

The Anatomy of Academic Rigor: The Story of One Institutional Journey

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Abstract The National Survey of Student Engagement (NSSE) draws from student feedback to gauge the level of academic challenge at particular institutions (Kuh 2009). Inspired by attempts to understand the implications of NSSE data on other campuses (Payne et al. 2005), a cross-disciplinary research group at our institution developed a multidimensional model of academic rigor. We argue that learning is most rigorous when students are actively learning meaningful content with higher-order thinking at the appropriate level of expectation within a given context. The model allows instructors and institutional decision-makers to aim towards increased levels of academic rigor in classrooms, departments, and across campus.

Keywords Academic rigor · National Survey of Student Engagement · Active learning

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Colleges and universities across the United States use the National Survey of Student Engagement (NSSE) to measure, among other things, the level of academic challenge on a given campus. Data from the NSSE point to some questionable trends in U.S. higher education. For example, many students do not spend much time studying outside of class, writing papers of twenty pages or more in a semester course, or reading even forty pages in a week (Arum and Roksa 2011). These data are part of a growing trend suggesting that institutions are failing to equip students with the skills necessary to engage in meaningful learning across a variety of contexts (Barrett 2012). After reviewing 2006 NSSE results, our institution made improving the level of academic challenge the cornerstone of its new five-year strategic plan. The first of five strategic directions mandated that faculty members “engage students in *rigorous* (italics added) and transforming learning experiences, both in and out of the classroom, heightening their aspirations and empowering them to succeed as citizens in a challenging world” (<http://www.buffalostate.edu/strategicplanning/documents/stratplanfinal.pdf>). In 2009, a cross-disciplinary research group formed to study how this might be achieved. A product of our nearly three-year investigation into the nature of academic rigor at our institution is a multidimensional model that can help faculty members discuss, conceptualize, and promote academic rigor.

At various points in the research process, the terms *academic challenge* and *academic rigor* were treated as synonymous. The researchers decided to frame the investigation using the term “academic rigor” because our institutional language includes the mandate to “engage students in more *rigorous* learning.” According to our model, promoting academic rigor requires attending to a number of overlapping elements, including active learning, meaningful content, higher-order thinking, and appropriate expectations. Academic rigor can operate in a variety of contexts (e.g., assignments, course, a course of study, or institution). These contexts can be considered rigorous along some dimensions and not others (e.g., students can be actively learning course content without yet engaging in higher-order thinking, or students can engage in higher-order thinking below course expectations). However, we argue that academic rigor is illustrated when students are actively learning meaningful content with higher-order thinking at the appropriate level of expectation in a given context. Because the model offers the prospect of articulating, discussing, and making changes along each of the dimensions, it can empower faculty members with the tools necessary to transform student learning experiences both inside and outside the classroom.

Existing Conceptions of Academic Rigor

The NSSE was created in 1998 to understand the collegiate experience from the student’s point of view (Kuh 2001). The survey draws on student perceptions of their own behavior as well as broader institutional factors, such as course requirements and campus environment (Kuh 2009). Data are clustered around five sub-scales: (1) level of academic challenge, (2) active and collaborative learning, (3) student-faculty interaction, (4) enriching educational experiences, and (5) supportive campus environment (Kuh 2003). While the entire 42-question survey contributes to a broad understanding of student engagement, we elected to focus on the eleven questions within the academic challenge sub-scale, including questions concerning the number of books assigned, the number of pages students are asked to write, and whether or not a course emphasizes analysis, making important judgments, and applying theories. According to NSSE designers, the instrument is premised on the following assumption:

The more students study a subject, the more they know about it, and the more students practice and get feedback from faculty and staff members on their

writing and collaborative problem solving, the deeper they come to understand what they are learning and the more adept they become at managing complexity, tolerating ambiguity, and working with people from different backgrounds or with different views (Kuh 2009, p. 5).

However, the validity of the instrument has been called into question. Some argue that the NSSE benchmarks fail to represent campus understanding of academic challenge adequately (Payne et al. 2005) and fail to predict student outcomes accurately (Gordon et al. 2008). Others argue that “the benchmarks provided an excellent jumping off point, but for the institution to fully take advantage of the promise of student engagement, that institution must be willing to closely scrutinize the data and determine what engagement looks like for them” (LaNasa et al. 2009, p. 330). This article does not directly critique the NSSE, but describes one institution’s journey to discover the anatomy of academic rigor on its campus; and we hope that this journey is of interest to others.

Most agree that academic rigor work must move beyond busy work (Bruner 1966, 1996; Graham and Essex 2001), but the precise nature of the concept is a matter of debate. Consider, for example, several themes found in the literature. Academic rigor seeks to “pose dilemmas, subvert obvious or canonical ‘truths’ or force incongruities upon our attention,” (Bruner 1996, p. 127) and *Embrace Contraries* (Elbow 1986). Rigor increases as learners move from mere comprehension to higher-order thinking (Braxton 1993; Nordvall and Braxton 1996; Payne et al. 2005) and conceptual transformation (Cope and Staehr 2005; Prosser and Trigwell 1999; Trigwell and Prosser 1991). Rigor draws attention to meaningful content (Jensen 2005; McKeough et al. 1995; Parkes 2001) and prepares students for transfer learning (McKeough et al. 1995; Parkes 2001). As a result, rigor emphasizes progress through time and process over product (Brooks and Brooks 2001). Moreover, rigor encourages students to take ownership of their own learning and builds the capacity for lifelong learning (Bain 2004; Finkel 2000; Light 2001). Each of these elements emerged during our investigation of academic rigor within our particular institutional context.

Background and Methodology

Faced with an institutional mandate to increase the level of academic rigor, this project began as an attempt to uncover the underlying structures, functions, and features of the concept. We hoped that this understanding would help us find ways of accurately measuring rigor as well as provide strategies for increasing rigor at our public, urban, comprehensive institution of approximately 12,000 students. Our research protocol was approved by our institution’s human subjects review board.

Initial conversations with the faculty suggested that everyone seemed to believe that they “know it [rigor] when they see it,” but few felt confident in their ability to define it. Appealing to the NSSE indicators was a good way to begin the conversation. Faculty members reported that the existing items on the survey needed to be prioritized (Payne et al. 2005) and that other indicators of rigor were missing altogether. Preliminary conversations with the faculty grew into a series of breakfast conversations attended by 30 faculty members, who were encouraged to discuss features and advantages of academic rigor as well as ways of assessing whether or not appropriate levels had been achieved. Participants in these pilot conversations described features that would later become part of the model (e.g., maintaining high standards and the mastery of a variety of higher-order thinking skills).

Focus Group Interviews

In summer 2010, the authors conducted focus group interviews. This approach was chosen because it provides group interaction, thereby allowing participants to compare their opinions and experiences; and it offers researchers a broader view than individual interviews (Morgan 1998). In response to a campus-wide invitation, twenty-two faculty volunteers, representing a cross-section from each academic unit on campus, participated in 75-minute focus group sessions. Five focus groups were scheduled with four or five members in each group. As stated in the research protocol, participants were reminded that their answers would be treated confidentially and that they could choose not to answer a question at any time. The interviews were recorded to facilitate transcription and analysis.

The focus group participants were asked to show their perceptions of items as *key indicators of rigor, moderately important, or less important* by applying sticky labels with NSSE indicators of level of academic challenge at the center, middle, or outer ring of a bulls-eye chart. Respondents were then asked to reflect on their experiences when they had been students that they would characterize as being academically challenging as well as those elements that made for a rigorous class experience. Next, they were asked to discuss their own lesson plans that they believed resulted in academically challenging/rigorous learning experiences for their students. We encouraged faculty members to share experiences with instructional strategies and activities that engaged students, stretched their knowledge, and encouraged skills development. We asked participants if they had used strategies such as grades, extra credit, group work, case studies, role plays, technology, or the creative arts to motivate and enhance student learning and, if so, which of these or other methods they had found to be successful. Lastly, we queried participants about the larger institutional forces that advance or impede a rigorous academic culture at our College. The focus group method yielded rich narratives about setting rigorous course expectations, instructional strategies to promote higher order thinking, and active learning.

Campus Survey

In fall 2011, we streamlined our focus group questions to create an anonymous 17-item survey that was distributed electronically to all faculty members. Six of the questions were designed to describe the sample demographically; the remaining twelve queried respondents about the relative importance of various indicators intended to measure academic rigor. Within two weeks, 104 faculty members from across all academic units responded to the survey, which represents about 23 % of the total faculty. Respondents ranged in academic rank and years of teaching experience. The median years of teaching experience was the 6–10 year range. The most frequently reported academic rank was associate professor. Many respondents taught classes in both general education and their major discipline.

Workshops

In fall 2011, the research team offered two one-hour small group workshops to explore applications of the emerging model of academic rigor. Six faculty members participated. A variety of scheduling issues, including the timing of the workshops within the semester and other activities on campus, partially explain the small number of participants. While the number of participants was small when compared to the overall size of our faculty on

campus, the workshops were built on the results of our findings in the campus-wide survey and focus group interviews. The aim was to foster conversation on the model. After a brief presentation of some preliminary findings and cursory description of our multidimensional model, participants were asked to reflect on a series of prompts in order to apply the model to a particular course context. The goals of the workshop were twofold. First, we hoped that the faculty would engage the model and use it to think through decisions made about their assignments, courses, and academic programs. Second, we hoped to collect information concerning how the various dimensions of academic rigor might be expressed in particular disciplinary contexts. Participants discussed their particular application of the model with the group and the workshop facilitators.

Analysis and Findings

Focus group transcripts were analyzed using an iterative process of comparative analysis (Glaser and Strauss 1967). One researcher conducted the first round of reading using an inductive process to identify emerging themes. After multiple discussions of these themes, a codebook comprised of nine codes was developed. Two other researchers independently coded the transcripts.

After each step of the data gathering process, discussions were held among the four researchers to highlight similarities, contrasts, divergent findings, and questions. Through this process we looked to see where faculty perceptions aligned or diverged. From this, we derived a “line-of-argument synthesis” (Noblit and Hare 1988) that allowed us to draw inferences about faculty perspectives of the characteristics of academic rigor. For example, when asked to recall their own experiences as a student in rigorous classes, one participant spoke about the high level of expectations in an abstract algebra class: “You got one point for every proof you completed correctly. Every single detail and spelling had to be correct... there was no partial credit... That for me was a new level of rigor... I’ve never been graded that way before.” Another focus group participant spoke about a philosophy class in which she had been “forced to argue the opposing view... the professor had organized panels where students discussed points of view and applied their readings to their arguments. You had to be much more prepared as well as working with other people which is also very challenging.” This latter example shows the intersections among active learning, high standards, and higher-order thinking. Other themes emerged in a similar fashion.

When asked to rank various elements of the NSSE, participants in our focus groups responded that the ability to synthesize ideas, apply theories, and make judgments about important ideas were far more important indicators of academic rigor than the mere number of pages assigned to read or write. The campus survey supported this initial finding. In particular, 65 % of respondents indicated that “key indicators” of academic rigor were the extent to which (1) coursework emphasized analyzing elements of an idea, experience or theory; (2) coursework emphasized making judgments about the value of information, arguments, or method; (3) course assignments emphasized applying theories to practical problems or new situations; (4) student coursework emphasized synthesizing and organizing ideas, information, or experience into more complex interpretations and relationships. In contrast, respondents ranked the following as moderately important: (1) the number of written papers or reports fewer than 5 pages during the school year; (2) the number of written papers or reports between 5 and 19 pages during the school year; (3) the number of assigned textbooks...during school years; (4) asking students whether they thought they worked as hard as they could.

Participants considered the number of written papers or reports of twenty or more pages during the current school year to be the least important component of academic rigor. This suggests that what a student learns to do with a reading or in a paper (e.g., analysis and making important judgments) is more important than how many books are assigned and how many pages a student must write. It is worth noting that 78 % of respondents reported that the “number of hours a week students spend on class preparation” was also considered to be a key indicator of academic rigor. Respondents reported that student preparation is a necessary precondition of academic rigor (e.g., it is difficult to discuss material for which students have not prepared). In short, the faculty members responding to the survey and those participating in the focus groups were essentially in agreement: Higher-order thinking, which requires students to judge data sources critically, to analyze information and positions, to apply theory to practical problems, and to prepare ahead for class were deemed key indicators of academic rigor.

A Multidimensional Model of Academic Rigor

Our qualitative and quantitative analyses revealed at least four primary dimensions of academic rigor: active learning, meaningful content, higher-order thinking, and appropriate expectations. Our analysis found that academic rigor occurs when these elements overlap. It is possible for a course or course assignment to be rigorous along some dimensions and not others (Graham and Essex 2001). Suppose, for example, that a student memorizes the important terms at the end of the chapter. While the content is meaningful and these terms are important building blocks for future learning, the mode of learning found in mere memorization is passive; and the student has not yet engaged in higher-order thinking. It might also be the case that a student becomes enthralled in a discussion of concepts that turn out to be peripheral to the course. The student is actively learning but is learning content that is not particularly meaningful with respect to course learning objectives. The goal, however, is for students to be learning core course content actively (see Fig. 1).

Rote learning of important terms can give students the vocabulary necessary to engage meaningful content actively. Similarly, vigorous discussion of peripheral (perhaps less challenging) material can prime students for the discussion of more meaningful content. Identifying elements of rigor in this way can facilitate the scaffolding of assignments to ensure that students are moved towards active learning of meaningful content. However, even if a student’s understanding of meaningful material has progressed since the beginning of the semester, it might still be the case that the student falls short of the learning expected at a particular point in the course (see Fig. 2).

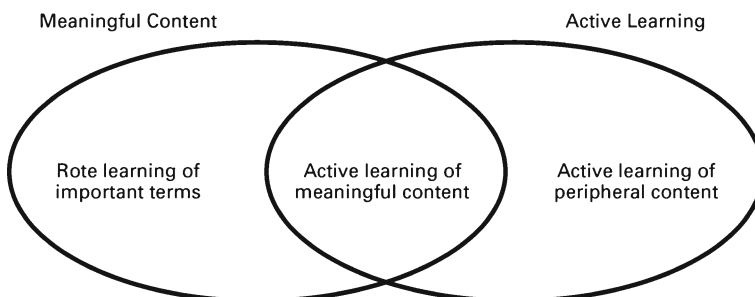


Fig. 1 Overlap between meaningful content and active learning

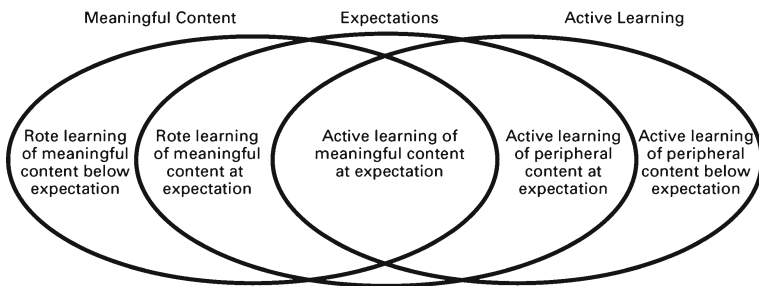


Fig. 2 Overlap between meaningful content, active learning, and expectations

The goal is for students to be actively learning meaningful content at the appropriate level of expectation given a particular point in the course, but many instructors want students to move beyond mere comprehension towards higher-order modes of thinking (see Fig. 3). Therefore, the ultimate goal is for students to be actively learning meaningful content with higher-order thinking at (or above) the appropriate level of expectation (see Fig. 4).

Figures 1, 2, 3, and 4 demonstrate some of the ways in which these dimensions can overlap and at least some of the ways the context (e.g., assignment, course, or course of study) can be rigorous along some dimensions and not others. This list is, however, not meant to be exhaustive. It is worth noting, for example, that each of the dimensions could be sub-divided. For example, expectations can come from a variety of sources (Bursuck 1994; Exley 2002; Hayes et al. 1997). Faculty members have particular expectations of their students as well as expectations of themselves as instructors. Students have expectations of their instructors as well as expectations of themselves. Additional expectations come from academic disciplines, departmental culture, accrediting agencies, and institutional environments. Each of these expectations can overlap (both individually and collectively) with each of the other dimensions of academic rigor.

Similarly, course material can be meaningful for a variety of reasons. Instructors may have a particular conception of what is most fundamental to the course. This conception is shaped by the instructor's disciplinary training, departmental values, and institutional culture. The nature of core concepts in the course will depend on the level of the course as well as whether or not it is part of a disciplinary major or a part of the general education program.

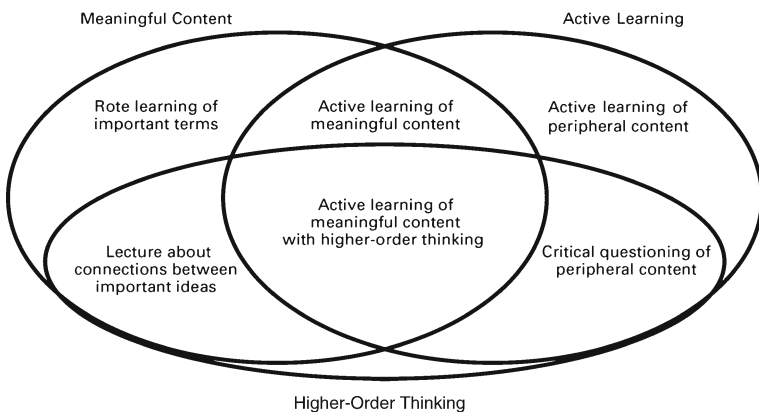


Fig. 3 Overlap between meaning, active learning, and higher-order thinking

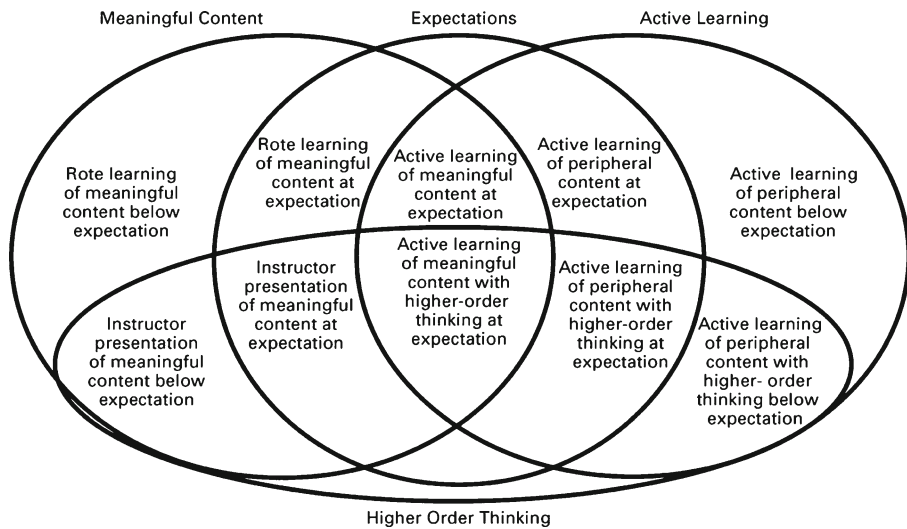


Fig. 4 Overlap between meaning, active learning, higher-order thinking, and expectations

Furthermore, students can create meaningful connections to course material that differ from those intended by the instructor or other institutional forces. Again, each of these dimensions of meaning can overlap with each of the dimensions of expectations. While not exhaustive, this model enables individuals to create a conceptual map that allow instructors, students, and institutional decision-makers to aim towards increased levels of rigor.

The model becomes even more complex when we consider various models of higher-order thinking and conceptions of active learning. For example, Bloom's model (1956) is typically thought to be hierarchical (i.e., summary builds to application which builds to analysis and finally synthesis). If students are to move in stepwise fashion from summary to synthesis, then assignments must be crafted to build mastery of the building blocks while slowly stretching students to subsequent stages. In contrast, critical thinking models typically provide students with a toolbox of skills (Nosich 2009; Paul 1990). Students are asked to question assumptions, consider concepts, clarify meaning, seek additional information, and explore implications of a variety of views. Similarly, models of deep learning (Trigwell and Prosser 1991) typically emphasize the importance of integrating discrete bits of information into larger wholes. Because these critical thinking and deep learning models are nonhierarchical, there is no fixed starting point. This has implications for assignment scaffolding. While students should be given manageable chunks at any given time, they are encouraged to move back and forth among the various elements of a system although no one set of skills has to be mastered before moving on to the next. Whatever the conception of higher-order thinking, however, our multidimensional model can help instructors be intentional about what they plan to accomplish (the curriculum), how they plan to do it (instruction), and how they plan to measure learning (assessment).

This brings us to some of the complex issues surrounding the dimension of active learning. Educators have interpreted and implemented active learning through a variety of teaching methods; for example, constructivism purports to increase ownership, motivation, and knowledge through group interaction and experiential learning (Bowles 2006; Loyens, et al. 2006; Shah and Glascoff 1998). The literature suggests that participation in active learning increases and/or maintains student engagement in the learning process (Maehr and

Meyer 1997; O’Grady 2000; Rocha 2000; Simons and Cleary 2006). Simulations that draw students to apply theory, knowledge, and skill sets to resolve real-life problems have been an effective (and affective) teaching method to engage students in solution-focused collaborations. Other teaching methods, like service learning, are intended to foster student thought and feeling as well as develop town-gown relationships. From the faculty viewpoint, students can demonstrate active learning in class and beyond by showing motivation, interest, and effort to come to terms with class material. Attendance, attention to class material, reading the text, and preparing assignments would constitute a minimal level of active learning. Asking for educational material, unrelated to securing a high grade, would suggest a higher level of student ownership. An advanced level of active learning is shown when students endeavor to apply theoretical principles, empirical evidence, and skills to meaningful problems that matter to them. Because students might have a totally different explanation of what constitutes active learning, the multidimensional model of academic rigor has broadened our realm of inquiry to include student perspectives in the next phase of our research and is beyond the scope of this article.

Illustrating the Model with Disciplinary Examples

When this study began, we anticipated different visions of academic rigor across campus. The model that emerged, however, did not vary across academic disciplines. Faculty members representing each of our institution’s schools (Arts and Humanities, Education, Natural and Social Sciences, and Professions) were largely in agreement. The goal, they suggested, is for students to learn meaningful course content actively with higher-order thinking at the appropriate level of expectation. The small group workshops allowed us to discuss our preliminary findings, pilot the tool, and also receive feedback as to how individual courses might be mapped on to our model.

By way of illustration, consider the following example taken from one of the workshops that applies the model to a course on fashion merchandizing (see Fig. 5).

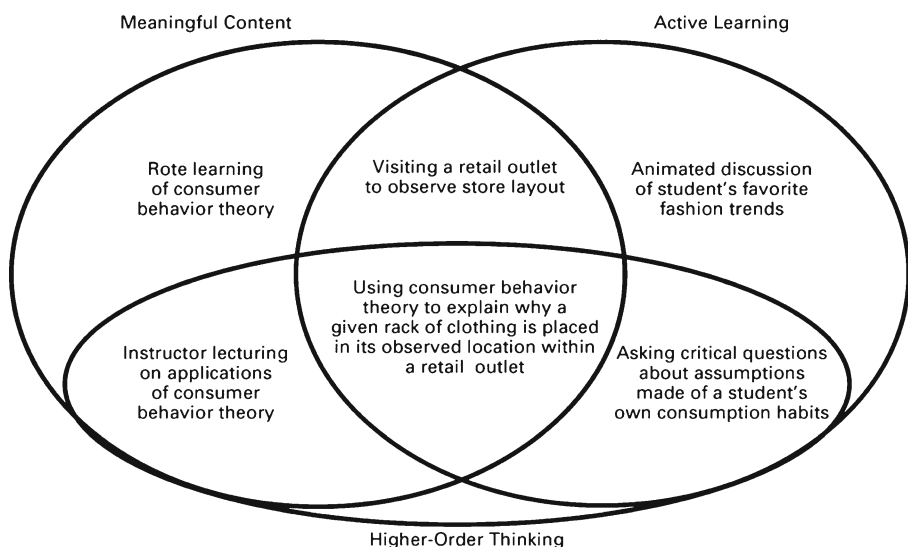


Fig. 5 Fashion merchandizing

One of the learning goals of this course is to shift a student's perspective from a consumer mentality to thinking like those inside the industry. Given this goal, student reflections on fashion and their own fashion preferences are peripheral to the course as a whole. An instructor might use student interest in fashion consumption as a way to motivate discussions about theories of consumer behavior. As such, an animated discussion about fashion trends can serve as a building block for future discussions more closely aligned with course goals. Similarly, if students begin to question their own consumption habits actively, then they are beginning to engage in higher-order thinking about fashion merchandising. Critical thinking models encourage the questioning of assumptions that underlie a particular consumption pattern and its implications for other lifestyle factors. Deep learning models encourage students to construct an integrated picture of fashion consumption. In both cases, students are actively learning material that they have identified as meaningful from their point of view. Higher-order thinking allows students to explore the material and deepen its meaning (from their own point of view). Because the instructor's goal, however, is to move students beyond their own consumption habits to a discussion of consumer behavior theory, students have not yet engaged in active learning of core course content until they have the opportunity to apply new learning. Rote learning of consumer behavior theory may give students the resources to discuss core concepts more carefully, but it is itself a passive exercise. Sending students to the mall to observe the layout of retail stores is an active exercise but does not necessarily entail higher-order thinking. The goal is for students to apply consumer behavior theory to their observations of retail outlets. In particular, if students can use consumer behavior theory to explain why a given rack of clothing is placed in a given location, then they are actively learning core course content with higher-order thinking at (or above) the appropriate course expectation. It is unreasonable to expect that students will always be actively learning meaningful content with higher-order thinking, but this assignment suggests that the course will achieve this outcome at least some of the time (see Fig. 5).

Consider another example taken from a statistics course designed for non-math majors (see Fig. 6). One of the goals of the course is to have students reflect on sources of data and possible biases. Students are often asked to collect their own data

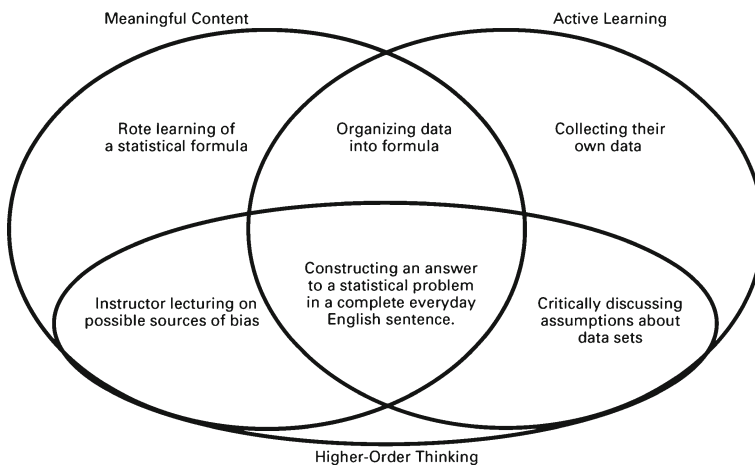


Fig. 6 Statistics for non-mathematics majors

sets (e.g., coins in their pockets and shoe sizes). In contrast to the rote learning of a mathematical formula, this assignment creates “buy in” by demonstrating real-world application. The course involves computation, but actually *doing* the problem is far less important than understanding what the result means. Consequently, the goal is to equip students with the ability to express answers to statistical problems in a complete sentence that could be understood in an everyday setting. Constructing such answers requires that students are actively learning meaningful course material with higher-order thinking (see Fig. 6).

While not every math course can (or should) deemphasize the role of numbers, it may nevertheless be the case that the ability to give the answer to any statistical question in a complete sentence that can be understood in an everyday context demonstrates that students have actively engaged in higher-order thinking about meaningful course content. Thus, it is evidence of academic rigor.

Lessons Learned: Suggestions for Using the Multidimensional Model

We have learned a great deal through the process of exploring the concept of academic rigor at our institution, and we encourage other institutions to write their own story of rigorous practice. Recommendations to begin this process include:

- Gather a diverse group in terms of discipline area, rank, teaching experience.
- Start by analyzing your own NSSE results.
- Seek institutional buy-in by connecting this work to the strategic goals of your institution.
- Try the model at different context levels (department, program, course, assignment).
- Collect examples to examine rigor through the lens of the model discussed in this article.
- Share your work with other institutions for feedback and dissemination of ideas.

Conclusion

Motivated by an institutional mandate to increase levels of academic rigor, we have explored the anatomy of academic rigor. We have considered how it might be defined and measured through a survey of faculty perceptions, qualitative analyses of focus group interviews, and workshops with faculty members. The authors recognize the methodological limitations of this study. For example, while we used student perceptions in the NSSE as the starting point, we did not gather data that would further reflect the student voice. Moreover, even within the data collected around faculty perceptions, we recognize that the faculty members who participated in the focus groups and who responded to the survey were self-selected; and the sample size was relatively small. While all Schools within the College were represented, it is not the case that all departments or content areas have been represented. However, we view the study as exploratory using an availability sample. Since this is a non-probability sampling design, we cannot estimate sampling error or place our findings within a confidence interval. Therefore, we should not over-generalize our findings to a larger population. That said, the sample drew from a cross-section of the faculty. We used two different survey methods—focus groups and anonymous surveys; and the findings converged to allow us to trust the results to be meaningful for our institution; and they raised helpful questions for the exploration of rigor and the development of the conceptual model.

The analysis reveals a multidimensional conceptual model of academic rigor, including active learning, meaningful content, higher-order thinking, and appropriate expectations. The dimensions can overlap in various ways. The context (e.g., an assignment, course, course of study, or institution) can be considered rigorous along some dimensions and not others. We have argued that learning is most rigorous when students are actively learning meaningful content with higher-order thinking at the appropriate level of expectation in a given context. This has not been an exhaustive treatment. Indeed, we recognize that each of the four main dimensions can be sub-divided into multiple categories. We also recognize that this particular model of academic rigor emerged from one particular institution.

The purpose of this article has been to tell that story. If the model holds elsewhere, it may need to be adapted to fit those circumstances. Still, we believe that the model provides resources with which to create conceptual maps and as such allows instructors, students, and institutional decision-makers to aim towards increased levels of rigor both inside and outside the classroom.

References

- Arum, R., & Roksa, J. (2011). *Academically adrift: Limited learning on college campuses*. Chicago, IL: University of Chicago Press.
- Bain, K. (2004). *What the best college teachers do*. Cambridge, MA: Harvard University Press.
- Barrett, D. (2012, February 5). Harvard conference seeks to jolt university teaching. *The Chronicle of Higher Education*, 58(24). Retrieved June 4, 2012 from <http://chronicle.com/article/Harvard-Seeks-to-Jolt/130683/>
- Bloom, B. S. (1956). *Taxonomy of educational objectives: The classification of educational goals*. New York, NY: Longmans, Green.
- Bowles, D. J. (2006). Active learning strategies...not for the birds! *International Journal of Nursing Education Scholarship*, 3(1), 1–13.
- Braxton, J. (1993). Selectivity and rigor in research universities. *Journal of Higher Education*, 6, 657–675.
- Brooks, J. G., & Brooks, M. G. (2001). *In search of understanding: The case for constructivist classrooms*. Alexandria, VA: Association for Supervision & Curriculum Development.
- Bruner, J. (1966). *Toward a theory of instruction*. Cambridge, MA: Harvard University Press.
- Bruner, J. (1996). *The culture of education*. Cambridge, MA: Harvard University Press.
- Bursuck, W. D. (1994). Introduction to the special series on homework. *Journal of Learning Disabilities*, 27, 466–469.
- Cope, C., & Staehr, L. (2005). Improving students' learning approaches through intervention in an information systems learning environment. *Studies in Higher Education*, 30, 181–197.
- Elbow, P. (1986). *Embracing contraries: Explorations in learning and teaching*. New York, NY: Oxford University Press.
- Exley, R. (2002). Academic rigor in the open door college. *NISOD: Innovation Abstracts*, 24(16), 1–2.
- Finkel, D. L. (2000). *Teaching with your mouth shut*. Portsmouth, NH: Heinemann.
- Glaser, B., & Strauss, A. (1967). *The discovery of grounded theory: Strategies for qualitative research*. Chicago, IL: Aldine.
- Gordon, J., Ludlum, J., & Hoey, J. (2008). Validating NSSE against student outcomes: Are they related? *Research in Higher Education*, 49, 19–39.
- Graham, C., & Essex, C. (2001, November). *Defining and ensuring academic rigor in online and on-campus courses: Instructor perspectives*. Paper presented at the Association for Educational Communications and Technology Conference, Atlanta, Georgia.
- Hayes, K., King, E., & Richardson, J. T. E. (1997). Mature students in higher education: III. Approaches to studying in access students. *Studies in Higher Education*, 22(1), 19–31.
- Jensen, E. (2005). *Teaching with the brain in mind* (2nd ed.). Alexandria, VA: Association for Supervision and Curriculum Development.
- Kuh, G. (2001). Assessing what really matters to student learning: Inside the National Survey of Student Engagement. *Change*, 33(3), 10–17.
- Kuh, G. (2003). What we're learning about student engagement from NSSE: Benchmarks for effective educational practice. *Change*, 35(2), 24–32.

- Kuh, G. (2009). The National Survey of Student Engagement: Conceptual and empirical foundations. *New Directions for Institutional Research*, 141, 5–20.
- LaNasa, S., Cabrera, A., & Trangsud, H. (2009). The construct validity of student engagement: A confirmatory factor analysis approach. *Research in Higher Education*, 50, 315–332.
- Light, R. (2001). *Making the most of college: Students speak their minds*. Cambridge, MA: Harvard University Press.
- Loyens, S. M., Rikers, R. M., & Schmidt, H. G. (2006). Students' conceptions of constructivist learning: A comparison between a traditional and a problem-based learning curriculum. *Advances in Health Sciences Education*, 11, 365–379.
- Maehr, M., & Meyer, H. A. (1997). Understanding motivation and schooling: Where we've been, where we are, and where we need to go. *Educational Psychology Review*, 9, 371–409.
- McKeough, A., Lupart, J., & Marini, Q. (Eds.). (1995). *Teaching for transfer: Fostering generalizations in learning*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Morgan, D. L. (1998). *The focus guidebook*. Thousand Oaks, CA: Sage.
- Noblit, G. W., & Hare, R. D. (1988). *Meta-ethnography: Synthesizing qualitative studies*. *Qualitative research methods series 11*. Newbury Park, CA: Sage.
- Nordvall, R., & Braxton, J. (1996). An alternative definition of quality of undergraduate college education: Toward usable knowledge for improvement. *Journal of Higher Education*, 67, 483–497.
- Nosich, G. (2009). *Learning to think things through: A guide to critical thinking across the curriculum*. Upper Saddle River, NJ: Pearson Prentice Hall.
- O'Grady, C. R. (2000). *Integrating service learning and multicultural education in colleges and universities*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Parkes, J. (2001). The role of transfer in the variability of performance. *Educational Assessment*, 7, 143–164.
- Paul, R. (1990). *Critical thinking: What every person needs to survive in a rapidly changing world*. Rohnert Park, CA: Center for Critical Thinking and Moral Critique.
- Payne, S., Kleine, K., Purcell, J., & Carter, G. (2005). Evaluating academic challenge beyond the NSSE. *Innovative Higher Education*, 30, 129–146.
- Prosser, M., & Trigwell, K. (1999). *Understanding learning and teaching: The experience in higher education*. Buckingham England: Society for Research into Higher Education and Open University Press.
- Rocha, C. J. (2000). Evaluating experiential teaching methods in a policy practice course: The case for service learning to increase political participation. *Journal of Social Work Education*, 36, 53–63.
- Shah, N., & Glascoff, M. (1998). The community as classroom: Service learning in Tillery, North Carolina. In J. Norbeck, C. Connelly, & J. Koerner (Eds.), *Caring and community: Concepts and models for service learning in nursing* (pp. 111–118). Washington, DC: American Association for Higher Education.
- Simons, L., & Cleary, B. (2006). The influence of service learning on students' personal and social development. *College Teaching*, 54, 307–319.
- Trigwell, K., & Prosser, M. (1991). Improving the quality of student learning: The influence of learning context and student approaches to learning on learning outcomes. *Higher Education*, 22, 251–266.