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On the prevalence of linear versus nonlinear thinking in undergraduate business education: A lot of rhetoric, not enough evidence

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Abstract

The purpose of this research is to examine the undergraduate learning goals of business programs and determine if these goals are skewed in the directions posed by critics of undergraduate business education. The underlying theme of many critiques is that nonlinear-thinking processes are underrepresented in undergraduate business curricula, whereas linear-thinking processes are overrepresented. The learning goals of 208 Association to Advance Collegiate Schools of Business International-accredited business programs were coded into two goal categories: linear thinking and nonlinear thinking. The results support the contention that nonlinear-thinking processes have a lesser presence in the typical undergraduate business program's curriculum. These findings are consistent across research and teaching universities.

Keywords: linear thinking, nonlinear thinking, learning goals

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INTRODUCTION

The business-education model has been criticized and debated for over 60 years. Before the 1950s, business education was thought to be nothing more than trade-school education, absent of any kind of rigor (Hall, 1968). Business programs changed direction in the late 1950s, moving away from trade-school education to a focus on education for middle-to-top management positions (Hall, 1968). The changeover to management education had questionable results at that time. Harvard Business Professor Sterling Livingston struck a nerve when he concluded that 'there is no direct relationship between performance in school or training programs and records of success in management' (1971: 79).

In the early 1980s, business schools responded to such criticisms by becoming highly standardized and adopting a more academic, scientific model (Cheit, 1985). Business disciplines were treated as a science, with a lot of attention placed on esoteric knowledge and weighty analytical techniques. In response to this new trend, Cheit argued that business schools had gone too far in an attempt to rid the vocational label. In an effort to redirect business education, Cheit (1985) proposed a professional model that considered management as an art, rather than a science, with students learning to make

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good judgments on complex, ill-defined, and real-world business problems. Business education had 'become too academic, too technical, too narrow, and, as a result, business school graduates are not prepared to be the kinds of leaders crucially needed in an economy under stress' (Cheit, 1985: 47). Decades later, Bennis and O'Toole (2005) lodged a similar complaint, saying that business curricula reflect a scientific model of research, resulting in an educational experience that is out of sync with real-world business practices.

More recently, Kilpatrick, Dean, and Kilpatrick (2008) shifted attention to the liberal-education versus business-education models and how these models differ with respect to employing and developing thinking processes. Kilpatrick, Dean, and Kilpatrick opine that whole-brain thinking processes that characterize liberal arts are deemphasized across undergraduate business curricula. The protestations of other scholars (e.g., Petkus, 2007; Spender, 2007; Colby, Ehrlich, Sullivan, & Dolle, 2011) are similar; business schools are primarily developing linear-thinking processes in lieu of nonlinear-thinking processes. Linear thinking relies on logic, rationality, and reason while attempting to understand cause-and-effect relationships, whereas nonlinear thinking is a multi-faceted construct emphasizing other forms of thinking, such as critical thinking, intuitive thinking, creative thinking, and debate and discourse (Vance, Groves, Paik, & Kindler, 2007; Kilpatrick, Dean, & Kilpatrick, 2008; Colby et al., 2011). These differences in thinking processes may underlie the more superficial tensions between relevance versus rigor, as well as the professional versus academic/scientific models that have been long debated.

Both linear and nonlinear-thinking styles are important. Linear thinking has utility for comprehending relatively simple, unchanging systems and performing highly structured tasks, but it is not sufficient for complex, turbulent systems and poorly structured tasks (Sadler-Smith & Shefy, 2007). Thus, the traditional analytical tools that are associated with linear thinking have limited applicability to the complexity of today's real-world problems. Nonlinear thinking, on the other hand, is more useful than linear thinking in dealing with complex, changing systems (Vance et al., 2007). Kilpatrick, Dean, and Kilpatrick (2008) also say that linear thinking is inadequate in today's complex business climate. Nonlinear mental activities, on the other hand, are necessary to make better judgments when faced with a highly complex, ambiguous, and uncertain business environment. Such multiple-intelligence thinking is needed to arrive at effective decisions when encountering complex problems. Research suggests that a business curriculum without nonlinear-thinking processes could be costly for undergraduate business students. Silvester and Dykes (2007), for example, found that ratings on a critical-thinking dimension (assigned in assessment-center exercises) were a strong predictor of the individual's future performance. In a review of the intuition literature, Salas, Rosen, and DiazGranados (2010) concluded that the effects of intuition on organizational decision making are, on the whole, positive. Milgram and Hong's (1993) longitudinal study indicated that a higher level of creative thinking as an adolescent was associated with outstanding creative achievements later in their career. Groves, Vance, Choi, and Mendez's (2008) findings illustrate that successful entrepreneurs employ both nonlinear and linear thinking.

Given the importance of nonlinear-thinking processes, identifying whether they are, in fact, deemphasized in undergraduate business programs is essential. Though the criticisms suggesting that nonlinear thinking has a lesser presence in undergraduate business education may resonate with the experiences of a number of academics, they are mostly based on anecdotes and personal experiences. It is doubtful that business school administrators will respond to such a 'call to action' if there is no empirical evidence to support the alleged deficiencies. In this paper, we examine the aforementioned criticisms from the thinking-process perspective in undergraduate business education. First, we provide more detail on prior criticisms of thinking processes in business education. We then investigate programmatic learning goals of business schools to determine whether the criticisms, which were mostly based on anecdotal evidence, are warranted.

LINEAR THINKING VERSUS NONLINEAR THINKING

Vance et al. (2007) developed and empirically tested a comprehensive thinking-style model that is comprised of two constructs: linear thinking and nonlinear thinking. Before their model, thinking styles (nonlinear styles in particular) were fragmented and lacked a unifying theory. There was little theoretical means of synthesizing and classifying linear and nonlinear-thinking styles and, therefore, little theoretical foundation to scholars' critiques and recommendations.

According to the Vance et al. (2007) model, linear reductionism underlies linear thinking. Linear reductionism is 'a system (that) is equal to the sum of its parts that can be analyzed and understood separately and added together to form an understood and predictable whole system' (Vance et al., 2007: 168). Linear thinking includes processes such as reason, logic, rationality, analytical thinking, and deduction. Nonlinear-thinking processes are the multi-faceted alternatives to the rational linear approach. Nonlinear-thinking processes include creative thinking, intuitive thinking, integrative systems thinking, and emotive thinking (Vance et al., 2007).

How business students are taught to think, reason, and be creative in developing their solutions should be a priority, according to Datar, Garvin, and Cullen (2010). Kilpatrick, Dean, and Kilpatrick (2008) further argued that whole-brain thinking (i.e., nonlinear thinking) has been given short shrift in today's business education relative to the more common linear-thinking models. Linear thinking employs thinking processes that have a 'mechanistic, formulaic, and narrowly analytical approach' (Kilpatrick, Dean, & Kilpatrick, 2008: 201). Kilpatrick, Dean, and Kilpatrick (2008) commented that 'critical thinking' and 'problem solving' are inappropriately considered to be similar thinking processes. They add that these concepts differ markedly, with critical thinking being the art of making judgments based on seeing connections and engendering multiple perspectives, whereas problem solving is more linear and rational. Analytical thinking, integral to linear thinking, is 'methodical and consistent, beginning with a particular set of assumptions or categories and proceeding to develop the implications of these concepts through deduction' (Colby et al., 2011: 60). In contrast, nonlinear whole-brain thinking encompasses critical thinking, creative thinking, debate and discourse, intuitive thinking, emotive thinking, and reflective thinking; it brings the full range of mental activities into the student's learning (Kilpatrick, Dean, & Kilpatrick, 2008).

Petkus (2007) concluded that linear thinking is less helpful for comprehending the complexity and ambiguity in 21st-century business environments, adding that critical thinking, intuition, conceptual creativity, reflective thinking, and emotive thinking help unravel the unpredictability of a nonlinear business system. When faced with a time deadline and a complex decision, intuitive thinking on the part of an experienced, capable person leads to a highly effective decision (Salas, Rosen, & DiazGranados, 2010). Linear thinking does not fit a business setting that has incomplete information and rapidly changing data. Such dynamic environments require both linear and nonlinear thought processes to arrive at effective solutions.

Today's managers need to be imaginative rather than just mechanistic 'rule followers' (Spender, 2007: 39). Management should be more about the process of imagining (Spender, 2007), but there is a widely shared opinion that imagination is absent in business education. Porter and McKibbin (1988) argued that business education prioritizes analyzing solutions instead of generating creative solutions to problems. Ideas and solutions tend to be presented in the business school classroom with PowerPoints, with little discussion; what is needed is more debate and discourse of these ideas (Colby et al., 2011). Through dialectical discovery, learners become proficient at seeing patterns, finding connections between seemingly unrelated ideas, and understanding parts of the system, as well as inter-relationships of these parts within the whole system (Colby et al., 2011).

Though linear and nonlinear thinking are separate constructs (Vance et al., 2007), there is no question that both are important in business education and practice. No forms of thinking, linear or

nonlinear, should be excluded in business education. However, there appears to be consensus among these scholars (Petkus, 2007; Sadler-Smith & Shefy, 2007; Spender, 2007; Kilpatrick, Dean, & Kilpatrick, 2008) on the kinds of thinking that are lacking in business education; this consensus reflects the need for multiple and varied thinking processes to tackle complex problems. Nonlinear thinking is, in these scholars' opinions, underrepresented in the undergraduate business curriculum, whereas linear thinking, which takes the form of standard cause-and-effect problem solving and analytical skills, is well represented.

Despite the opinions of many scholars, there is no direct empirical evidence that this under-representation of nonlinear-thinking processes is, in fact, occurring. Such conclusions are merely speculative at this juncture, and there has been no empirical test of the hypothesis proffered by these scholars. It would be inadvisable for business schools to respond to these unsubstantiated criticisms and increase their emphasis on nonlinear thinking without the need for empirical evidence with respect to the emphasis on linear versus nonlinear thinking.

The purpose of our research is to examine the learning goals of undergraduate business programs accredited by the Association to Advance Collegiate Schools of Business International (AACSB) and determine if the substance of these goals is skewed in the directions suggested by these detractors. Are these claims of a misguided business-education model that is primarily focused toward linear-thinking processes supported by our learning-goal data? We chose to focus on learning goals, because they explicate a business school's mission and curricular priorities and what competencies are important for their graduates to possess. More exactly, AACSB Standards[1] say that learning goals are 'a key element in how the school defines itself' (2012: 61) and that:

> This list of learning goals derives from, or is consonant with, the school's mission. The mission and objectives set out the intentions of the school, and the learning goals say how the degree programs demonstrate the mission. That is, the learning goals describe the desired educational accomplishments of the degree programs. The learning goals translate the more general statement of the mission into the educational accomplishments of graduates. (AACSB, 2012: 60)

Based on Colby et al. (2011), Datar, Garvin, and Cullen (2010), Kilpatrick, Dean, and Kilpatrick (2008), Petkus (2007), and Spender's (2007) arguments, we put forth the following hypothesis:

> Hypothesis 1: Linear-thinking processes will be more represented in the learning goals of AACSB-accredited undergraduate business programs than nonlinear-thinking processes.

INSTITUTIONAL TYPE

It is conceivable that research institutions and teaching institutions differ in their emphases on linear and nonlinear thinking. The priorities of research institutions may focus their undergraduate business programs on traditional linear-thinking processes that are more in line with the research backgrounds of academics. In fact, the traditional deductive research model is very much a linear-thinking approach. In support of this, Kerlinger (1973: 15) described the 'controlled rationality' built into the orderly deductive reasoning research process.

This rationality begins with a 'gap spotting' and 'gap filling' mentality among experienced researchers (Alvesson & Sandberg, 2011: 249). Research questions are derived from gaps (i.e., unanswered questions) in the literature; and the study's results eliminate the gaps with incremental new knowledge. This approach to research appears quite straightforward and linear. Alvesson and Karreman (2007: 1279) argued that 'there is a strong norm to present research results in a fairly linear and

[1] AACSB Standards refer to the *Eligibility procedures and accreditation standards for business accreditation* (AACSB, revised 31 January 2012).

rational way,' which, in their opinion, is limiting. This norm considers the rejection of hypotheses as failed research projects instead of an opportunity for the researcher to use imagination and insight in reconsidering theoretical assumptions that can reshape a theory's propositions into a more workable theory (Alvesson & Karreman, 2007). Research institutions may be more prone toward the adoption of linear-thinking goals in their undergraduate business programs that are more in line with their scholars' research backgrounds and redoubtable belief in the scientific method.

We propose that nonlinear-thinking processes may be more likely to surface in the learning goals of undergraduate business programs in teaching-oriented institutions than in research-oriented institutions. Institutions that prize teaching more highly may call for non-traditional learning strategies that encourage nonlinear thinking across the undergraduate business curriculum. In addition, teaching colleges with a liberal-arts focus would likely have more learning goals in their business programs that relate to nonlinear-thinking modalities.

We hypothesize that:

> Hypothesis 2: Linear-thinking processes will be more represented in the learning goals of undergraduate business programs within research institutions than teaching institutions, whereas nonlinear-thinking processes will be more represented in the learning goals of undergraduate business programs within teaching institutions than research institutions.

METHOD

Sample

Our sample is comprised of AACSB-accredited undergraduate business programs in the United States. We chose to focus on AACSB-accredited institutions because they are required to have learning goals for assurance of learning purposes, making this a convenient sample with somewhat readily available learning goals. In addition, some regard AACSB as the more prestigious of the business school accreditors (Roller, Andrews, & Bovee, 2003). We focused on US schools, because in 2010, at the time of our data collection, the vast majority (81%) of AACSB's accredited programs were US schools. In addition, our moderator variable (Carnegie Classification) is only applicable to US institutions. Though narrowing our sample sacrifices generalizability, focusing on schools within the same accrediting body and the same country allows for more consistency and control. Given that this is the first empirical study investigating this topic, we thought it prudent to first restrict confounding factors and determine if an effect occurs rather than to determine the generalizability of the effect.

We searched for learning goals on the websites of each AACSB-accredited undergraduate business school in the United States. If the learning goals were not published on a business school's website, we contacted the school's dean by e-mail and requested that they send us their learning goals. Searches of schools' websites yielded 117 sets of learning goals. We received e-mail correspondence from deans or representatives of the dean, yielding another 91 sets of learning goals. In total, we obtained the learning goals of 208 of the 469 business schools on AACSB's accreditation list, which translates into a participation rate of 44%.

Learning-goal coding procedure

Our coding process reflects Miles and Huberman's (1994) 'start list' approach to coding qualitative information. That is, we surveyed all of the learning-goal themes appearing in the 208 sets of learning goals and coded them into two learning-goal categories (i.e., linear-thinking goals versus nonlinear-thinking goals) as applicable. The two categories were operationally defined based on the thinking-process descriptors provided in the research literature (i.e., Kilpatrick et al., 2008; Spender, 2007;

TABLE 1. DESCRIPTORS DEFINING LINEAR- AND NONLINEAR-THINKING CONSTRUCTS

Source	*Linear thinking*	*Nonlinear thinking*
Colby et al. (2011)	Methodical, deductive	**Debate and discourse**, finding patterns and connections between parts within the whole **system**
Kilpatrick, Dean, and Kilpatrick (2008)	**Analytical**, discrete, mechanistic, formulaic, rational, linear, rational model of **problem solving** Methodical beginning with a set of assumptions	Intuitive, indirect, sideways thinking, holistic, **critical thinking**, **debate** and dialogue, **reflective**, emotive, empathy, problem finding, tolerance for ambiguity, **innovation/creativity**
Spender (2007)	Mechanistic rules	Imaginative
Vance et al. (2007)	Rules, rationality, **analytical**, **logic**, **reason**, cause–effect, deduction	Intuition, emotion, feelings, impressions, **creativity**, lateral thinking, holistic, **integrative**, imagination, insight

Note. The bolded descriptors appear in both the research literature and in our learning-goal data sample.

Vance et al., 2007; Colby et al., 2011). These descriptors are provided in Table 1. The learning-goal descriptor themes captured a minority of the schools' learning goals. Learning goals that did not fit these two learning-goal categories (i.e., linear thinking and nonlinear thinking) were excluded because they are not relevant with respect to our hypotheses.

Two raters (one was the study's first author and the other was a trained research assistant) independently coded all business programs' learning goals according to the aforementioned goal descriptor themes depicted in Table 1. For all learning goals, a coding of '1' was assigned to a learning-goal theme if the goal was present in the program's set of learning goals; a coding of '0' was assigned to a learning-goal theme if the goal was not present. As shown in Table 2, we ultimately identified eight learning-goal themes that appeared in our data that could be classified (based on the descriptors in the research literature) into the two learning-goal categories. The learning-goal themes in the linear-thinking category include: problem solving, analytical thinking, and logical reasoning. The learning-goal themes in the nonlinear-thinking category include critical thinking, integrative systems thinking, creative thinking, reflective thinking, and debate and dialogue. After coding the 208 sets of learning goals, we found that some of the descriptors in this literature (e.g., intuitive thinking and emotive thinking) did not appear in any of the learning goals; hence, they were not considered further in this study. Decision making, which appears in many programs' undergraduate learning goals, was excluded from our analysis because it could reflect both linear thinking and nonlinear thinking (e.g., intuition).

Inter-coder agreement was determined based on the independent ratings of the two raters using percent agreement and Cohen's κ. Inter-coder agreement across all learning-goal themes is 86%. Cohen's κ across all learning-goal themes is 0.65, which is statistically significant ($p < .001$). Reneman, Brouwer, Meinema, Dijkstra, Geertzen, and Groothoff (2004) indicated a κ value of 0.60 or greater is considered acceptable. Therefore, our study's inter-coder agreement level is sufficient according to qualitative-research standards. Any discrepancy between the two raters was resolved with the independent judgment of a third trained rater.

Moderator variable

The Carnegie Foundation's classification system is a good way of distinguishing academic institutions with a research orientation and a teaching orientation (Koys, 2008). Therefore, we grouped each

TABLE 2. LEARNING-GOAL CATEGORY AND THEME FREQUENCY

Learning-goal categories and themes	*Total frequency*
Linear-thinking category	283[a]
Problem solving	144[b]
Analytical thinking	121[b]
Logical reasoning	18[b]
Nonlinear-thinking category	220[a]
Critical thinking	111[b]
Integrative systems thinking	54[b]
Creative thinking	37[b]
Reflective thinking	13[b]
Debate/dialogue	5[b]

[a]Total frequency equals the sum of the frequencies of the goal themes within the category.
[b]Total frequency represents the number of schools out of 208 that had learning goals in the listed learning-goal theme.

TABLE 3. LEARNING-GOAL CATEGORY MEANS AND STANDARD DEVIATIONS

	Thinking Process				
	Linear thinking		*Nonlinear thinking*		
Sample	*M*	*SD*	*M*	*SD*	*N*
Combined sample	1.38	0.80	1.03	0.85	202
Carnegie Classification					
Research institution	1.46	0.75	1.00	0.80	79
Teaching institution	1.33	0.83	1.05	0.88	123

institution in our sample into one of two categories based on the Carnegie Classification: research ($n = 79$) and teaching ($n = 123$)[2]. The research category was comprised of Doctoral/Research Universities–Extensive ($n = 45$) and Doctoral/Research Universities–Intensive ($n = 34$) schools. The teaching category was comprised of Baccalaureate Colleges–General ($n = 3$), Baccalaureate Colleges–Liberal Arts ($n = 6$), Baccalaureate/Associate's Colleges ($n = 1$), Master's Colleges and Universities I ($n = 105$), and Master's Colleges and Universities II ($n = 8$).

RESULTS

Table 2 shows the frequencies for the two learning-goal categories (i.e., linear thinking versus nonlinear thinking). Table 3 shows the mean number of learning goals that research and teaching schools have in the two learning-goal categories and the mean number of learning goals in the two learning-goal categories for the full (i.e., combined) sample. Our hypotheses are tested using a 2×2 (Thinking Process [linear thinking vs. nonlinear thinking] × Carnegie Classification [research vs. teaching])

[2] Six institutions that had other themes of Carnegie Classifications (e.g., 'Other or Unknown' or 'Specialized Institutions') were not included in either category.

analysis of variance test where Thinking Process is a within-subjects variable and Carnegie Classification a between-subjects variable; the dependent variable in this analysis of variance is the frequency count of learning-goal themes. This analysis of variance test excluded six schools that had a Carnegie Classification of 'Other or Unknown' or 'Specialized Institutions'; therefore, the sample size for this analysis is 202. The results of this analysis of variance showed a significant main effect for Thinking Process, $F(1, 200) = 24.08$, $p < .001$, $\eta^2 = 0.11$. In terms of the direction of the mean difference, Table 3 shows that the nonlinear-thinking goals ($M = 1.03$) are less represented than linear-thinking goals ($M = 1.38$) across research and teaching institutions (i.e., the combined sample). These results support our study's first hypothesis. There is no significant main effect for Carnegie Classification, $F(1, 200) = 0.20$, $p = .66$, nor is there a significant interaction between Carnegie Classification and Thinking Process, $F(1, 200) = 1.44$, $p = .23$. Therefore, nonlinear-thinking goals are less represented than linear-thinking goals in both research and teaching institutions, indicating a lack of support for Hypothesis 2.

DISCUSSION

Scholars have criticized business schools for placing too little emphasis on nonlinear thinking. Considering that these criticisms are mainly based on anecdotes, our research is the first to extend this literature with direct empirical evidence. The primary purpose of our study is to determine whether there is credence to the criticism that business schools have employed mostly linear thinking whereas placing less of an emphasis on nonlinear thinking. Specifically, we examined the learning goals of AACSB-accredited undergraduate business programs and identified goals that were related to two thinking types: linear thinking and nonlinear thinking. Learning goals as a unit of analysis are, in our opinion, an appropriate measure because they capture the overarching priorities relating to the business school's mission. Nothing should strike closer to the heart of a business school than its mission and learning goals.

Our findings show support for the critics' contention. Specifically, the results show that nonlinear thinking is less represented in the learning goals of AACSB-accredited business programs relative to linear thinking. As shown in Table 2, critical thinking was the only nonlinear-thinking goal theme that had a prominent presence in the goals of these business schools.

Implications for practice

Staying competitive in today's business environment is no easy task. Globalization, unprecedented technology changes, the 2008–2009 great recession, sustainability initiatives, and open innovation have affected many industries. Multinationals are faced with an 'accelerating rate of change in the external environment' (Ben-Menahem, Kwee, Volberda, & Van Den Bosch, 2013: 216). The number of multinational companies, for example, grew from 3,000 in 1990 to 63,000 in 2003; in 2012, the number of multinationals stood at 100,000 with 900,000 affiliates (Javidan & Bowen, 2013). Responding to calls for sustainability inventiveness while maintaining the organization's profitability is another complex challenge (Lawler & Worley, 2012; Lubin & Esty, 2014). In the transformation from a manufacturing economy to a service economy, companies cannot simply 'delight the customer' with outstanding service, as advocated by the popular press in the 1980s (e.g., Schlossberg, 1990); the new norm is more complicated with customers and service providers engaged in open innovation, co-creating innovations and solutions so that both can remain competitive (Wallin & Von Krogh, 2010; Ford, Edvardsson, Dickson, & Enquist, 2012).

As numerous critics contend (e.g., Petkus, 2007; Sadler-Smith & Shefy, 2007; Spender, 2007; Vance et al., 2007; Kilpatrick, Dean, & Kilpatrick, 2008; Colby et al., 2011), the reliance on linear

thinking could put business graduates at a distinct disadvantage in managing this complexity. Note that critics of the existing business-education model would not suggest that linear-thinking processes be discarded in undergraduate business schools. It is hard to argue against the use of analysis, logic, and reason, but these thinking processes are not sufficient to deal with the kinds of problems and decisions surfacing in the workplace. Reasoned solutions should always be encouraged. However, these critics argue that in the face of a complex internal and external organizational environment, other forms of thinking (e.g., integrative systems thinking, creative thinking, and intuition) should also be employed. In support, imagination, intuition, critical thinking, and integrative thinking may be what are needed to give more sense to the unpredictability emanating from such a business climate. Taxonomies of management competencies (Bartram, 2005; Tett, Guterman, Bleier, & Murphy, 2000) have identified creative thinking, among others, as a key competency for managerial effectiveness. Creativity, innovation, and critical thinking have been recognized as important skills for the job success of new entrants in today's workforce (Casner-Lotto & Barrington, 2006).

There are several actions business schools can take to redirect their focus toward nonlinear thinking. One clear option is to add learning goals that reflect this kind of thinking. This would provide a better balance to the mix of nonlinear-thinking activities and linear thinking. However, Kilpatrick, Dean, and Kilpatrick (2008) speculated that one reason why business programs hold onto certain learning goals over others is that these goals allow for easy quantitative assessment, making AACSB's Assurance of Learning Standards more achievable. Including these nonlinear-thinking processes in a school's learning goals could be disruptive in the short run, because it may prove more difficult to assess student outcomes such as creativity, debate and discourse, critical thinking, reflective thinking, integrative systems thinking, and intuitive thinking. Benchmarking best assessment practices in these hard-to-measure areas may provide a way to overcome these assessment challenges. This is certainly a feasible strategy given the number of programs that are already using these types of goals.

Mentkowski and Sharkey's (2011) suggestion of integrating institution-wide core curriculum learning goals (i.e., liberal-arts goals) into the business school's learning goals might also be considered. In this way, the thinking processes under the business-education and liberal-education models may have greater convergence. Business programs such as George Washington University and Santa Clara University have altered their curricula adding history, ethics, and writing to the study of marketing and finance (Korn, 2012). Embedding liberal-arts goals into the business school's goals may elevate the status of liberal learning to not only business students, but also to business faculty and prospective employers. In our experience, many business students grudgingly complete their liberal-arts requirements while missing the benefits of these courses in cultivating nonlinear-thinking skills. Only seven of the 208 business schools in our sample included the study of liberal arts as one of their business programs' learning goals.

Adopting pedagogies that bring multiple learning-goal themes into the same classroom instead of just one theme may be a parsimonious way to deliver nonlinear-thinking learning goals. For example, Kilpatrick, Dean, and Kilpatrick (2008) highlighted a number of pedagogical strategies such as requiring business writing assignments that promote critical thinking and creativity. Leaderless group discussion (Costigan & Donahue, 2009), business skills laboratory (Blaylock, McDaniel, Falk, Hollandsworth, & Kopf, 2009), and team-based learning (Goltz, Hietapelto, Reinsch, & Tyrell, 2008) are similar pedagogies that require critical thinking, integrative thinking, analytical thinking, creative thinking, debate and dialogue, all in one classroom experience.

Implications for research

Though the merit of nonlinear thinking in today's business environment is intuitively appealing, perhaps undergraduate business programs are on the right tract by prioritizing linear thinking over the

whole-brain nonlinear-thinking processes in their learning goals. More compelling evidence needs to replace plentiful anecdotes showing its effectiveness in workplace success. To make external stakeholders (e.g., prospective employers and business students) and internal stakeholders (e.g., deans and faculty) take notice of the value of nonlinear thinking, there needs to be more convincing research that demonstrates its value. Though it is difficult to believe that critical thinking, creative thinking, integrative thinking, and debate and dialogue are not important to a business graduate's job performance, future research that addresses this question with a direct comparison of the effects of nonlinear thinking versus linear thinking on career progression may be helpful in moving the critics' agenda forward. Does nonlinear thinking account for career success variance, above and beyond that of linear thinking? A longitudinal study along the lines of Mentkowski (2000), Waldman and Korbar (2004), and Milgram and Hong's (1993) research designs would be helpful in providing this evidence.

Some caution is needed when interpreting our findings because our sample is made up of 44% of US AACSB-accredited undergraduate business programs. Whether our results generalize to the learning goals of the other 56% of AACSB-accredited US undergraduate programs is uncertain.

The generalizability of our findings to programs that are accredited by other accreditors (e.g., European Quality Improvement System, Accreditation Council for Business Schools and Programs, and International Assembly for Collegiate Business Education) or non-accredited programs is also unknown. For example, partiality for linear-thinking processes may be due, in part, to the language in AACSB's Assurance of Learning Standards[3]. A sample list of undergraduate curriculum topics (not intended to be mandatory) is provided in the standards, one of which is 'analytical skills,' a linear-thinking construct. Nonlinear-thinking constructs are absent from the list. Perhaps, some business schools blindly or even strategically adopted these sample curricular topics for their learning goals, which would contribute to the edge in numbers of linear-thinking goals over nonlinear-thinking goals shown in Table 3. If so, imitation could be another factor supporting our study's first hypothesis. Business-education scholars might consider controlling for the contaminating effects of the actual wording of AACSB Standards in their future research.

Future research might also consider whether the prevalence of learning goals devoted to linear- and nonlinear-thinking styles varies by country. Regarding this possibility, Alves, Lovelace, Manz, Matsypura, Toyasaki, and Ke (2006) proposed that the 'uncertainty avoidance' cultural dimension (see Hofstede, 1980) is related to thinking styles. Specifically, rational thinking is associated with high uncertainty avoidance cultures and intuitive thinking is associated with low uncertainty avoidance cultures. Perhaps, educational institutions located in high uncertainty avoidance cultures have proportionately more linear-thinking goals, whereas institutions located in low uncertainty avoidance cultures have more nonlinear-thinking goals.

Our results did not vary by institution type, meaning that the differences detected in thinking-process goals surfaced in undergraduate business programs at both research and teaching institutions. These results are somewhat surprising, because one would think that teaching institutions might be more unorthodox in their thinking-style learning goals, in comparison to institutions that have research as their primary focus. Another explanation for the null moderator findings is that most of our teaching institutions were master's colleges/universities. If we would have been able to include more baccalaureate liberal-arts colleges in our sample, the results may have been different.

Furthermore, the sample in the present study was entirely AACSB-accredited schools. Historically, AACSB's research expectations have been rigorous across research and teaching institutions. Though AACSB Standards (2012, 2013) on intellectual contributions are flexible (i.e., the business school's mission should define the school's scholarship orientation), perhaps an intense research culture has developed across AACSB-accredited schools, regardless of Carnegie Classification. This might account

[3] AACSB Standard 15 lists typical learning experiences for undergraduate degree programs (AACSB, revised 31 January 2012).

for the rejection of our study's second hypothesis. Both research and teaching institutions may have a culture of producing a more traditional brand of research, spawning a bias toward the adoption of linear-thinking goals. A better test of institutional moderation might be the comparison of the learning goals of AACSB-accredited programs versus programs accredited by other accreditors versus non-accredited business programs.

Another research possibility is to examine the moderating effects of the level of business education (MBA versus undergraduate business) on the content of learning goals. One might expect that the linear and nonlinear-thinking goals would differ depending on the level of education. Unlike AACSB's expectations for the undergraduate business curriculum, AACSB Standards (2012)[4] state that MBA education be integrative, innovative as far as problem solving, and developmental as far as managing in unpredictable environments. Considering this set of requirements, it would seem that nonlinear-thinking processes should appear more frequently in MBA learning goals than in undergraduate goals.

CONCLUSION

The criticisms, lodged by Colby et al. (2011), Kilpatrick, Dean, and Kilpatrick (2008), Petkus (2007), and Spender (2007), among others, remain provocative and challenging to the current priorities of many undergraduate business educators. Our findings support these scholars' contentions that there is a divide between the kinds of thinking processes currently emphasized in business education and what they would like to see. The harm in all of this is a business-educated workforce that may be less equipped to employ a variety of thinking styles to solve complex 21st-century business problems. Business schools may be opting for more limited thinking-style learning goals to appease the demands being made by some stakeholders (e.g., AACSB and faculty) while downplaying the development of key nonlinear-thinking competencies that may benefit other stakeholders (e.g., business graduates and prospective employers).

Furthermore, it would seem that all business school stakeholders have a common interest in seeing less unsubstantiated conjecture and seeing more evidence-based scrutiny and action on the part of business schools when it comes to the relevancy of their learning goals. Our hope is that this will happen. Still, we realize that this change may not occur without more evidence. Namely, the shift to less traditional nonlinear-thinking modalities in undergraduate business education is unlikely without more convincing data showing that nonlinear thinking really matters in a business graduate's career.

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[4] AACSB Standard 18 discusses the learning that is to occur in accredited MBA programs (AACSB, revised 31 January 2012).

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