Quality Approaches in Higher Education

IN THIS ISSUE:

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EDITORIAL

Giving the Body of Knowledge a Voice

Fernando F. Padró

As someone who has been studying how quality is defined in higher education and how its quality assurance mechanisms interpret the definitions, what is striking is the difference in perceptions from academics, educational professionals, and non-academics (employers, policy makers, regulators, and members of the community at large) regarding quality and quality assurance. Whether a person is what Boiral and Roy (2007) call a quality enthusiast or a dissident, the decision to become one or the other rests with perceived expectations based on regulatory compliance or, more realistically, his or her own view of what quality is in a college or university environment. Regardless of perspective, the aim of this journal, *Quality Approaches in Higher Education (QAHE),* is to create a venue that may be outside the comfort zone of many of the potential contributors (cf. Ibarra & Hunter, 2007) to provide a forum for all whose practice and/or research add to the understanding of quality and quality assurance in higher education. To paraphrase Quinn (2005), *QAHE* seeks to move the narrative of quality from a normal state to a fundamental state in which the conversation moves from what one "knows" to venturing beyond familiar territory, based on one's values, learning from this environment, and recognizing when there is a need for change.

Editor, Fernando F. Padró

The Journal's Focus

Quality as a model was declared a fad as far back as 2000 by Robert Birnbaum, but if it is a fad why is it that the ideas and tenets from the world of quality are driving the discussion in the accreditation/external review world? Look at how the language and ideas proposed by the *National Advisory Committee on Institutional Quality and Integrity* are framing change for higher education in the United States (Padró, in press b). Simply, in a world environment in which accountability expectations for higher education institutions and systems continue to grow because of perceived deficits (Dill & Beerkens, 2010), quality is based on policy steering (Padró, 2009; Dill & Beerkens, 2010). Quality assurance often is posited as part of a balance between external control and internal improvement (Danø & Stensaker, 2009), therefore placing discussions of academic and academic support matters in a quality framework only makes sense. *QAHE* was created to provide a forum for the body of knowledge in higher education from all sectors, and regardless of viewpoint, to discuss issues related to good and excellent practices and/or how programs and processes in higher education can be improved. It is intended as a venue where:

- academic staff (faculty) from the different disciplines present their findings and ideas related to performance issues;
- student service professionals and academics can discuss how student engagement and other campus practices performed in support of students can express their theories and findings;
- specialists in centers dedicated to the scholarship of teaching and learning can showcase their research;
- institutional researchers can inform the higher education community at large;

- other members of the campus community can share their work; and
- policymakers and external regulators can engage in the discussion of how to make higher education the best it can be.

Framing the Quality Literature in Higher Education

"The theoretical link between quality management practices and firm performance has not been clearly understood" (Linderman, Schroeder, Zaheer, Liedke, & Choo, 2004, p. 604). For example, there is little empirical evidence that institutional accreditation as practiced in the United States has been effective in assuring academic standards (Dill & Beerkens, 2010). There is James' (2005) cautionary observation that learner outcomes are potentially problematic because too much is expected from them while they may have the unintended consequence of limiting or restricting learning because it commodifies knowledge. Also, issues articulated by Geoff Scott's (2004) forces of change enter the conversation on external reviews; learner outcomes (especially the competencies these represent); student engagement and its nexus with satisfaction; access; opportunity/diversity; and globalization and internationalization of higher education. Assessment and evaluation form integral aspects of accountability within a quality framework; however, questions abound as to whether learning and its effects can be effectively measured quantitatively and if other forms of evidence will be recognized as sufficiently rigorous to get recognition as legitimate data. There are curricular and programmatic development and implementation issues as well as co-curricular support activities and approaches that are part of the quality discussion. So too are contradictions and tensions surrounding academic (professional) development (Lee & McWilliam, 2008), divergent faculty conceptions of "leading" and "management" in the area of learning and teaching (Marshall, Orrell, Cameron, Bosanquet, & Thomas, 2011), strategic considerations of scholarship of teaching and learning (Palmer, Holt, & Challis, 2011), and differing faculty (academic staff) evaluation approaches (Padró, 2011), among other salient meta-topics that can and should frame the quality literature in higher education.

Diversity in Research and Viewpoints

The question when discussing quality is, to quote Zemsky, Wegner, and Massy (2005), "[w]ere there a good definition of quality, were educational products designed and engineered, and if the academic workforce understood its role in achieving a quality product, would the result be a better educational product?" (p. 140). Therefore, we are not looking for any one form of research. Qualitative studies are as welcome as quantitative research papers. Conceptual papers, policy pieces, best practices, and case studies are welcome as well. The requirements these articles must meet are rigor, the ability to generate reader interest, timeliness, and the ability to expand the body of knowledge. In this regard, our outlook is based on what Bertalanffy (1968) observed about adding to the body of knowledge of systems:

> It may be preferable first to have a nonmathematical model with its shortcomings but expressing some previously unnoticed aspect, hoping for future development of a future algorithm, than to start with premature mathematical models following known algorithms and, therefore, possibly restricting the field of vision. (p. 24)

This journal wants to be a forum for different viewpoints discussing issues relevant to quality in higher education. The body of knowledge in higher education is more than what Foucault (1980) termed "a polymorphous ensemble of intellectuals who virtually all pass through and relate themselves to the academic system" (p. 127). Campuses are multi-disciplinary in nature because of the tripartite composition of a campus—academic affairs, business affairs, and student services—along with the many academic and professional disciplines taught. Therefore, *QAHE* must be interdisciplinary in scope and look for contributions from faculty and other professionals working on campus. Given the myriad structural permutations within a higher education institution in terms of function, mission (and in some instances covenant), personnel, and what is taught, what must be remembered is Maturana and Varela's (1992) observation that structural coupling and human dynamics "entails a reflection enabling us to see that as human beings we have only the world we create with others—whether we like them or not" (p. 246).

QAHE desires to be a journal that looks at quality from all aspects of higher education and from all different perspectives. For many, quality as a concept is not the issue. The approach, language, and model toward the concept are the issues. Those interested in quality cannot dismiss or ignore the view espoused at the beginning of the 20th century by Thorstein Veblen (1965/1918) who believed "the intrusion of business principles in the universities goes to weaken and retard the pursuit of learning, and therefore to defeat the ends for which a university is maintained" (p. 165). It is alive and well today (Aly & Akpovi, 2001; Felder & Brent, 1999). Many teachers in the humanities and social sciences believe that way. Some would even argue that the reliance on external funding has impacted the views of those pursuing research in the natural sciences (cf. Stokes, 1997). On the other hand, Feigenbaum (1993) implies that competition within systems reflects the international competition between the educational infrastructures of nations in relation to quality,

e.g., how campuses and systems develop work and teamwork knowledge, skills, and attitudes. This feeling was anticipated by Clark Kerr who wrote in 1963 that "more than ever, education is inextricably involved in the quality of a nation" (p. 87). While adoption has been slow and piecemeal (Kanji, Tambi, & Wallace, 1999), quality management and assessment are more widely accepted today (Kitagawa, 2003), even if there are "fundamental differences of view of the appropriate relationship that should be established between higher education institutions and their external evaluators" (European Association for Quality Assurance in Higher Education, 2005, p. 11). To paraphrase Brubacher (1977), scholarly expertise is being called on to extend the concepts of industrial production to mitigate the social evils existing as a result of the existing economic order.

Veblen's view reflects why many individuals within academics look at quality and quality assurance from an ultra-pessimistic perspective of minimizing regret, playing what economists call a minimaxing strategy (Padró, in press a). This feeds into the often-found traits of problematic preferences, unclear technologies, and fluid participation (Cohen, March, & Olsen, 1972). Consequently, "[w]hat becomes tightly or loosely coupled in this symbolic system is related to a mixture of collegial interactions, bureaucratic structures, ongoing coalitions, chance, and cognitive processes by which people make inferences and judgments under conditions of uncertainty" (Birnbaum, 1988, p. 160). Under these conditions, even small misunderstandings about quality and quality plans have the potential to form inaccurate perceptions if key ideas about the system are not understood (Folkerts, 2007). As a consequence of the dynamic, sometimes seemingly contradicting, and interdisciplinary nature of higher education, this journal has to embody Niels Bohr's theory of complementarity posited in 1927 to focus on what the different articles and perspectives have in common rather than focusing on the discrepancies. According to Bohr (1963):

> … it must be recognized that such evidence which appears contradictory when combination into a single picture is attempted, exhausts all conceivable knowledge about the object. Far from restricting our efforts to put questions to nature in the form of experiments, the notion of **complementarity** simply characterizes the answers we can receive by such inquiry, whenever the interaction between the measuring instruments and the objects forms an integral part of the phenomena… Likewise we must be prepared that evidence, which obtained by different, mutually exclusive… arrangements, may exhibit unprecedented contrast and even at first sight appear contradictory… (pp. 5, 12)

The Rewards of Publishing in *QAHE*

What are the rewards of publishing in *QAHE?* First and foremost there is the reward of sharing information and advancing the discussion and the body of knowledge of quality approaches throughout the campus. Hopefully, there is a professional reward of recognition and professional advancement. This last point is a particular challenge for academic staff seeking upward mobility through the academic *cursus honorum* because an interdisciplinary venue for publication is not always recognized as an "appropriate widget" depending on type of institution or national protocols dictating how to account for scholarship. Some colleges and universities are comfortable following the more expansive definition of scholarship as proposed by Boyer (1990), but others prefer the more traditional singular-focused approach toward publication that recompenses specialized research in a subject area and discourages ancillary interests in the field. Such a mindset has created problems for many academic staff who are interested in the teaching and learning aspects of their discipline. Similarly, those interested in evaluating teaching face the same challenge. If the metaprofessional model of teaching suggested by Arreola, Theall & Aleamoni (2003) holds, the many dimensions of teaching in higher education become a legitimate subtopic within the disciplines. For all of the rhetoric at the national and international levels about the importance of teaching and considering teaching as important as research, academic recognition is typically lacking. The same holds for those individuals interested and/or involved in external review activity within the campus. External reviews require academic staff input and participation. Their output needs to be recognized as well.

As someone who has been intimately involved in the tenure and promotion process of faculty at teaching institutions and involved in a number of external institutional and program reviews in the United States over the years, I have seen the aforementioned challenges first hand. What is striking is the "star chamber" quality of the processes and decisions impacting academic staff performance recognition. The best way to describe the attempt at countering the secretive nature of decisions and deliberations is what Weick (1995) calls sensemaking, simply because academic staff make strategic choices based on extracted cues that may be plausible but not necessarily accurate. For those involved in the decision making, *QAHE* commits itself to recognition in the various journal indexes and to climb the so-called ratings ladder as expeditiously as it can be managed. The journal is about quality and thus it strives for excellence on its own. It is a relatively new journal, yet, it is one that seeks to become a more visible voice in higher education. For those academic staff seeking a publication venue, it is our goal to make the journal a

recognized place for people in different disciplines to share their work. For researchers whose area(s) of interest do not really have a home, for example, those involved in the scholarship of teaching and learning at campus centers or improving the doctoral studies experience, we want to make sure you have a place that will be interested in your work.

The talk about academic staff is not meant to minimize contributions from other campus professionals. The opposite is the case. As a proud, long-standing member of the National Association of Student Personnel Administrators (NASPA), I want to invite student services professionals to consider publishing with us. Quality as a concept and as a model is embedded in the topics represented in the field's research agenda as proposed by NASPA's Q-list and continuing efforts at identifying the future direction of research in the student services. So much is happening in the sector that it is important for student personnel professionals to share their practices and research so that they, too, contribute to shaping and expanding the body of knowledge relating to higher education. The same holds true for institutional researchers and other individuals performing research within colleges and universities to better inform the internal and external stakeholders of current developments. We also welcome submissions from accrediting bodies and regulatory agencies at different government levels because their perspective and activities are now integral to the understanding of colleges and universities at the institutional as well as systems level. The reality is that many of these professionals within campuses and outside them have their own publications and venues for promoting discussion; yet, *QAHE* wants to consider itself as another setting for their practices, research, and ideas because of what these professionals do offer to the overall body of knowledge in higher education. The goal for the journal is a simple one, to be a recognized repository of excellence through the publication of articles that give a voice to the different sectors within higher education.

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This issue presents some of the changes to the journal that we will be implementing during this year. We have been listening to feedback from contributors and readers alike and are making changes based on what contributors and readers want to see as soon as it is practical. For example, this issue provides a new look and articles that are longer in length than before to provide more in-depth coverage of the issues raised by the authors' research. The author guidelines have been revised to reflect the longer word limit for articles we will accept for review and publication. You will also note the inclusion of an editorial informing the readership of issues of concern or interest to the editorial team regarding the journal and higher education quality in general. We will continue to publish editorials as developments in higher education quality warrant or when noted scholars in the field feel they want to inform our readership about a particular concern, issue, or significant research that is worth all of our attention.

—*The Editorial Team*

A case study of a residential college devoted to the sciences provides insight on improving student success in the sciences.

Lyman Briggs College: An Innovative Living-Learning Community for STEM Education

Ryan D. Sweeder, Kathleen A. Jeffery, and Aaron M. McCright

Abstract

Michigan State University's Lyman Briggs College (LBC) is a residential, undergraduate college devoted to studying the natural sciences with an understanding of the history, philosophy, and sociology of science. LBC is the longest-running program of its kind at a large U.S. research university and offers its students the close-knit living-learning community of a liberal arts college and diverse resources and opportunities of a research university. LBC has succeeded in developing a strong residential science learning community that supports its students by creating a culture of engagement in science and employing student-centered learning techniques. This has resulted in a first-year retention rate of approximately 95% (92% in STEM) and a six-year university graduation rate of approximately 85% (more than 70% in STEM with equal retention of male and female students). LBC can therefore provide a useful case study for approaches that lead to student retention and success in STEM fields.

Introduction

Significant research has gone into understanding student motivation in college and retention in a major. Astin examined the student experience extensively and reported that one of the most important factors influencing students' choices about remaining in college is the connection they feel with the institution and their fellow students (Astin, 1984, 1993). Considering further Lave and Wenger's (1991) view of learning as a social construct, the environment that incoming potential science majors experience has a huge impact on their choice to remain in the sciences. Astin additionally identified that a student's desire to make a theoretical contribution to a scientific field was positively associated with "the hours per week spent talking to faculty outside of class, enrolling in an honors program, tutoring other students, working on an independent research project, assisting faculty in teaching a course… a number of interesting possibilities for how students' science interests might be strengthened" (Astin, 1993). Research specifically within the sciences has also suggested that connecting undergraduates with authentic research experiences helps maintain interest in the pursuit of a science major (Russell, Hancock, & McCullough, 2007; Seymour, Hunter, Laursen, & Deantoni, 2004). Providing all students with real undergraduate research experiences early in their careers has been a challenge; however, there are examples of success at large institutions for larger enrollment classes (Full, 2010; Weaver et al., 2006).

Concerns over the need for more graduates in science, technology, engineering, and mathematics (STEM) fields have led to national calls for reform of teaching and learning in undergraduate science education: The President's Council of Advisors on Science and Technology's (PCAST) *Engage to Excel Report* (2012), *Boyer Commission Report* (1998), and *Rising Above the Gathering Storm* (2007). Each report stresses the importance of engaging students in the authentic practice of science and improving student-faculty connections, as such out-of-class interaction has been found to be extremely impactful for undergraduate students (Strong, 2009). Similarly, they recognize that science students must be

prepared for authentic problem solving in real-world, interdisciplinary settings, which requires that students better understand the connections between science and society (Goldey, 2008). These calls for reform reinforce the need to rethink the student experience especially in the early years to attempt to maintain and even strengthen student interest in the sciences (National Science Board, 2003). Even though students majoring in STEM fields are more likely to complete a bachelor's degree than are students in other majors (DesJardins, Kim, & Rzonca, 2002; Pascarella & Terenzini, 2005; National Science Board, 2012), Seymour and Hewett (1997) reported that 40 to 60% of undergraduates from a representative sample of universities leave the STEM fields—especially among women and students of color (Carnevale, Smith, & Melton, 2011).

One method to improve undergraduate science education is the creation of residential colleges or similar forms of learning communities (Bean & Kuh, 1984; Tinto, 1997; Zhao & Kuh, 2004). These residential learning communities have great impact by blurring "the boundaries between students' academic and social lives, and the evidence indicated clearly and consistently that they succeeded" (Pascarella & Terenzini, 2005). In studying three differing living-learning communities in a single institution, Stassen (2003) found that two of the three communities had statistically positive impacts on grades and retention after controlling for pre-college academic success predictor variables. These settings provide the kinds of out-of-class, student-faculty interactions that have been shown to have positive impacts on students' academic, personal, and social development (Strong, 2009) and give strong indication for how to improve undergraduate education and retention.

This article focuses on Lyman Briggs College (LBC), a residential science college, as a model for cultivating student success and retention in STEM fields. This article describes the curriculum including impacts on student retention, summarizes the students' experiences assessed via student surveys, discusses lessons learned, and provides key recommendations for developing high-impact, science-based residential colleges.

Lyman Briggs College: A Model Community

Founded in 1967 at Michigan State University (MSU) with the mission of bridging the divide between C.P. Snow's "two cultures" of the sciences and the humanities (Snow, 1959), the LBC is a residential, undergraduate college devoted to studying the natural sciences in their historical, philosophical, and social context. LBC offers its students the best of both worlds: the close-knit living-learning community of a liberal arts college and resources and opportunities of a large research university. The faculty—active and accomplished scholars focused on undergraduate education—span the sciences from astrophysics to zoology including the fields of history, philosophy, and sociology of science (HPS). For more than 40 years, LBC has educated scientists to understand both the fundamental scientific and mathematical context of their disciplines in a societal context. By interlacing academics, residential life, and student services, LBC is able to fulfill its educational philosophy that those sharing an interest in the sciences will benefit from learning and living together.

Annually, 625 first-time, first-year students enter LBC intending to earn a bachelor's of science degree in STEM or HPS. Students self-select into the college through their application for undergraduate admission to MSU with no special requirements or costs associated with the program; it is open to all entering students on a first-application priority. LBC has nearly 1,900 total students, and all first-year students are required to live in the residence hall where LBC classrooms, laboratory, faculty, staff, and administrative offices are located. LBC majors are affiliated with 17 departments across the Colleges of Natural Science, Engineering, and Agriculture and Natural Resources. The faculty of LBC consists of natural scientists (biologists, chemists, mathematicians, and physicists) and social scientists (historians, philosophers, and sociologists). The interactions between these groups provide excellent opportunities for LBC to engage students in all aspects of science and experience a wider range of potential science careers. Since each faculty member also has a joint appointment in a disciplinary department, the faculty can provide insight and advice to students regarding their academic pursuits.

The Lyman Briggs Curriculum

Nationally, 90% of students who leave the sciences cite poor teaching as one of the primary factors in their departure (Seymour & Hewitt, 1997). However, research from the field of the scholarship of teaching and learning (SoTL) has helped identify practices that can help change these discouraging patterns. "High-impact" teaching and learning strategies can greatly increase student retention in science majors (Bransford, Brown, & Cocking, 2000; Johnson, Johnson, & Smith, 1991). The LBC curriculum strives to use these learner-centered teaching techniques to provide students with a solid foundation before they focus on a specific major, see Table 1. Through active and collaborative learning, initial courses help students understand the nature of scientific reasoning, evidence, and knowledge, and instructors strive to demonstrate the relevance of course material to real-world issues (Gutwill-Wise, 2001). They not only introduce field-specific concepts, theories, and methods, but also demonstrate the inter-relation of various

Table 1: Courses Typically Taken by LBC students

Student year	Usual courses taken through LBC	Courses taken outside LBC
First	Intro to HPS, Biology I, General Chemistry I & II, Mathematics (Calculus or other appropriate)	1-3 general education courses
Second	Biology II, Physics I & II	Organic Chemistry 2-6 general education courses
Third	1-2 HPS upper-level courses	4-7 major or general education courses
Fourth	0-1 HPS upper-level courses, senior seminar (Capstone Course)	5-8 major or general education courses

scientific disciplines: e.g., how chemical principles underpin biological processes. Students discuss course material with each other at a conceptual level to deepen their understanding and engage in science collaboratively through course-based research projects.

Class sizes are designed to be smaller than equivalent university courses and provide a greater level of individual attention from faculty (Kokkelenberg, Dillon, & Christy, 2008). The introductory laboratory courses employ inquiry-based experiments that focus on scientific methods and argumentation to help students understand the process of science (Bransford et al., 2000) rather than confirm pre-existing "right" answers. The laboratory courses strive to help students learn how scientists communicate through the development of the skills necessary to write journal-style lab reports that illuminate their scientific reasoning skills. Students also begin to learn scientific presentation skills through the creation and display of research-based scientific posters. This highly diverse range of pedagogies helps reach all types of students and engage them in learning the basic skills essential for all scientists.

Three courses in the HPS field strengthen the science education. In an initial HPS course, students are introduced to key questions, concepts, theories, and methods in HPS. Students then extend and apply their foundational HPS knowledge to more advanced courses in at least two substantive fields of HPS of science, technology, environment, and medicine. These courses help students gain a more complete understanding of the fields of science in which they are gaining technical proficiency by exploring the interdisciplinary, professional, and civic

nature of science. HPS instructors regularly prompt students to engage with each other to confront their prior knowledge and reflect upon how and why they know what they know. By their very nature, HPS courses break down the boundaries erected in traditional disciplinary science courses (cf. Snow, 1959), illustrating, for example, sociologically that scientists have never divided neatly along the lines we draw when teaching undergraduate courses. HPS courses also expose students to the human implications of scientific research, thereby discouraging students from thinking about science as merely vocational knowledge, and instead seeing it as a professional career that demands more than the mastery of a bounded body of technicalities.

The overall curriculum is designed to engage students with learner-centered pedagogical techniques and assessment methods to impact a diverse group of learners. Science courses that include pedagogical approaches used in LBC such as active learning benefit all students, but disproportionately increase retention of underrepresented students (Herreid, 1998; Froyd, 2009). Much like the Colorado Learning Assistant model (Goertzen, Brewe, Kramer, Wells, & Jones, 2011), LBC employs undergraduate learning assistants (ULAs) to assist in teaching many of the courses. This approach builds on the long-held research model of identifying and engaging undergraduate students early in their careers in a core aspect of the science disciplines. Highly talented students are introduced into the culture of teaching science and work closely with faculty members in instruction as early as in their second year. Much like those students undertaking research, some of the ULAs use this as an opportunity not only to improve their understanding of the core science, but also to explore teaching as a potential career option.

As a means to formatively assess each course, Lyman Briggs faculty formally adopted the research-validated Student Assessment of Learning Gains (SALG) (Seymour, Wiese, Hunter, & Daffinrud, 2000) in 2011 as the primary means for collecting student feedback about their course experience to better evaluate their own teaching. This research-validated instrument asks students to evaluate their improvement on specific skills, abilities, or knowledge, shifting assessment of the classroom from "teaching" to "learning" and better addressing the key question about the efficacy of classes: what did students learn? Similarly, the faculty employs the Reformed Teaching Observation Protocol (RTOP) (Sawada et al., 2002) as a means to assess the learning environment that an instructor fosters within the classroom. This instrument provides a resource for mentoring committees and strengthens a culture that openly discusses challenges and opportunities in promoting student learning.

The Lyman Briggs Experience

The Lyman Briggs experience profoundly influences how students critically think about science and the world around them. More than just a set of classes, it involves creating a culture of science engagement with students, faculty, advisors, and staff engaging with each other around science.

The residential nature provides an environment conducive to building this science-laden culture. The inclusion of the LBC classrooms, faculty, and student services within Holmes Hall is critical to the Lyman Briggs experience, providing out-of-the-classroom interaction between community members. These informal interactions humanize the faculty and staff in the minds of the students and allow them to serve as better mentors. Significant discussions take place during class times, advising appointments, office and walk-in hours, as well as informally in hallways, the cafeteria, and elsewhere throughout Holmes Hall (Strong, 2009).

The culture of science is further strengthened by the wide range of co-curricular opportunities that help foster learning and engagement in the Lyman Briggs community and beyond. Such activities include the LBC Research Symposium, the freshman class book debates, community service, and the LBC Speaker Series as well as involvement in student groups (e.g., Briggs Multiracial Alliance, Women in Science, and STEM Alliance). Students also help shape the future of LBC and MSU through their involvement in governance (on all LBC standing committees and many university student groups) and in their participation in the faculty hiring process.

Active research is another key component of the Lyman Briggs culture, as demonstrated through the consistent engagement of students in scientific research. The LBC Research Symposium involves more than 700 student participants annually as they present research from faculty-led research labs, coursework, and honors option projects. Each year more than 70 LBC students participate in the University Undergraduate Research and Arts Forum. LBC faculty work closely with students in their research labs, involving nearly 70 undergraduates in research and leading to between 15 and 22 students coauthoring papers and a similar number presenting at regional/national conferences each year. Many other students work with non-LBC faculty as well. These numbers testify to our efficacy in developing a culture of scientific research and investigation that reaches beyond the classroom.

Methods for Evaluation

Our students are well situated to provide information about the success of our program. With MSU Institutional Review Board approval, a standardized survey was administered anonymously online to 1,712 LBC students in spring 2012 to gauge the student experience. The survey included closed-ended questions. The measurements included usage of facilities, features of residence living, curriculum, and the general teaching and learning environment experiences in LBC. Students had three weeks to complete the survey and were requested twice via email to prompt completion. Four hundred and forty six respondents completed the survey fully, representing a 26% response rate with equal distribution across class standing. Females were statistically more likely to respond than males (34.6 versus 19.2%; p<.05 using z-test of proportions) consistent with previous literature (Sax, Gilmartin, & Bryant, 2003).

Results were analyzed using SPSS 20.0. To better understand the differences between the male and female experiences and potential reasons for differential retention, a z-test of proportions was used to determine the statistical significance of differences between male and female responses. Retention data was obtained from the MSU registrar.

Students were determined to qualify as a STEM graduate if they earned a degree in mathematics; natural sciences (including physical sciences and biological/agricultural science); science or math education; engineering/engineering technologies; health professions and related clinical sciences; and computer/information sciences. This broader definition of STEM tends to more accurately reflect the participation of women and minorities in STEM-capable careers (George-Jackson, 2011).

Evidence of Success
Student Survey Supports LBC's Teaching Model

The students overwhelmingly showed support for a number of the pillars of the LBC teaching model through the 2012 survey as shown in Table 2. For example, regarding the use of reformed teaching practices, 82.8% of Briggs students indicated that their LBC STEM courses had a "moderate amount" or "great deal" of influence on their success in upper-level STEM courses in their major as illustrated in Table 2. Also, 96.8% indicated that class size and 73.3% indicated that the inquiry-based nature of the LBC's labs added either "a great deal" or "a moderate amount" to their LBC experience. Students also indicated moderate or great benefit from their interactions with Briggs faculty both inside (91.5%) and outside (88.6%) of the classroom and with their peers (92.9%) as illustrated in Table 2. For both the class size and preparation items, female students were significantly more likely to indicate a greater positive response, consistent with previous literature results (Kokkelenberg et al., 2008).

Table 2: Results of 2012 Student Survey

LBC characteristic	Percent of respondents indicating factor added a "great deal" or "moderate amount" of quality to their LBC experience	Percent of Males (N=137)	Percent of Females (N=309)
Smaller class sizes	96.8	83.8	98.2*
Inquiry-based labs	73.3	72.3	73.8
Intro STEM classes leading to success	82.8	77.9	85.0*
Living in Holmes Hall	88.4	85.2	89.8
Interaction with faculty in class	91.5	90.3	91.9
Interaction with faculty outside of class	88.6	85.5	90.0
Interaction with peers/classmates	92.9	91.7	93.5
Integration of HPS with science and math	67.4	63.4	69.3
Statement	**Percent of respondents who indicated they "somewhat agree" or "strongly agree"**	**Percent of Males (N=137)**	**Percent of Females (N=309)**
The Briggs curriculum has given me opportunity to do real science	84.2	82.2	85.2
The Briggs curriculum is helping me graduate timely with a BS degree	70.6	71.2	70.3
LBC promotes an inclusive science learning environment	82.1	71.9	86.7*
How much did your LBC courses help you…	**Percent of respondents who indicated a "moderate amount" or a "great deal"**	**Percent of Males (N=137)**	**Percent of Females (N=309)**
Develop scientific skills	87.0	84.9	87.9
Understand relationship between science and society	84.7	85.6	84.2
Communicate science to others	83.8	81.5	84.9
Activity	**Percent of Senior respondents who participated in activity (N=115)**	**Percent of Males (N=36)**	**Percent of Females (N=79)**
Research with professor outside a course	48.7	55.6	45.6
Study abroad	38.3	36.1	39.2
Work as learning assistant	24.3	25.0	24.1
* z-test of proportions indicates significant difference between males and females at the 0.05 level.			

The student survey also provided strong evidence that the LBC culture encourages students to participate in many high impact co-curricular activities. Of the 115 senior respondents, 48.7% had conducted research with a professor outside of a lab course, 11.3% had co-authored a publication with a faculty member, 38.3% had participated in a study abroad program, and 24.3% had worked as an undergraduate learning assistant as listed in Table 2. These percentages may be inflated by the self-selection of student respondents, yet the independently verifiable study abroad rate of the classes from 2008 to 2010 ranged from 31% to 41%. Interestingly, 67% of non-freshman respondents still felt that greater opportunities for research would significantly enhance their experience,

suggesting an unmet demand for authentic research opportunities.

High Persistence Rates at LBC

The value of the LBC experience, which supports its students in their transition from high school to college and through to graduation, is evident in the retention and graduation rates. The first-year retention rates at MSU for LBC's incoming classes between 2003 and 2008 were consistently around 95.5%, and the six-year graduation rates at MSU for the LBC classes entering as freshmen between 2001 and 2006 were between 82% and 86%. This compares to 74-77% for MSU overall (MSU, 2012) and 57% for life science majors nationally (PCAST, 2012). Sixty percent of matriculating LBC students graduated within four years, almost double the national four-year graduation rate of 31.3% (NCES, 2012). Figure 1 shows how the incoming class of 2006 progressed through MSU in six years. It is remarkable that more than 70% of incoming LBC students persist in the STEM fields, with nearly equal retention of male and female students. This high rate helps LBC fill the expected 17% growth of STEM occupations between 2008 and 2018 (Langdon, McKittrick, Beede, Khan, & Doms, 2011). The survey results support that these high first-year retention and graduation rates are a result of the learner-centered teaching and science culture developed with LBC.

Assessment of recent student graduation trends indicate that incoming female LBC students graduate at an equivalent rate to their male counterparts (+/- 2% on the six-year graduation rate). This is evidence that LBC helps female science students pass the critical first and second years where most institutions lose females from science majors at higher rates than they lose males (Astin, 1993; Atkin, Green, & McLaughlin, 2002). Presently, minority students in LBC graduate at a slightly lower rate than the LBC average (0-12% lower), yet at a higher rate than MSU's average. These data, combined with a 95% first-year retention rate at MSU, suggest that LBC is providing a broadly supportive environment that leads to success across the demographic diversity of incoming students. For each of the graduating classes of 2008 to 2010, nearly 80% of LBC graduates have continued on to some form of post-baccalaureate

Figure 1: Six-Year Path of LBC Freshman Class of 2006
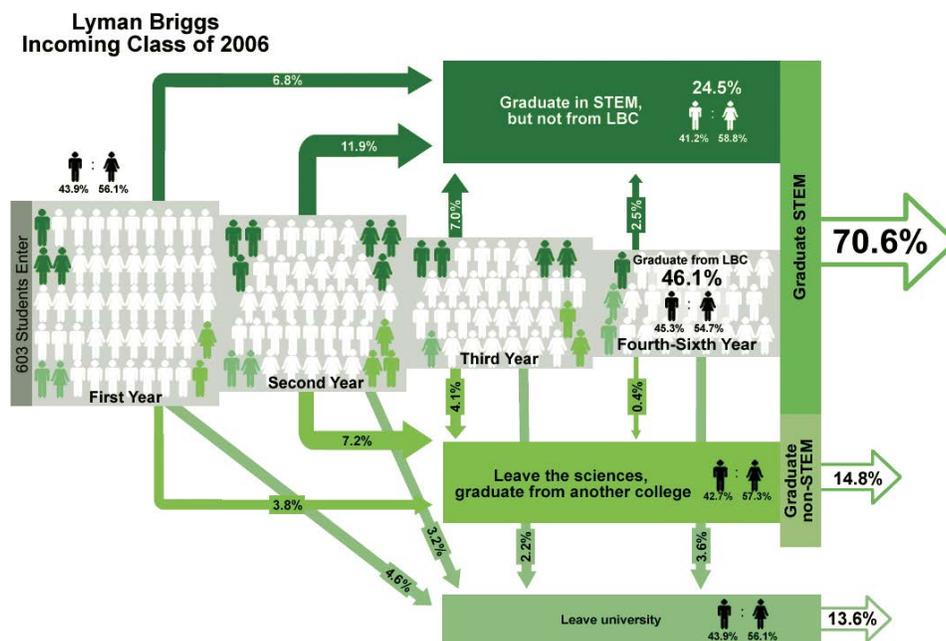
education. This is indicative that a large number of our students have fostered an interest in continuing their education and have achieved a sufficient level of academic success to be accepted by a subsequent institution.

Conclusions

Many institutions are recognizing the benefits of an educational setting such as LBC. Stanford University has recently created a Science, Technology, and Society program which, similar to LBC, strives to bridge Snow's two cultures divide (AAC&U, 2012). The lessons taken from LBC highlight the importance of using learner-centered teaching pedagogies in combination with the creation of a strong science culture. Although the creation of a robust residential college such as LBC can be an extensive undertaking, in the case of MSU it has been a strong investment that has continued to pay dividends for almost 45 years by creating a setting with the 95% first-year retention and 85% six-year graduation rates. The student survey strongly indicates the importance of any designed science living-learning community to:

- Utilize learn-centered teaching techniques

- Engage students in the research culture of science

- Provide meaningful student-faculty and student-student interactions

- Employ smaller introductory science courses to create an inclusive environment for female students

Creation of programs with these key elements may help meet the demand for quality STEM graduates that all institutions of higher education must work together to fill.

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**Ryan D. Sweeder,
Ph.D., Michigan
State University**

Ryan D. Sweeder, Ph.D. *is an associate professor of chemistry in the Lyman Briggs College at Michigan State University. He earned his Ph.D. at the University of Michigan in inorganic chemistry and chemistry education. He is a member of MSU's Center for Research on College Science Teaching and Learning (CRCSTL) and is co-director of the STEM Learning Laboratory. His research group explores gender inequity in science education, retention of STEM students, and the impact of curricular interventions on learning. He can be reached at sweeder@msu.edu.*

**Kathleen A.
Jeffery, B.S.,
Michigan State
University**

Kathleen A. Jeffery, B.S. *is a recent graduate of Lyman Briggs College at Michigan State University. She earned a BS in biological sciences for secondary education and was a semi-finalist for the 2012 Knowles Science Teaching Fellowship. Jeffery is in the process of earning her teaching certificate. She is interested in how students understand scientific concepts and the effect of alternative pedagogical approaches on their learning. She can be reached at jeffery7@msu.edu.*

**Aaron M.
McCright, Ph.D.,
Michigan State
University**

Aaron M. McCright, Ph.D. *is an associate professor of sociology in Lyman Briggs College and the Department of Sociology at Michigan State University. He earned his Ph.D. in sociology at Washington State University. He examines the influence of inquiry-based learning projects on students' scientific and statistical knowledge, skills, and attitudes. He was a 2007 Kavli Frontiers Fellow in the National Academy of Sciences, and he received the 2009 Teacher-Scholar Award and the 2009 Curricular Service-Learning and Civic Engagement Award at MSU. He can be reached at mccright@msu.edu.*

Critical Event Narrative Inquiry in Higher Education Quality

Patricie Mertova and Len Webster

Abstract

The paper is another one of a series of works describing a research study concerning the academic voice in higher education quality in England and the Czech Republic (Mertova & Webster, 2009). To investigate the academic voice in higher education quality, a critical event narrative inquiry method was employed, and that is the focus of this paper. A significant feature of the method was eliciting critical events related to higher education quality in professional practice of academics and higher education leaders. The research uncovered a number of similar issues and concerns in higher education quality voiced by academics and higher education leaders in both countries. Some culture-specific issues related predominantly to Czech higher education quality were also uncovered.

Keywords

Quality Management, Educational Quality

Quality in Higher Education

Quality has moved from a marginal to a central issue in higher education as a result of heightened political control combined with stricter control over financing the sector, the growth in the number of students in higher education, and changing stakeholder and student expectations. The migration of quality to the the center stage of higher education during the past 20 or so years, however, has brought with it particular perspectives regarding its approach and use. For example, quality assurance processes have become control-focused and management-driven (Lomas, 2000; Jones, 2003). In the literature, works by Barnett (1992), Harvey & Green (1993), Morley (1997), Lomas (2000), and Harvey (2004, 2005) make the case that monitoring in higher education disguises the emphasis on accountability rather than on enhancement even when scholars such as Birnbaum (2000) and Green (1994) point out the unsuitability of such approaches in higher education (Mertova & Webster, 2009). Missing is a generic understanding of the human-centered elements or "soft factors" that contextualize quality processes along with the academician's perspective on how to make universities even better, a voice that has had little impact in the development of these processes (Kogan, Bauer, Bleiklie, & Henkell, 2000; Blythman, 2001; Newton, 2002; Lomas, 2007; Cartwright, 2007). Studies by McInnis, Powles, & Anwyl (1995), Newton (2002), Anderson (2006), Lomas (2007), and Cartwright (2007) argue for the importance of the academic voice to be heard and for more research in this area.

This paper focuses on quality in two higher education systems: English and Czech. The choice of these particular two systems was guided partly by the lead researcher's familiarity with the systems but also by the fact that these systems are historically and culturally very different, and to see whether these differences would impact the approaches and main trends in quality. The emphasis of the discussion is on the qualitatively-based methodology used to capture the academic voice.

Background

The data gathered through the methodology of critical events was based on research performed to capture the academic voice in higher education quality in the UK and Czech Republic. The UK system was selected because it was one of the first countries in the world to create a formal quality assurance system for its higher education system (Westerheijden et al, 1994). The study eventually only focused on the English system and not the whole of the UK higher education system that also includes the Welsh, Scottish, and Northern Irish higher education systems (Tapper, 2007). The Czech higher education as a system was selected because of its cultural and historical differences from the English system. First, the Czech higher education system was significantly influenced by the so-called Humboldtian tradition from the German system that places teaching and research as part of educational achievement (Rozsnyai, 2003; File & Goedegebuure, 2003; File, Hauptman, Herlitschka, Kristensen, & Weko, 2006). The second reason for selecting the Czech system was the impact that Communist rule had on its development (File & Goedegebuure, 2003).

Methodology

The research concerning the academic voice in higher education quality was conducted using a critical event narrative inquiry. Critical events in professional practice of academics and higher education leaders were elicited through semi-structured, face-to-face interviews with the individuals (cf. Mertova & Webster, 2009).

Narrative inquiry

Over the last two decades, narrative has gained momentum as both a phenomenon and a method across a wide range of disciplines from philosophy, education, theology, and psychology to economics, medicine, biology, and environmental science. Narrative inquiry is set in human stories of experience. It provides researchers with a rich framework through which they can investigate the ways in which humans experience the world depicted through their stories (Carr, 1986; Dyson & Genishi, 1994; Bruner, 1986).

Narrative inquiry has depicted human experience and endeavors from ancient times. It records human experience through the construction and reconstruction of personal stories. It is well-suited to address issues of complexity and cultural and human centeredness because of its capacity to record and retell events that have been of most influence on us. Such issues play a significant role in many areas of human activity, including higher education (Webster & Mertova, 2007).

People make sense of their lives according to the narratives available to them (Dyson & Genishi, 1994; Webster & Mertova, 2007). Stories are constantly restructured in the light of new events because stories do not exist in a vacuum but are shaped by lifelong personal and community narratives. Narrative allows researchers to present experience holistically in all its complexity and richness. It illustrates the temporal notion of experience, recognizing that one's understanding of people and events changes (Herman, Manfred, & Ryan, 2005; Conle, 2000; Riessman, 1993).

Connelly and Clandinin (1987, 1988, 1990, 2000) have been prominent in adapting narrative inquiry for educational purposes. Their work offers an introduction of the field to teachers and teacher educators. They have also pioneered narrative inquiry as a research method, and it appears that they have coined the term narrative inquiry.

Even though the original methodological resources for narrative inquiry were provided by literary theory, Webster and Mertova (2007) found no single narrative inquiry method that predominates, but rather a number of methods dispersed into individual disciplines. Webster and Mertova suggested that the most likely reason was the fact that the individual narrative inquiry approaches have been impacted by other theoretical underpinnings of the various disciplines. They outlined a critical event narrative inquiry approach, which arguably would be applicable in a wide range of disciplinal settings. The research described in this paper further refined the methodology by applying to an investigation of academic voice in the area of higher education quality.

Critical events

The essence of the critical event narrative inquiry method is in the identification of critical events in professional practice of individuals (Webster & Mertova, 2007; Mertova, 2008); in the case of this research it was the academics. Consistent with Mertova and Webster (2009), a critical event is defined as an unplanned and unstructured event that significantly impacts the professional practice of an academic (Webster & Mertova, 2007; Mertova, 2008). The event can be internal or external in nature and can be either as a result of professional practice or from other personal experiences. The impact of this type of event on an academic's perception of their professional practice might have entirely or considerably changed his or her perception of what he or she does or even the lens through which the world is seen. Consequently, a critical event can only be identified retrospectively (Webster & Mertova, 2007; Mertova, 2008) and has a unique, illustrative, and confirmatory nature regarding the identified phenomenon. As an example of how

data of this type can be collected, for this study, critical events in the professional practice of academics were elicited through semi-structured, face-to-face interviews with the individuals.

Critical events in professional practice of academics were further distinguished as critical, like, and other events in accordance to the degree of significance and uniqueness characteristics. Stories that were collected through narrative inquiry interviews were then analysed accordingly. A more detailed description of the criteria is described in detail in Mertova (2008).

A critical event was an event which was unique, illustrative, and confirmatory in nature in relation to the studied phenomenon. An event which had a similar level of significance as a critical event, however, not as unique as the critical event and which further illustrated, confirmed, and/or repeated the experience of the critical event was labelled a like event.

A review of the like events was useful in confirming and/or broadening issues arising from the critical event (Webster, 1998). Further, confirmatory events that may or may not have taken place at the same time as the critical and/or like events were referred to as other events. Typically, such events related to other background information which may have revealed the same or related issues. These other events were interwoven in the analysis of the critical and like events (Webster, 1998). Critical, like, and other events may have occurred within the narrative of a single interview, but more often would have occurred across a number of different interviews.

Distinguishing critical, like, and other events provides a way of approaching the complexity and extent of data that might be collected using a qualitative research method. A common question in qualitative research is how to manage the amount of collected data. Identifying and distinguishing individual events provides one way to assist the researcher in this (Webster & Mertova, 2007).

Design

Per Mertova and Webster (2009), six pilot interviews were conducted initially in Australia (four interviews) and England (two interviews) to refine the methodology and interview questions. Three of the interview participants were female and three male. Four of the pilot interviews were conducted at three large research-intensive universities in Australia, and two at one "old" university college (so-called old universities gained university title before 1992) in England. The pilot interview participants represented the disciplines of education, political science, and law. Five of the interview participants were senior leaders with at least 15 years of experience in higher education while one interview participant was less senior with six years of experience.

The pilot stage of interviews was followed by the main set of interviews. The total number of main interviews conducted was 30: 11 in the Czech Republic and 19 in England. Seven of the main interview participants were female and 23 were male.

Interviews in England were conducted at two old university colleges and four "new" universities (new universities gained university title after 1992). In the Czech Republic, interviews occurred at two large research-intensive universities. The decision was made to concentrate on interviewing academics from the social sciences and humanities: education, higher education, law, history, English, English literature, Russian, Slavonic studies, Australian studies, political science, sociology, medicine, psychology, media studies, geography, quality, and management. Twenty-two interview participants were senior academics and/or higher education leaders with at least seven years of experience to more than 20 years; the remaining eight interview participants had fewer years of experience in higher education. Interviews, on average, took between 30 and 45 minutes. They were recorded, transcribed, and line-numbered to allow tracking of particular issues back to the original transcripts), and analysed to extract the critical events in the interviewees' professional practice. Interviewees were given pseudonyms to protect their identities.

Face-to-face interviews were augmented by extensive literature and documentation reviews concerning the nature of English and Czech higher education systems and quality practices in English and Czech higher education to provide additional context to the stories interviewees were providing. Short surveys were also conducted to gather biographical information and to identify the academic/professional backgrounds of the interviewees.

Findings

Critical Events in Professional Practice of Academics and Higher Education Leaders

Looking for critical events in professional practice of academics and higher education leaders in Czech and English higher education quality identified at least one type of critical event in each interview with Czech and English academics and higher education leaders. The individual events were distinguished according to their level of criticality, using criteria of criticality for critical, like, and other events.

This paper presents examples of each of the event type to give an idea of the kind of events related to higher education quality that the study identified. Due to the limited space, only examples of the different event types described in the Czech context are provided. Examples from the English academic and higher education leaders are reported in Mertova and Webster (2009).

Example 1—"Critical" Event: Tomas

Tomas was an associate dean for education in a faculty of a research-intensive university in the Czech Republic and an associate professor in political science with more than 10 years of experience in higher education. Tomas' story referred to the changes in higher education instigated by the political change-over related to the so-called Velvet Revolution in November 1989 in what was then Czechoslovakia. The event had a significant impact on Tomas, Czech higher education, and the entire Czech society. This event brought considerable interest and motivation into Tomas' academic life (then a student), providing an example of the kind of qualitative changes happening in Czech higher education after 1989. Tomas was a student of Russian and history, and he related:

> "I remember the first lectures by people I might have heard of, but who could not lecture until 1989. All of a sudden, you were 'confronted' by these people who really had the knowledge and the ability to 'pass' it on. But even those who could lecture under communism, but perhaps were lecturing just on Soviet literature or something like that, suddenly liberated themselves and started lecturing on, e.g. Classical Russian literature, or on the 'forbidden' authors… (VII/CR/Tomas: p. 4, 158-164)

> At the same time, we managed to get rid of those who had no place in the university environment. I remember, for instance, one compulsory seminar we had in history run by the deputy of the Communist party regional committee, who was a professor, of course, but who had never published a single academic piece. But [after 1989], luckily, he very quickly realized that he had no place in the university." (VII/CR/Tomas: p. 4, 168-172)

The event was identified as critical because of its unique, illustrative nature of the issues concerning higher education quality within the Czech context. The issues were also highlighted as critical by the interviewee, and they were distinguished as critical by the criteria of criticality (described in detail in [author], 2008).

Example 2—"Like" Event: Ivo

Ivo was a vice-chancellor's executive officer at a research-intensive university in the Czech Republic. He had seven years of experience in higher education, which included his experience as a student representative in the university senate. He was responsible for organizational and legal affairs in the vice-chancellor's office and for an internal audit of the university. Despite his young age, Ivo held a senior leadership position in the university.

The like event described by Ivo concerned the unification of a credit system throughout his university. Ivo believed that the like event (related to unification of study rules throughout his institution) described by him was key in terms of making the university environment more transparent and responsive to student needs and subsequently to academics' needs. The event was identified as like because its level of significance was comparable to a critical event, except it repeated the experience outlined in the critical event.

Example 3—"Other" Event: Richard

Richard was a director of an office for international studies in a research-intensive university in the Czech Republic. He was previously a senior lecturer and also head of the English department at the same university. Overall, he had more than 25 years of experience in Czech higher education.

The other event concerned the process of internationalization that was being debated in Richard's institution. Richard outlined it as an ongoing process or debate in the institution. To him, the process of internationalization was closely related to quality, and there were a number of issues associated with the possible approaches to internationalization with underlying implications for quality. Richard pointed out one specific aspect of quality enhancement related to internationalization in the Czech higher education culture, which was the introduction of programs taught in English. The event was identified as other because it provided further information on the range of measures of quality enhancement, which Richard saw gradually being introduced into Czech higher education, in particular to his university.

Emergent Issues and Concerns in English and Czech Higher Education Quality

The research uncovered a number of significant issues identified by both English and Czech academics and higher education leaders (Mertova & Webster, 2009, p. 149):

- focus on innovation and change in higher education;
- collegial approach and sharing of opinions and values;
- value of research in teaching practice;
- quality in higher education stemming from personal involvement of the academic in the educational processes;
- hierarchical approach to research and teaching; and
- benefit of exposure to different worldviews (within different disciplines).

Identifying a narrative based on critical events showed a disconnect between current higher education quality enhancement practices in both countries and what academics in the UK and the Czech Republic considered important. Some of the issues uncovered in this research were highlighted by the academics as

having a negative impact on the quality enhancement processes in their respective higher education systems. The similarity in identified themes suggests a potential for wider relevance of such trends among a broader range of higher education systems worldwide.

Based on the common issues identified by this research, Mertova (2008) proposed a framework for a human-centered approach to quality enhancement in higher education. This framework featured:

- attention to human-centered aspects of higher education quality;
- a need for a collegial approach and reflection on the purposes of quality evaluation processes;
- an effort to afford equal value to teaching and research; and
- a focus on innovation and change.

There were also culture-specific issues uncovered, primarily in regard to the Czech higher education system. These culture-specific issues may have reflected certain trends and features commonly found in other higher education systems in the Central and Eastern European region. In this respect, applying Mertova's (2008) framework to the identified culturally-specific Czech issues may have provided insights of potential relevance to other Central and Eastern European higher education systems (cf. Mertova & Webster, 2009). What the methodology suggested was a quality framework for these countries that needs to concern itself with:

- the significance of transparency in educational processes;
- the need for a fundamental change in the style of pedagogy in higher education institutions (to focus more on thinking processes and reasoning);
- the need for a more systematic move toward a student-centered approach across the whole higher education system;
- the need to address the factor of pressure on Czech academics to publish mainly in English to receive international recognition; and
- the need for education of Czech academic staff to enable a broader and better understanding of the concept of higher education quality in the context of the Czech higher education system.

The only aspect that might be considered as culture-specific to English higher education quality "is the lack of regard for the academic voice in English higher education quality policy development, which was highlighted by the English academics and higher education leaders" (Mertova & Webster, 2009, p. 150). This issue was practically not raised in the Czech interviews.

This was probably because higher education quality policies in the Czech Republic were typically government driven (Van der Wende & Westerheijden, 2003). However, because of their experiences under the Communist regime, Czech academics and higher education leaders probably would not let their autonomy and voice to be undermined.

Conclusion

The main aim of this paper was to outline a critical event narrative inquiry method and illustrate how the method was utilized in a study of academic perspectives in English and Czech higher education quality. It was argued that this narrative inquiry method is particularly well-suited to investigations of complex, human-centered, and culture-specific environments, such as quality in higher education. Due to space limits, only one example of each type of event—critical, like, and other was provided and only from the Czech higher education context. For a more detailed explanation of what the respondents had to say, please refer to Mertova & Webster (2009). Using narrative inquiry to identify and categorize the importance of critical events helped identify a range of issues common to both the English and Czech higher education systems as well as issues that were more culture-specific, particularly in the case of the Czech system. These issues were summarized as the main research findings. To paraphrase Connelly and Clandinin (1990), the central task of the methodology was to grasp the perspectives of people who are both living their stories and reflecting upon their experiences by listening to themselves talk through and explaining these events. In so doing, what was found were themes on how quality is a contested issue (Newton, 2002) from the point of view of those who are responsible for making quality happen within the university environment. There was a range of perspectives on quality (from antagonism through to support), although the dominant concern was one of appropriateness.

Critical event narrative inquiry method is currently proposed for research conducted outside of the domain of higher education. There is a potential for capturing important evidence within different types of complex environments (such as business, government, and public sectors) that would otherwise be lost. The findings from this research encourage this point of view because of its emphasis on the participant's perspectives.

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Acknowledgements

**Dr. Patricie Mertova,
University of Oxford**

Dr. Patricie Mertova *is currently a research fellow in the Department of Education at the University of Oxford, UK. Her current research focuses on internationalisation and quality in higher education. Her Ph.D. research investigated academic perspectives on higher education quality. She has research expertise in a broad range of education settings, including the fields of higher education, higher education quality, sociology of education, adult education, educational development in law, and linguistics. Her previous background is in the areas of linguistics, translation, cross-cultural communication, foreign languages, literature, and cultural studies. For more information, contact Mertova at patricie.mertova@education.ox.ac.uk.*

**Dr. Len Webster,
Tertiary Education
Quality and
Standards Agency**

Dr. Len Webster *is currently a director, Regulation and Review, Tertiary Education Quality and Standards Agency (TEQSA), Australia. Prior to this he was an audit director with the Australian Universities Quality Agency (AUQA). He has experience in teaching and learning in higher education in areas of quality development, e-learning, distance education, educational development research, educational strategic policy and planning, qualitative research methods, and academic staff development. He has also played an active part in the learning design and development of the Future Research Leaders Program, an initiative of the Group of Eight universities and the Commonwealth Government, Australia. For additional information, you may contact him at leonard.webster@teqsa.gov.au.*

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