatic collaboration in higher education, this chapter proposes concrete methodologies. According to Bath et al. (2004), "it is suitable and indispensable to measure a practical curriculum against its original intentions". In the case of GS, these original and inalienable intentions were cooperatively defined in a peer-oriented process by Kumpfmüller (2007, 2009) and are reiterated in the general introduction of the curriculum (GS 2010: 1-2) and documented as a history of GS in Ahamer et al. (2011: 21-23).

Literature on "quality" as a concept is extremely extensive; one of the early paradigmatic narrative considerations of quality as such was the cult novel by Robert Pirsig (1974) *Zen and the Art of Motorcycle Maintenance: An Inquiry into Values*. Harvey and Green (1993) similarly provide very general criteria: "Quality can be viewed as exception, as perfection, as fitness for purpose, as value for money and as transformative". For quality assurance of (joint) Master programmes, Euro League (2010: 14) suggests to understand quality as follows:

- Quality as compliance with standards.
- Quality as fitness of purpose.
- Quality as fitness for purpose.
- Quality as customer satisfaction.
- Quality as continuous enhancement.

Such includes evaluation of curricula against needs of global real-world complexity and evaluation of the inherited course structure against the curriculum; called curriculum mapping and course mapping, respectively, in literature (Ried 2011, compare Figure 6). Uchiyama and Radin (2009) perceive curriculum mapping in higher education as a vehicle for collaboration. In an older article, English (1978) states that "the efforts of each teacher must be 'mapped', which means the real

Figure 6. The continuous quality improvement model proposed by Ried (2011, p. 2), simplified representation along his main path of curriculum mapping and course mapping, including reassessment



curriculum being taught in each classroom must be examined and recorded. This mapping can be done by having teachers map their own classroom curricula…. It can also be done by having observers use tools like an observer form for curricular mapping to record what is being taught in the classroom. The results of this mapping must be the beginning point for making the real curriculum fit the desired curriculum."

Cheng and Tam (1997: 24ff) present seven models of quality in education:

1. Goal and specification model
2. Resource-input model
3. Process model
4. Satisfaction model
5. Legitimacy model
6. Absence of problems model
7. Organizational learning model

Cheng (1995) emphasizes the *multidimensional concept of education quality*, which is not easily assessed by only one indicator (in similarity with management literature), as:

Education quality is the character of the set of elements in the input, process, and output of the education system that provides services that completely satisfy both internal and external strategic constituencies by meeting their explicit and implicit expectations.

Cheng and Tam (1997: 23) continue: "the difference in the *choice* of and the emphasis on indicators may *reflect the diverse interests* and expectations among the concerned constituencies and also the different management strategies". Consequently, consensus must be reached on the set of indicators, especially in such a complex case as GS. Regarding QA of Interdisciplinary Scientific Research (ISR), Wagner et al. (2011: 15) are undertaking a very comprehensive study commanded by the US National Science Foundation NSF, a review of the literature in order to consistently understand and measure interdisciplinary scientific research (IDR) and propose while "expanding the inquiry beyond quantitative measures to be inclusive along the following lines:

1. "Measurement of interdisciplinary research should recognize and incorporate *input* (consumption) and *process* value (creation) components as well as *output* (production) [compare the architecture of Figure 1 taking this into account].
2. Interdisciplinary research involves both *social and cognitive* phenomena, and both these phenomena should be reflected in any measure or assessment of interdisciplinarity [hence no limitation to cognitive measures].
3. Assessment of research outputs should be broadened *beyond* those based in *bibliometrics*, [i.e., ISI, Scopus, PoP, see later section

> of this chapter] while also factoring in differences in granularity and dimensions of measurement and assessment [hence include lecturing, didactics and pedagogy]."

A practical application of such measurement endeavors will be performed in the section "Applying Bibliographic Criteria to GS."

Taking a learner-centered standpoint, Gosling and D'Andrea (2001) suggest that "the quality of students' experience of higher education can more effectively be improved by combining educational development with quality assurance to create a more holistic approach."To reach better learning, van den Akker (2006, 4f) sees design research as important regarding (curriculum and course) design. He suggests interventionist, iterative, process oriented, utility oriented and theory oriented design research.

Methods for QA as a Process

Peterson et al. (2011) propose a course assessment process for curricular quality improvement and Piascik & Bird (2008) strive to create and sustain a culture of assessment. Ried (2011) suggests a model for curricular quality assessment and improvement (Figure 6); all three authors for the case of pharmaceutical education. Prager and Plewe (2009: S47) assess and evaluate GI Science curricula using the Geographic Information Science (GIS) body of knowledge while mentioning the pros and cons of being a completely regulated scientific field. They favor an outcome-based assessment of curricula founded on clear objectives: "in this approach, quality is not judged by conformance but by results". For them, the assessment of outcome sand curricular alignment can be thought of as an ongoing process that addresses four important steps (Suskie, 2004, p. 3):

1. What does the programme expect students to learn? (Desired Student Outcomes)
2. Does the programme give students sufficient opportunities to meet these expectations? (Curriculum Alignment)
3. What have students learned? (Actual Student Outcomes)
4. How can learning be improved through changes in the programme? (Programme Revision)

Such procedural architecture is still sufficiently in line with the process suggested in Figure 1. Ried (2011) discusses each component of his continuous quality improvement model, "including (1) the definition of a competent practitioner, (2) development of the core curricular competencies and course objectives, (3) students' baseline characteristics and educational attainment, (4) implementation of the curriculum, (5) data collection about the students' actual curricular performance, and (6) reassessment of the model and curricular outcomes" (simplified as flow chart in Figure 6).

Prager and Plewe (2009: S50) suggest a model with seven steps for integrated assessment and curriculum evaluation: specify mission and objectives, specify curriculum elements, review objectives and curriculum, assess student learning outcomes, verify alignment of objectives and curriculum, verify alignment of student outcomes with objectives and curriculum, and identify revision needs. These seven steps fit roughly into Ried's concept in Figure 6.

For the sub-process "course mapping" in Figure 6, Peterson et al. (2011: 4) propose a tentatively standardized course evaluation form for each

lecturer with ten open-ended questions including a variety of perspectives:

1. **Course Policies and Procedures:** Completeness of course syllabi, use of standardized syllabi format, and compliance with policies and procedures.
2. **Course Content and Relationship to Learning Outcomes:** Content and competencies match, learning objectives are addressed.
3. **Integration within the Curriculum:** Appropriate placement within vertical integration, appropriate sequencing and horizontal integration with concurrent courses when appropriate.
4. **Skills:** Identifies that knowledge and skills are developed, practiced, and assessed.
5. **Student Assessment:** Types and number of assessments linked to learning objectives, student performance, and advancement.
6. **Course Coordinator Performance Review:** Course management skills.
7. **Summary of Individual Faculty Teaching Reviews:** Summarized from teaching evaluation forms and student instructor evaluations.
8. **Recommendations:** Specific recommendations and suggested changes for course improvement.
9. **Active Learning:** Describe active-learning techniques observed.
10. **Key Assessments and Key Artifacts:** Specific examinations or learning activities that serve as a demonstration of competency.

The implementation of the above-mentioned processes of QA (and of any sustainable QA) that is to be accepted by those involved requires a "spirit of cooperation, mutual understanding, esteem, and respectful professionalism" (Towell 2012: 107) among the greater team of assessors and assessees.

Assessable Quality Criteria

In this subchapter, the set of quality criteria assessed as most appropriate by the present paper is displayed in Table 7; its leftmost column is identical to Table 1 that has been equally recommended in this paper. These structured quality criteria are general enough to be used henceforth and practically. As an example, "communication skills" indicate the necessity of learning the language of discourse of different disciplines in order to be able to negotiate meaning, resolve epistemological differences, develop shared understanding, and communicate cognitive advancements to a broad audience (Manathunga et al. 2006; Woods 2007; Spelt et al. 2009).

As a suggestion, Table 7 can be complemented by a fourth column into which performance for the respective quality criterion is then entered.

Practical examples for curriculum development around the world:

Over the last decade, almost all European countries have established national systems for the assessment of quality in higher education. Similar developments can be found in many other parts of the world (Brennan & Shah, 2000).

Regarding developmental curricula such as GS, curriculum development in the South (earlier called 3rd world) seems no less common than in the North (earlier called 1st world).Among others, the following studies and notes pertain to Kenya, South Africa, China, Indonesia, Iran, and Latin America: SAQA (2000), Busoga (2012), Mayer et al. (2011), HigherKOS (2012), Mwinyipembe (2012), Western Cape Government (2012), Fu Jen (2012), Sumaedi et al. (2012), Monarca (2012), Havas et al. (2011), and Masembe and Nakabugo (2004). Themes pertain to students' perceived service quality,

Table 7. Overview of potential sub-skills and conditions for interdisciplinary curricula. Source: Spelt et al. (2009), adapted from Biggs (2003).

Interdisciplinary thinking	Having knowledge	Knowledge of disciplines
		Knowledge of disciplinary paradigms
		Knowledge of interdisciplinarity
	Having skills	Higher-order cognitive skills
		Communication skills
Student	Personal characteristics	Curiosity
		Respect
		Openness
		Patience
		Diligence
		Self-regulation
	Prior experiences	Social
		Educational
Learning environment	Curriculum	Balance between disciplinarity and interdisciplinarity
		Disciplinary knowledge in-/outside courses on interdisciplinarity
	Teacher	Intellectual community focused on interdisciplinarity
		Expertise of teachers on interdisciplinarity
		Consensus on interdisciplinarity
		Team development
		Team teaching
	Pedagogy	Aimed at achieving interdisciplinarity
		Aimed at achieving active learning
		Aimed at achieving collaboration
	Assessment	Of students' intellectual maturation
		Of interdisciplinarity
Learning process	Pattern	Phased with gradual advancement
		Linear
		Iterative
		Milestones with encountering questions
	Learning activities	Aimed at achieving interdisciplinarity
		Aimed at achieving reflection

the influence of national systems of evaluation on curriculum development, the quality of curriculum evaluation in postgraduate studies, or they pertain to QA in curriculum development.

Curriculum development in the North especially seems to take place in Anglo-Saxon countries (Scottish Government 2011; Teagasc 2012; Lime 2012; UNEVOC 1993) that appear to have more of a review and discourse-oriented tradition than Central European countries might have. Wolverhampton (2012) takes advantage of inter-disciplinarity for new curricula and courses, Jordens and Zepke (2009) propose a network method for QA of curricula, Schmidt and Shaw

(2008) assess quality regarding e-learning, Towell et al. (2012) create an interdisciplinary business program, Saunders-Smits and de Graaff (2012) include alumni research, Huntoon and Baltensperger (2012) educate earth science teachers.

For further quality assurance in transnational education management, clear declaration of assessment criteria, assessment procedures and a revealing of the hidden agendas of those involved (such as attempts to strengthen own institutes) will prove most useful.

QA FOR THE GS CURRICULUM

The key motto of QA in a developmental curriculum such as GS is responsibility and "accountability for educational outcomes" (Ried 2011: 8). Any assessment procedure should use "a variety of valid and reliable measures" serving as metric for quality criteria agreed in consensus. The university or "school must use the analysis of assessment measures to improve student learning and the achievement of the professional competencies", best as continuous quality improvement (p. 1).

Why GS and What is GS?

The target of the inter-paradigmatic, intercultural and interdisciplinary developmental curriculum GS was coined and formulated by the Austrian doyen in peace research, Karl Kumpfmüller (2007, 2009) and has been developed by him (Kumpfmüller & Ahamer, 2013) in cooperation with a peer-oriented "Steering Committee GS" (SC GS 2010) since 2004. The target and history of GS is extensively explained in Ahamer (2011) and Ahamer et al. (2011). The aim of GS is a professional preparation for critical and peaceful global developmental cooperation and humane management of globalization issues, for example with a strong orientation towards human rights (Benedek 1994). Since its inception, the SC GS has always comprised representatives from all schools of Graz University (in German: faculties, hence GC is an interfaculty curriculum). The author was dispatched to the SC GS to represent the interdisciplinary curriculum Environmental Systems Science and has done so since the first year of GS; this unique curriculum in the meantime belongs to a nearly founded university faculty comprising pedagogics, environmental, systems analysis and interdisciplinary studies (URBI 2012).

According to the above scheme Figure 6 of (a) curriculum mapping and (b) course mapping, the activities listed below have already been performed for GS Graz; another assessment exercise is likely to be launched by the university senate soon. The present chapter should also provide a framework for such a forthcoming assessment.

Measuring Quality in the GS Curriculum

For future QA of an inter-paradigmatic GS curriculum, the methods described by Figure 1 and Table 7 are proposed.

Until now, from the author's view the following feedback activities from the student side have been retrieved. These serve as the first examples of Quality Assurance (QA) measures already implemented to date for the Master's curriculum GS Graz:

- A reviewed paper by the student representative Bader and Zotter (2012) including their survey among all GS students after the second year of GS in 2012; and other surveys by student representatives.
- Regular evaluation of all GS courses by the university-wide online course tool UGO.
- All courses held with the cooperative online learning WebCT included evaluations.
- Students have nominated the lecturer of "economics in developing countries" for the university's prize for the best lecturer. (Lehre: Ausgezeichnet 2010)

- In the framework of GS, interdisciplinary practicals of environmental systems science were eligible and have yielded WebCT evaluations and final reports of ~200 pages.
- The didactic methodology of the Web-supported negotiation game "Surfing Global Change" utilized in these courses was published a dozen times in reviewed journals and entered into the didactic retrieval systems of the Academy of New Media and Knowledge Transfer.
- The genesis of GS Graz and its national context has been published two times. (Ahamer et al. 2011; Ahamer 2011)
- On January 15, 2012 the nationwide workshop on developmental policy was held in Graz, co-organized by the author.
- As a result of the course "Analysis of practice in GS" the participants published a collaborative article in the "Multicultural Education Technologies Journal" on two contested hydro-energy projects in Brazil and Turkey. (Duraković et al. 2012)
- The publication outlet for the 5th national conference on global development three special issues of a peer reviewed journal entitled "Global Studies".
- The national university project Sustainicum (2012) on university didactics includes a description of the didactic procedures used in the "basic lecture GS" by the author, as well as other pedagogic strategies for eligible GS courses such as the interdisciplinary practical "energy revolution" ("SGC", "3x7 = 21", "jet principle").
- In coherence with the university mission statement, the foundation of a new peer reviewed online journal "Global Studies Survey" was planned and submitted (GLOSS 2007). Another SSCI journal was founded by a SC GS member: Sturge and Wolf (2008).
- As an input to the new strategic agreement among ministry and university, the author has submitted a structural proposal upon invitation to the rectorate to strategically foster GS. The proposal was supported by the curricula commission and the official students' representation (GS 2011) and has been very positively received by the rectorate; however, the text of the agreement has yet to be amended.
- Student representatives have expressed their opinion in favor of lectures on developmental economics and social and cultural geography in 2012.
- As an elective exercise, students in the basic lecture GS compared the GS curriculum against other, similar developmental curricula and submitted suggestions for the improvement of the GS curriculum.
- Amonographis planned to include student papers authored during the basic lecture GS. This could serve as a textbook for the basic GS lecture.
- Cross-national cooperation with GS curricula in Salzburg, also Vienna, Linz and with umbrella institutions such as the Mattersburg Circle for Developmental Policies (MK 2012), including a lecture for the GS curriculum in Salzburg.

The abovementioned student feedback suggests among other things (a complete list is available as an addendum to the chapter titled "Education and literature for development in responsibility – Partnership hedges globalization"):

- Increase the role of foreign languages in GS.
- Include lectures on non-neoclassical economics in GS.
- Include the introductory lecture by the founder of GS in the economics module in the regular GS curriculum.

- Arrive at true inter-disciplinarity among all lecturers, who should regularly communicate among themselves.
- Usage of learning platforms was seen positively.

Also the curricula commission (CuKo 2012) took account of some aspects of QA, based on feedback from students:

- More cohesion among the modules of the basic lecture.
- Clear definition of the perspectives adopted by lecturers.
- Clear definition of a main thread throughout the basic lecture.
- Localization of each lecturer's contribution within the greater context.
- Presentation of a meta level of GS by the GS founder.
- The unique selling proposition of GS is its multi-perspectivistic and integral analysis of the phenomena of globalization (see the inter-paradigmatic model of columns in Figure 5).

These items will be completed by achievements seen from other points of view.

Applying Bibliographic Criteria to GS

Price (1978) and Wagner et al. (2011) argue that "publication provides the function within science of correction, evaluation, and acceptance by a community. Published works are collected in journals, and a select set of journals is included in various databases such as the Web of Science (built and maintained by ISI Thomson Scientific) or Scopus (built and maintained by Elsevier)" as well as Google Scholar (analyzed by the small but powerful program tool "Publish or Perish" by Anne Harzing (2007) which makes this vast database easily usable.

These databases provide the raw material used in current bibliometric efforts to measure IDR, such as ISI Thomson "introduced by Derek de Solla Price and Eugene Garfield and adopted among others by the National Science Foundation NSFA or the OECD.… Scopus has now achieved high recognition and offers promise in that it currently indexes many thousands more source titles than the ISI databases" (Wagner et al. 2011: 18) and especially by having introduced skillfully normalized metrics such as SNIP and SJR that attempt to level out inconsistencies among citation rates among disciplines. Still, "citation measures privilege publication as the major outcome of IDR. This is one of the sharpest limitations of this approach" (Wagner et al. 2011:19) and therefore requires the use of an additional structural approach by including courses, outreach activities, press and public lectures, as is already implemented in the university's internal citation system in some criteria for professorship.

For the following analyses, some of the criteria suggested by Wagner et al. (2011) were practically applied to the twelve lectures having been active in courses planned specifically for GS in the (last available) academic year 2011-12 (including the number of weekly course hours, according to the retrieval system University Graz OnlineUGO 2012):

- Basic lecture GS (winter semester, 324.519, Basisvorlesung GS, 6)
- Ring lecture GS (winter semester, 324.529, Ringvorlesung GS, 2)
- Introductory lecture GS (winter semester, 324.539, Einführungs-LV GS, 2)
- Analysis of practice GS (winter semester, 324.509, Praxis-Analyse, 1)
- Analysis of practice GS (summer semester, 324.500, Praxis-Analyse, 1)
- Master seminar GS (summer semester, 324.540,Masterseminar GS, 2)

Within this list, the "basic lecture GS" at the start of the first semester in the Master's curriculum provides most of the disciplinary models on development such as history, economic history, economics, environment, society and culture, and international law (Figure 5); these should be integrated by a truly interdisciplinary lecture: such is the intention.

Figure 7 displays the results for the mentioned databases. ISI and ERIC are located in the US (reddish, above row), Scopus in the European Union (blue, below left), PoP is global and shows a tenfold load of documents (green, below right). All documents were manually counterchecked for identities and ambiguities in authorship regarding authors with similar names, if necessary single documents were read.

Documents Retrieved in Literature Repositories

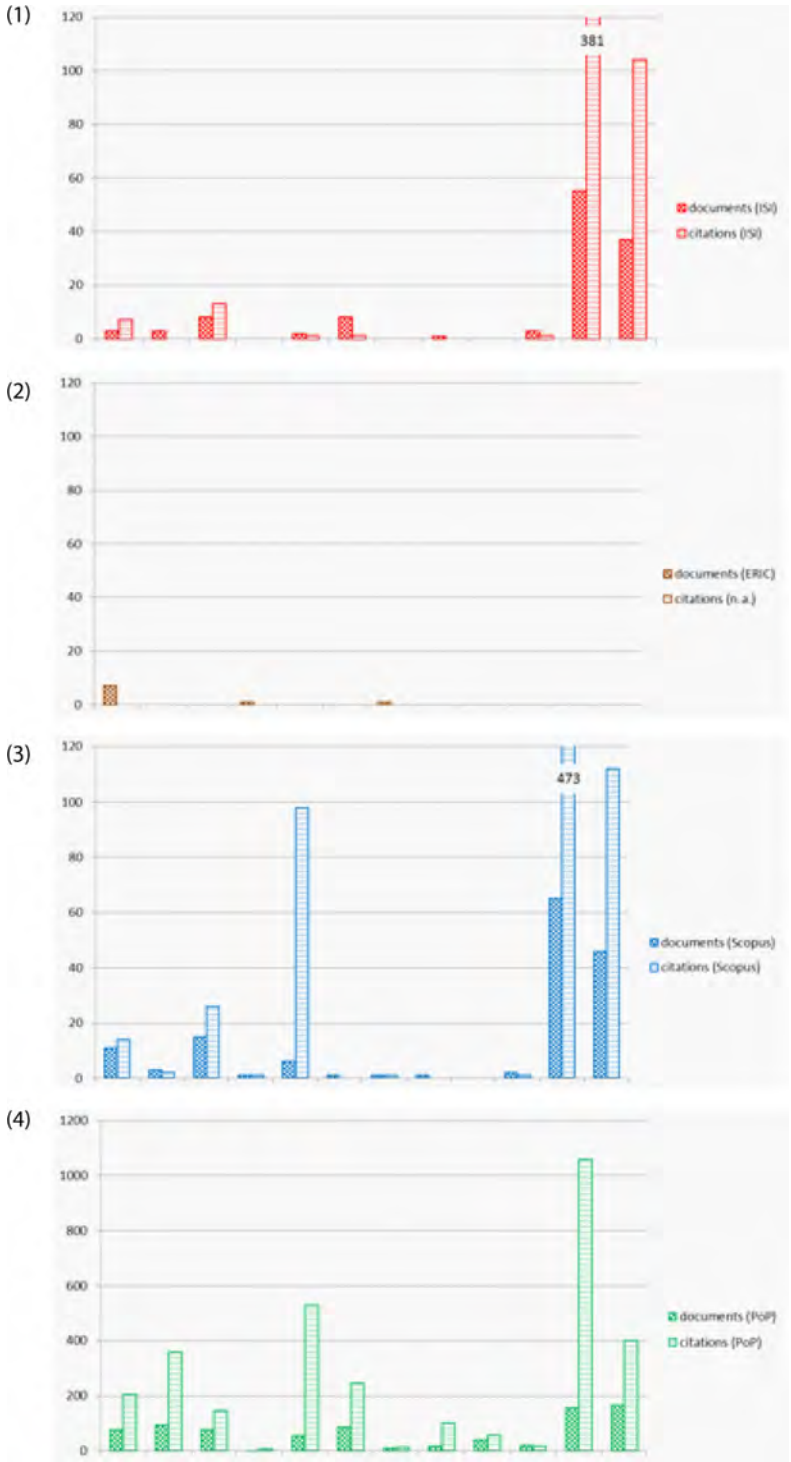
The first two of all pictured databases (ISI rather for sciences, ERIC for educational literature) were selected identically to the categories of the monitoring system AkademIS used by the Austrian Academy of Sciences (ISI (S)SCI, ERIC; while for A&HCI on humanities no specific access seemed to be implemented).

The second row of Figure 7 provides the other databases identified by most authors and commentators in the field, such as Wagner et al. (2011), Harzing (2010), Barbour (2012), Virtual Canuck (2011). It appears that the access to ISI and Scopus is restricted to subscribed universities but the use of the other databases is free. The list of Scopus-referenced journals (~20,000) is almost twice as long as with ISI Thomson. Scopus has amended one of the most striking shortcomings of the classical ISI impact factor (equal to roughly the number of citations per number of papers) by the introduction of SNIP and SJR (Scopus 2011) for which time series can easily be compared by a very user-friendly tool, "journal analysis." In this sense, Wagner et al. (2011: 24) ask "what types of normalization (necessary to account for the different relative sizes and dynamics of science across research fields) are required to match the different units of analysis and granularity and what types of measures are best for computing the inputs, processes, and outputs of interdisciplinary research (e.g. simple counts, network measures, dynamic models, or a combination)?" According to Science Watch (2010), the disciplines "with the lowest citation thresholds observed are Social Sciences, Computer Science, and Multidisciplinary Sciences" – which does not at all favor the case of interdisciplinary or inter-paradigmatic thinking – when relying on mere bibliometrics.

Regarding the differences between single databases, Scopus shows more equilibrated scores among representatives of natural sciences, social sciences, and humanities than ISI. The program PoP based on the Google Scholar Database shows the least differences in documents between the main branches of science, notably between technology and others. These data include publications without having undergone a peer review process, as do most journals as the main means for QA. On the other hand, informal articles such as public lecture talks, conferences, and outreach activities are included here. Barrier-free or open access documents especially facilitate citation by students or low-budget countries – as can be shown by download statistics provided by some of these publishers (e.g. INTEC 2011). Also un-reviewed books from regional publishers and eulogies may increase the number of documents in PoP.

In the frequency distribution charts of Figure 7, two lecturers from another, technologically oriented university have been taken out of the regular order and placed rightmost for easier interpretation. Technical and natural sciences have higher scores in almost any citation index, non-quantitative disciplines such as history or humanities tend to have fewer citations, social and economic sciences might range in the middle. When interpreting it becomes apparent that real performance of individuals is not sufficiently well

Figure 7. Bibliometric results for twelve GS lecturers active in 2011-12 regarding retrieved documents (dark, at left) and retrieved citations (light, at right) from four different databases: ISI Thomson (first), ERIC (second), Scopus (third), and publish or perish based on Google Scholar (fourth). Vertical axes (0-120 for the first three and 1-1200 for the fourth) underline the larger sample of the latter.



illustrated by such data. Neither is interdisciplinary competence measured suitably by sheer citation data, which favor single-disciplinary careers.

High scores in purely disciplinary metrics (such as those being referenced by ISI Thomson) do not protect against feedback from students: sustained high levels of student criticism were targeted at "unequilibriated presentation of only one out of several appropriate paradigms" (student feedback) because of its sharply limited notion of how the complex syndrome of globalization was considered. On the other hand, such lecturers often found other colleagues as insufficiently qualified. This shows that self-perception and perception by others may differ considerably – actually this is the core motivation to set up an *inter-paradigmatic world view* in any case, especially applicable for multi-paradigmatic necessity to understand globalization while slipping out of one's own conceptual and epistemological limitations.

Figure 7 above right (ERIC) shows that publications on didactics and pedagogics occur very seldom, even if teaching and training accounts for a large share of the profile of university staff. Generally, didactic skills are underappreciated in the assessment of university careers, according to the author's view.

Members of the curricula commission (CuKo) have low scores in several databases, nevertheless decisions are often made without consulting other team players who have for many years been active for GS. Compared against a subset of 11 non-retired lecturers, the 5 CuKo members had among the lowest scores of ISI documents (except one) as well as among the lowest scores of ISI citations; the same applies when using the ERIC, Scopus or PoP databases. A negative correlation becomes apparent between performance according to above bibliometrics and self-alleged importance at organizational and political levels regarding university administration and curriculum management. From the perspective of Figure 7, publishing little and being cited rarely in peer reviewed literature correlates with high locally visible honors.

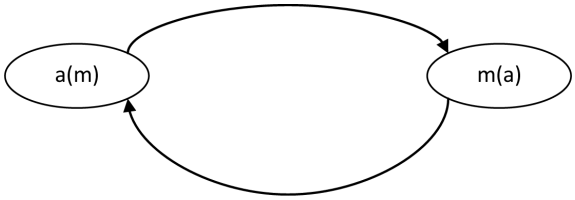
However, it is also possible to draw on a more local database: The combined retrieval system of all Austrian libraries (OBV 2012) yields approximately the number of documents and citations shown in Figure 8, top. The relative distribution is markedly different when dismissing the quality criterion of "international peer review" but adding works being produced by local publishers, seemingly without peer review, historic and social sciences wins the highest scores. Because the self-perception of authors most likely uses the lenses of one's own discipline and its weighing of what is preferable (e.g., book versus journal article), it might be possible that each individual ranks high in their own assessment but colleagues from other disciplines rank much lower. Such (apparently very perspective-bound) perception may extend to disciplines, their paradigms and methods but even to individual personalities and their degree of justification in academia. As an example of bibliometrically induced personal reactions, Virtual Canuck (2011) warns that "a nice glass of scotch is sometimes necessary – either for savoring self-induced feelings of smugness or for drowning one's sorrows over the incapacity of others to recognize true genius". Readers are therefore kindly requested to consult their bar when reading this article. If ever in a casual community of loosely interacting stakeholders (e.g., team of lecturers meeting just once a year discussing timing and schedules) individuals do not engage in a deeper dialogue on the weighing factors of their implicit quality assessments (e.g., what types of result are important), a situation can arise where all individuals enter a room feeling better than their colleagues and 2 hours later they leave the room with the same self-conception. Such perceptional patterns may potentially carry on for decades.

Figure 8. Documents retrieved from additional sources: Top: OBV (2012): Catalogue of Austrian libraries (draft numbers). Bottom: Google books, Amazon.com, worldcat.org, EnFoNet (all draft numbers, after manual checks for errors, without checks for double counts).

Other descriptors (Figure 8, bottom) such as retrieved documents in Google books, Amazon.com, or the recently established very comprehensive worldcat.org yield other distribution patters and correspond to other preferences in underlying conscious or unconscious assessment. The recent Austrian study on developmental research networks EnFoNet (Witjes et al. 2012 in Figure 8) has decided to use connectivity with other authors as a main criterion after a potentially subjective selection procedure of developmentally relevant pieces of work using the OBV (2012) data set.

Bluntly speaking, for each author (a) an assessment method (m) can be found where author 'a' ranks as best or second best out of the given sample of twelve. This "finding" translates the assessment exercise (or optimization exercise) "how good is each author 'a' in the perception of assessment method m" in a conjugate assessment (or optimization) exercise, namely "how good is each assessment method 'm' in the perception of the author a" (Figure 9). Such a self-referenced social procedure (in the language of social systems analysis) might produce non-linearities in optics,

Figure 9. From a systems analysis viewpoint, assessment exercises can be understood as a self-referential system: the assessment a(m), i.e. "how good is each author 'a' in the perception of the assessment method 'm'" is complemented by a conjugate assessment m(a), i.e. "how good is each assessment method 'm' in the perception of the author 'a.'" Such autopoietics create social dynamics that are typical for any closed systems.



favor sub-optimal perception and the persistence of local sub-optima. Clearly, power relations are an important ingredient on both a local and global scale, including the power of defining success criteria. In the author's view, escape from such a closed loop pictured in Figure 9 is feasible by proactive esteem and acknowledgement of other, foreign quality definitions and quality concepts. Escape is impossible when continuously residing within one's own frame of reference for quality.

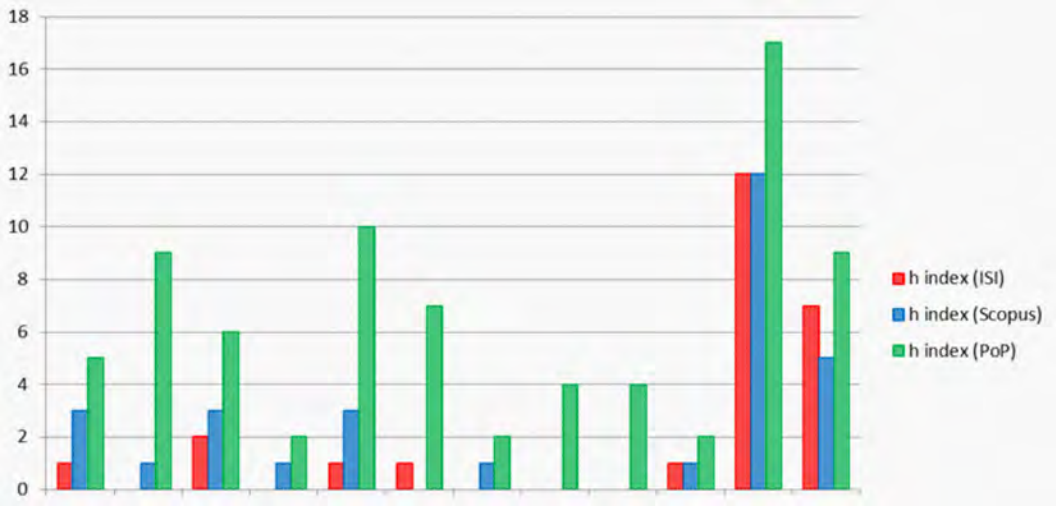
Mathematically speaking, a and m are conjugate functions producing two conjugate spaces: the a-space and the m-space. Assessors and assessees might decide to wish to live (only) in either of them – but they might also remember that in other walks of life they change their roles – this is exactly the approach of the negotiation game "Surfing Global Change" (Ahamer 2005, 2006). For design science (Dorst & Cross 2001), such conjugate spaces are known as problem space and solution space. For systems analysis (Ossimitz 2000), such structure is autopoietic and constructs itself – this might be a nice reference to pedagogic constructivism (Watzlawick, 1988). In such systems, the "construction of meaning" (e.g. of "quality") may depend on the smallest stochastic changes in initial preconditions; according to the teaching of chaos theory.

Assessment by Hirsch's h Index

As a consequence of the above-mentioned characteristics of the growing volume of databases, almost all metrics increase along the chain ISI – Scopus – PoP (Figure 7). Also, given the vast multitude of assessment methods and databases for each assessment and in order to combine authors' production with their reception, a need has arisen for a combined and dimensionless measure that takes into account both the number of documents and the number of their citations. The so-called Hirsch index or "*h index*" combines both parameters by yielding an index h if h of a scientist's papers have received at least h citations each (Figure 10). The h index aims to measure the cumulative impact of an author's output by looking at the amount of citation the author's work has received.

When contemplating Figure 10, naturally this h index grows markedly with the growing substrate of documents, notably along the chain ISI – Scopus – PoP (Figure 10); this is the case especially for non-technologists. Most strikingly, researchers in humanities and law might have an h index of zero or one with ISI but high h values with PoP; social scientists and economists have a middle position regarding this increase of h indices across databases; while natural scientists may even have similar h indices in all three databases, astonishingly enough, due to the thorough inclusion of their (even grey) literature in ISI Thomson. Quite naturally, the global outreach and world-wide auditorium will be very different for different outlets such as books, journal articles, presentations and informal papers. In the author's opinion, a mature scientist's profile should show assets in

Figure 10. Hirsch's h index based on three different data bases: ISI Thomson, Scopus, and publish or perish based on Google Scholar. The h index can be computed only for such databases that provide both document numbers and citation numbers.



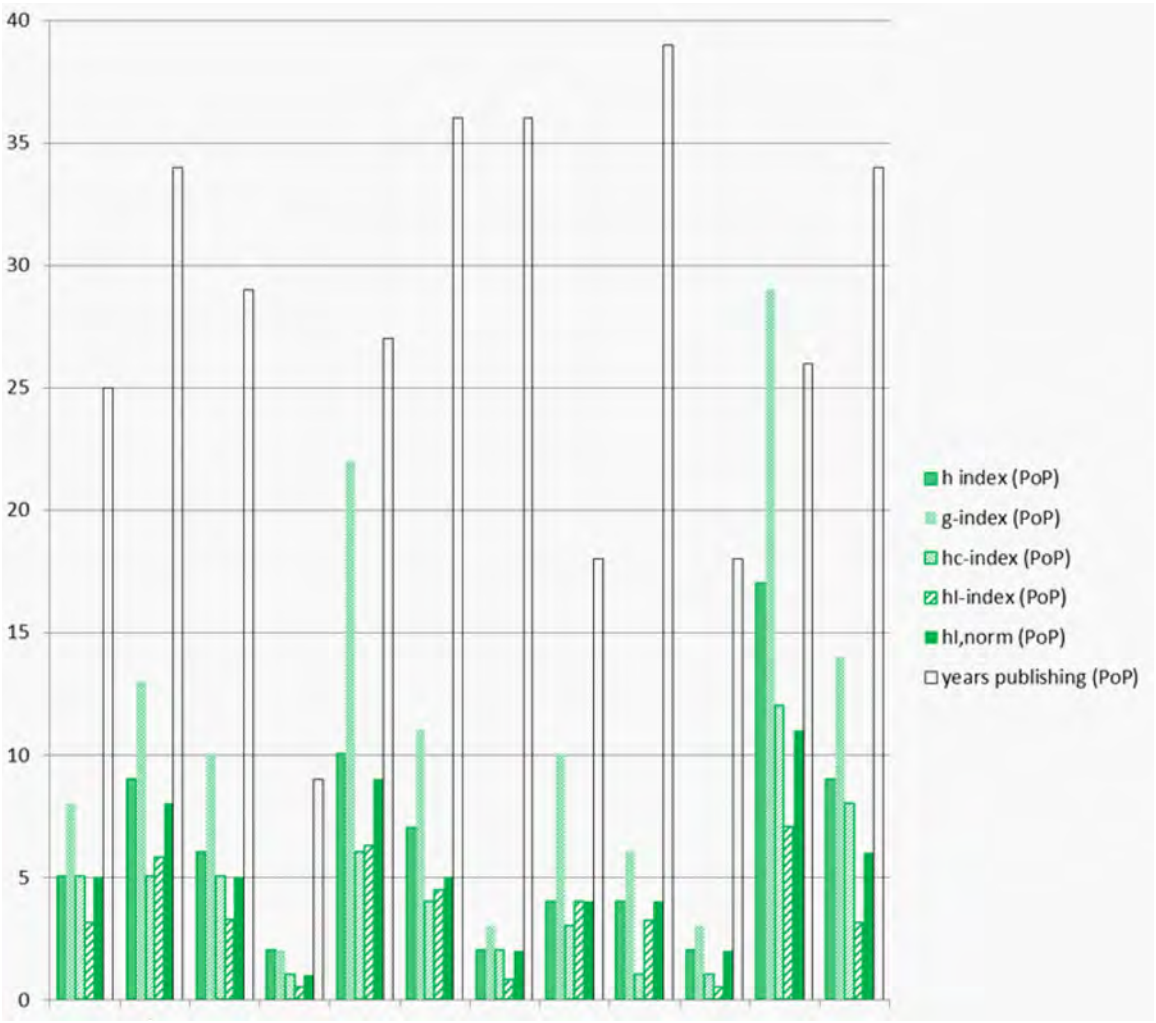
many such publication strategies – but should not be modest in all of them. Again, when taking an aggregated picture of all three h indices in Figure 10, 4 out of the 5 CuKo members score in the last places, their (vice-)presidents in the very last places. Strategically designing an innovative curriculum might often be considered as bringing lower honors than publishing papers – at least tacit selection criteria in force suggest this.

Several modifications of this quite telling h index have been proposed in literature and are also provided by the PoP tool (Figure 11). In order to better account for recent publications as compared to older ones, the g index was proposed (light green) but is considered as not very telling by the author; similarly the contemporary h index or h_c index (definitions, algorithms, detailed interpretations and caveats see in Harzing 2010). The individual h index or h_I index accounts for shared or multiple authorship (which might be a positive sign of team-orientation, or likewise be a deliberate strategy by authors to push their indices), as does the $h_{I,norm}$ index (preferred by the author, dark green in Figure 11)in a still more fine-grained manner. An in-depth description of all indices and their pros and cons can be found in the help function of the highly recommendable PoP program (Harzing 2007) or on Wikipedia.

The cascade of these indices shows a strong decline for several authors in Figure 11 which might be co-determined by technical sciences having more multi-author publications than other branches of science, especially humanities. Along the chain of ISI – Scopus – PoP, the author on average scores roughly in fourth, third and fifth place, i.e. rather in the middle of the field, and hence has no personal interest in favoring one metric over another.

Figure 12 adds two variables of general interest (based on PoP data), namely authors per paper (almost 3 in technical sciences, lowest around 1.5 in humanities) and papers published per year (averaged since first publication), maybe closer to personal diligence than other parameters. Again here, 4 out of the 5 lecturing CuKo members range in the last places. At universities, career building in general need not be correlated with high scientific output; such was proven again when a call

Figure 11. Modified h indices from the tool Publish or Perish (PoP, greenish), including the number of years an author has passed since their first publication (white)



for professorship recently turned out successful for a candidate who scored far behind the leaders in science-oriented metrics but who already had personal knowledge of the respective institute.

Attempting to Measure Diversity for Inter-Disciplinarity

According to (Wagner et al. 2011: 21)who reports Stirling's (2007) conceptualization of interdisciplinary quality criteria as Figure 13, an additional criterion for inter-disciplinarity is distribution among various disciplines for which a proxy might be the pie charts provided by Scopus listed in Figure 14, again without names in order to secure anonymity. Still other criteria are: roles of (co-)editor in journals, editorial board member, participating in and managing of international projects with a developmental approach, countries worked in for different institutions in diverse roles, own academic formation in several disciplines, affiliation to and cooperation with different, inter-paradigmatically relevant institutions, lecturing in diverse subjects and diverse disciplines at diverse

Figure 12. The PoP tool additionally provides the average number of authors per paper and the annual output of papers per year

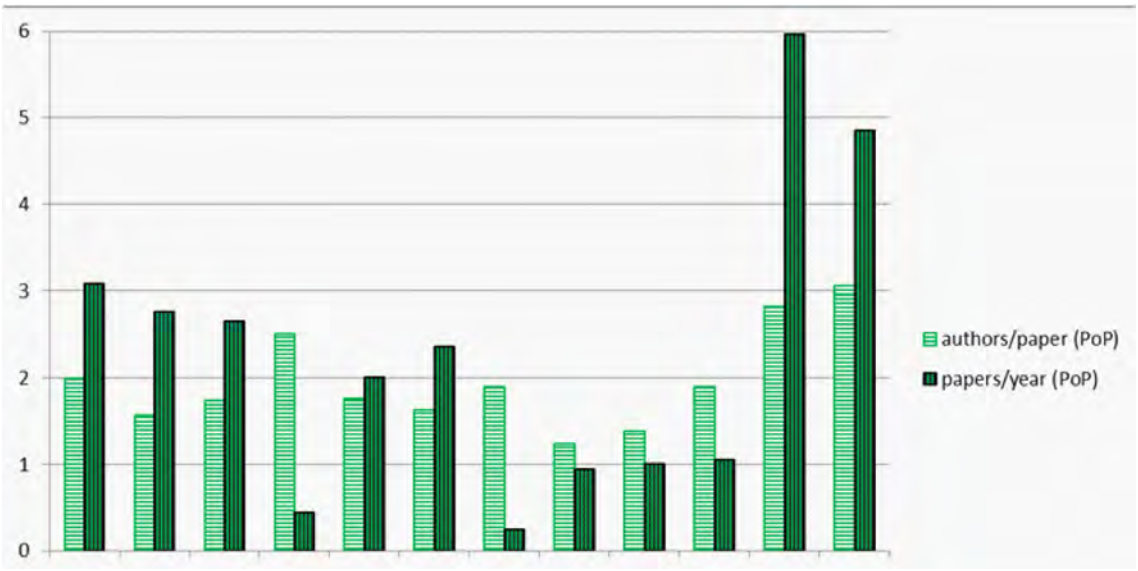


Figure 13. Schematic representation of the attributes of diversity based on Stirling's (2007) conceptualization (Wagner, et al., 2011, p. 21): variety, disparity, and balance. A proxy for the variety indicator might be given through Figure 14.

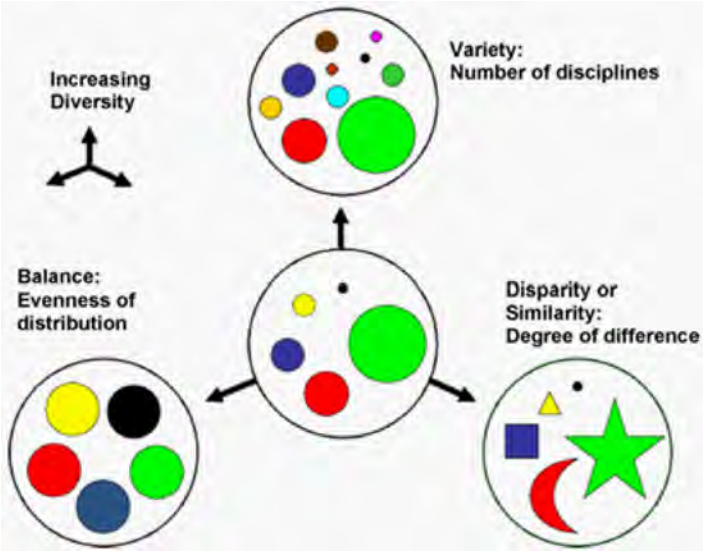


Figure 14. The pie charts from Scopus' "author analysis" tool graphically denoting the distribution of publications between different disciplines for all GS lecturers in 2011-12 ordered as in above figures. Colors are arbitrary regarding disciplines, just meaning consecutive order.

universities, have lived and coined multiple corporate cultures, performing outreach activities, didactic and pedagogic formation and achievement etc. – but quantitative charts are difficult to perform in these cases.

Figure 14 visualizes the multi-disciplinarity of authors by different colors: each color denotes a discipline (according to Scopus categories) in decreasing order of occurrence (orange, green, blue etc.). For the interpretation of such figures, evidently the definition, categorization, and granularity of disciplinary subdivision are highly critical for the appearing graphical impression. Also, these colors do not describe the effective interdisciplinary and inter-paradigmatic quality of the content of any single paper. In Figure 14, the lecturer with the lowest score had the highest administrative position for the GS curriculum in the given year. Sharing of power was experienced by some to be uncommon in this period. An inverse correlation between international bibliographic achievements and actual self-attributed power is apparent in this, and many similar, analyses.

In an attempt to produce impressive graphics quickly, one can always "introduce disciplinary diversity indicators to describe the heterogeneity of a bibliometric set viewed from pre-defined categories" or design "indicators of disciplinary impact by focusing on the intensity of knowledge streams between research fields" or "suggest that betweenness centrality can be used as a measure of interdisciplinarity" (Wagner et al. 2011: 21) or use spatial distances as an assessment tool (Witjes et al. 2012) without preceding in-depth analysis. However, acceptance of such exercises would be limited when assessing the deep quality of inter-paradigmatic understanding as such.

Critical Evaluation of Bibliometric Approaches

"Each approach may tell a useful story" is possibly a suitable final assessment on bibliometric attempts: Wagner et al. (2011: 25) speak up against the limitations to purely quantitative measures and metrics, but call for structural and process-oriented strategies of assessment that take into account complex, self-referential, inter-paradigmatic dynamics of what could be finally considered "academic quality": Γνῶθι σεαυτόν = know yourself – including a critical analysis about your own misconceptions about yourself.

Escape from the self-referential cycle of QA and related power attribution may quite profitably be achieved by proactive application of QA frameworks that are different from one's own; this means to exchange lenses and standpoints in an inter-paradigmatic manner (Figure 5 and Table 4). Mono-disciplinary sclerosis is undesired for such targets.

CONCLUSION AND RECOMMENDATIONS

This paper has been undertaken in order to facilitate transparent and internationally acceptable high-quality assessment to assure the quality of interdisciplinary curricula such as developmental, peace, environmental and global studies.

The literature analysis undertaken in first section of the chapter has yielded sufficient theoretical concepts on quality, inter-disciplinarity and QA methodologies for inter-paradigmatic university curricula to propose a framework for future QA: Figure 1 shows the general overview which has to take into account the input, procedure and output of higher education. Figure 6 proposes to include both curriculum mapping (against initial targets and aims) and course mapping (performance of individual lectures). Table 7 lists criteria, skills, and conditions for especially interdisciplinary curricula.

For transnational higher education it is found to be important to take on an inter-paradigmatic approach which means being able to think along conceptions of diverse stakeholders involved in the complex issues of development, global change and globalization. Such an approach practically means a collaborative and team-oriented performance of academic duties, and no reliance on administrative hierarchies.

The application of above findings for the innovative inter-disciplinary developmental curriculum "Global Studies" in section 2 includes a collection of learner-centered feedbacks and assessment procedures as well as bibliometric analysis. Documents and citations from three different bibliographic databases and derived metrics such as the h index permit quantifiable insight into the performance of lecturers which has to be complemented by social and structural information such as inter-paradigmatic competence, real-world experience from international developmental projects and didactics.

Options and limitations of bibliometrically based QA strategies were extensively discussed and changing frames of reference were recommended that span across disciplines.

The main recommendation for quality assurance in transnational higher education, especially in interdisciplinary curricula on global change and development, is professional clarity on targets that should most efficiently be monitored in a peer-oriented procedure involving assessors, lecturers, practitioners and university administration on an equal basis in a culture and atmosphere of collaboration. Limitation to discipline-oriented bibliometric metrics alone is not appropriate, as is limitations to implicit or explicit attribution of administrative or political power or financial sources in higher education. The present paper suggests that cutting-edge quality can be maintained and enhanced best in a culture of mutual esteem, respect, personal integration and orientation towards clear performance criteria previously agreed in consensus among older and younger contributors, from both the theory and practice sides of all disciplines.

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KEY TERMS AND DEFINITIONS

Curriculum Assessment: Means the quality assessment of university curricula regarding the quality criteria set out in literature and in this articlechapter.

Global Change: Is seen here as the long-term change in global patterns of social, cultural, economic and environmental systemic patterns that in the present epoch may take the form of globalization, but in other epochs exhibit different change patterns.

Global Studies: Are developmental university curricula dealing with globalization, international equity and respectful development.

Globalization: Is understood here as the slow but steady change in systemic patterns of global trade, economics, culture, society and behavior; triggered among other things by easier accessibility mediated through communication technologies.

Graz University: Is Austria's second-oldest (since 1585) and second-largest (over 30,000 students) university in its second largest city of Graz (260,000 inhabitants) offering almost all important curricula in its six faculties. The latest innovation of this public generalist university is the interdisciplinary, intercultural, interparadigmatic and interfaculty Master's curriculum "Global Studies",," operating since 2010.

Intercultural: Approaches combine different understandings resulting from the actors' entrenchment in different cultures and their adoption of differing values.

Interdisciplinary: Approaches combine understandings, models and views from different scientific disciplines.

Interparadigmatic: Approaches combine interdisciplinary and intercultural approaches; hence they respect both understandings stemming from different scientific disciplines and understandings from different cultural entrenchments.

ENDNOTES

1. Whereas the interesting literature review performed in the US by Spelt et al. (2009) used mostly literature bases provided by the more traditional US-based ISI Thomson retrieval system (SSCI, extended SCI, A&HCI; additionally ERIC), the present literature review used the literature base provided by more recently established Scopus.com (the European counterpart of ISI Thomson) that provides about twice as many journals, in-depth analytical tools as well as an extremely practical online option to search and directly retrieve full-texts of citing and cited literature.