HOW THE MULTIMEDIA COMMUNICATION OF STRATEGY CAN ENABLE MORE EFFECTIVE RECALL AND LEARNING

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Many claims have been made about the learning benefits of communicating strategies in multimedia picture-plus-text formats, rather than monomedia text-only formats. However, there is little theorization and empirical evidence to support these claims. Drawing upon cognitive load theory to develop learning-related hypotheses, this manuscript reports on a multicountry experiment that tests the effects of different modes of strategy communication on student learning. The results show the learning benefits to students of multimedia presentations of strategy and suggests how strategy professors should further encourage students to draw strategies in class.

For 3 decades a multimedia combination of pictures and words has been promoted as a more effective way to enable recipients to learn about strategies (Huff, 1990; Fiol & Huff, 1992; Kaplan & Norton, 1992, 1996a, 2000, 2005; Mintzberg & Van der Heyden, 1999; Kim & Mauborgne, 2005; Osterwalder & Pigneur, 2010; Meyer, et al., 2013; Wright et al., 2013; Jarzabkowski & Kaplan, 2015). In the past decade, the strategic management classroom has become a site of particular pedagogical interest, where strategic management courses have been criticized for being mere "kit bags" of theories and frameworks (Mintzberg, 2004; Bell et al., 2018), and calls have gone out for more practically applicable strategy education (Albert & Grzeda, 2015; Clegg, Jarvis, & Pitsis, 2013). To this end, some researchers have advocated less emphasis on theory-based approaches and more on practical skills and implementation (Grant & Baden-Fuller, 2018; Lindsay, Jack, & Ambrosini, 2018). Others have advocated using better theory (Buckley, 2018).

Bridges between theory and practice in the strategic management classroom have traditionally been built by utilizing picture-plus-text frameworks such as SWOT, VRIO, and the value chain to "unpack" and discuss cases toward making practical recommendations. Michael Porter (1991: 98), developer of many popular strategy frameworks, related the value of these multimedia conceptions to their ability to help "identify the relevant variables and the questions which the user must [then] answer in order to develop [their own] conclusions." While strategic management courses have tended to use frameworks as diagnostic aids, there has been little reflection on why they are used, what the benefits of them are, how their results help communicate strategy to students, and how we might use them more effectively to address the demand for practically applicable strategic management courses.

This article reports on a study that increases our understanding of how presentation and engagement with *multimedia*, defined here as drawings and text, can improve learning in the strategic management classroom. It helps reveal the benefits and drawbacks of presenting strategies using a multimedia format, and provides recommendations to strategy educators about enhancing student capability in dealing with strategy communications.

ADVOCACY WITHOUT EVIDENCE

Beyond the development of many of strategic management's best-known theoretical frameworks in the 1970s and 80s, academic discussion on the value of presenting strategy by using pictures and text can be traced to the early 1990s. It was noted then that "managers have long recognized the importance of map-like products" and that "maps used as [management] tools [would become] increasingly important in an uncertain world that requires managerial judgement" (Fiol & Huff, 1992: 273). The benefits of using pictorial forms to enhance strategy communication was attributed to their ability to help managers and students make sense

of complexity, focus attention and trigger memories, signal priorities and supply missing information, simplify and aid the communication of complex ideas, and divorce ideas from specific speakers—making them more accessible to debate and modification (Huff, 1990; Fiol & Huff, 1992).

The framework of this era most associated with communicating strategy pictorially was Kaplan and Norton's "Balanced Scorecard." Kaplan and Norton (2005: 72) argued that the typical lengthy and text-laden (or monomedia) forms of communicating strategy were not effective: "Our research reveals that, on average, 95% of a company's employees are unaware of, or do not understand, its strategy." More recently, Sull et al.'s (2015) study showed that only about half of the managers they studied could name any of their organization's strategic priorities. Kaplan and Norton claimed that their picture and text "comprehensive snapshots" would help people "view strategies in a comprehensive, integrated and systematic way" (Kaplan & Norton, 2000: 60), and enable strategy to be "bottled" "so that everyone could share it" (Kaplan & Norton, 1996a: 40). This would "motivate" and even "obligate" "breakthrough improvements" (Kaplan & Norton, 1996b: 4). However, the empirical evidence behind these claims was not made clear.

In the 2000s, there was renewed impetus for seeing strategy in pictures in addition to words, as "building [a strategy] process around a picture yields much better results" (Kim & Mauborgne, 2002: 77), and some works advocated the use of drawings in strategy development and communication (Osterwalder & Pigneur, 2010; Meyer et al., 2013). Other theorists began to explore the added-value that might be achieved from using frameworks in a strategy development process (Wright et al., 2013; Jarzabkowski & Kaplan, 2015).

More recently, a more systematic categorization of the benefits was espoused by Eppler and Platts (2009). Their study grouped the advantages of using multimedia picture and words frameworks into *cognitive benefits* (easier recall and sequencing; facilitating elicitation and synthesis; enabling new perspectives; and better, more exhaustive comparisons); *emotional benefits* (creating involvement and engagement; providing inspiration; and providing convincing communication); and *social benefits* (integrating different perspectives; assisting mutual understanding; tracking, and showing interdependencies).

Eppler and Platts (2009) did not, however, theorize the mechanisms behind these benefits, or test them empirically. Instead, they and other proponents of multimedia strategy communication either referred to works from conceptual thinkers in other fields, such as design, organization theory, mapmaking, and cognition (e.g., McKim, 1972; Kosslyn, 1980; Morgan, 1986; Tufte, 1990; Wood, 1992; Foos & Goolkasian, 2005; Hull & Nelson, 2005), or they pointed to experiments from other domains, such as children learning mathematics (Anghileri, 2005) or note taking (Mueller & Oppenheimer, 2014). Alternatively, they drew on after-the-fact case examples of "companies that achieved performance breakthroughs... by placing [a pictorial approach at] the centrepiece of a new strategy management system" (Kaplan & Norton, 2005: 73), or cases of firms already engaged in "the systematic use of visualization in strategic processes" (Eppler & Platts, 2009: 50).

Other articles provided detailed investigations of the affordances and other benefits of strategy frameworks, but these articles were again based on single cases and gave no evaluation of, or comparison with, the benefits of other modes of communication (e.g., Paroutis et al., 2015). As such, these articles are predisposed to demonstrating advantages from the approach that their subjects have already selected to invest in. There has been some recent support from outside the management field (Dansereau & Simpson, 2009), but in the management literature, the evidence supporting the claims for multimedia strategy communication is limited to a few anecdotal cases or small samples lacking in specificity, suggesting a need for further rigorous empirical investigation (Meyer et al., 2013).

COGNITIVE LOAD THEORY (CLT) AND THE COGNITIVE THEORY OF MULTIMEDIA LEARNING (CTML)

If we are to advance our understanding of the effects of different forms of communicating on students, and for those students to perceive how they might affect organizational stakeholders' ability to understand, learn, and interact with a strategy, there needs to be more theorizing and testing of how larger samples of recipients of a strategy respond to different communication approaches.

Our initial interest in this topic led us to surmise that multimedia strategy communication may be effective because it reduces the recipients' cognitive load (the total amount of mental effort used in the working memory) which may provide benefits such as greater recall, sequencing, and elicitation. This led us to cognitive load theory (CLT). In the paragraphs below we outline how we used CLT, and a branch of CLT called the cognitive theory of multimedia learning (CTML), to develop hypotheses that broadly relate to the three categories of assumed effects (cognitive, social, and emotional) of multimedia strategy communication.

CLT is attractive for understanding strategy communication because it focuses on complex learning environments and real-life settings (Sweller, 1988). Through extensive studies, Sweller and his colleagues showed how communications that result in heavy cognitive loads are associated with errors in recipients' recall and interference with tasks, particularly when instructions and tasks are subjective and complex (Sweller & Cooper, 1985; Paas, 1992; Sweller et al., 1998, 2011). We reason that strategy communication can be subjective and complex and can result in confusion for recipients, causing heavier cognitive load, especially when multiple strategy dimensions are combined or integrated. Cognitive load could be reduced in recipients through the incorporation of pictures in communications because these provide a vehicle for "mental integration," allowing the integration of concepts that cannot be achieved as effectively through the use of text-only formats, such as bullet points (Sweller et al., 2011).

Richard E. Mayer and his associates at the University of California built on Sweller's work on CLT to concentrate on the role of multimedia or multichannel approaches. The primary focus of Mayer's cognitive theory of multimedia learning (CTML) is that human working memory has subcomponents that work in parallel and that learning can be improved if multiple channels are used for information processing at the same time. Based on many decades of findings, as evidenced by measures such as recall or the ability to subsequently solve problems using what students have learned, Mayer and his followers now have significant evidence for their "multimedia principle" that people learn more from words and pictures than from words alone, and CTML studies continue to seek to better understand how this works and to design more effective instructional materials (Mayer & Anderson, 1991; Mayer, 1997, Mayer, 2002; Moreno & Mayer, 1999).

CTML theorizing relates multimedia communication to three avenues of inquiry in cognitive research. The first is the *Dual-Channel Assumption*, which proposes that we have separate channels in our working memory to process pictures and text, and that engaging both can enhance learning. This idea was first suggested by Baddeley and Hitch (1974) where they referred to a phonological loop system channel and a visuospatial sketchpad channel which developed into Paivio's (1991) "dual-coding theory." This assumption is analogous to cognitive load theory's acknowledgment of "separate channels for dealing with auditory and visual material" (Sweller, 1999: 128). While much of the early research conducted in this avenue looked at multimedia communication using visual plus audio content (Drewnowski & Murdock, 1980), it was suggested that, within the visual channel, different approaches (e.g., text and pictorial communication) could activate different mental responses and processes, so that a multiplicity of visual media using pictures and text might be superior to singular text-based communication in enhancing learning.

The second avenue of CTML theorizing is the *Active-Processing Assumption*, which claims that humans are dynamic learners who attend to incoming information by organizing it into mental representations developed in relation to prior knowledge. This view conflicts with the conventional assumption that humans are passive processors who pile incoming information onto what is already held, as if inputs were discrete files to be retrieved or downloaded at a later stage. The CTML theorization suggests that multimedia picture-plus-text instruction may aid effectiveness if it assists learners in building representative schemas that combine the information communicated with knowledge held in the long-term memory, and is related to what is often referred to as "Constructivist Learning" approaches (Huang et al., 2010).

The third avenue of CTML in this regard is the *Limited Capacity Assumption*. Research dating back to Miller's information processing theory (which identified that humans could effectively hold only seven, plus or minus two, units of information in their short-term memory) showed that our channels have inherent working memory capacity load limits (Miller, 1956; Chase & Simon, 1973; Linden, 2007). Cognitive load theorists have defined three types of cognitive load to help us understand how *limited capacity* works in practice: intrinsic, extraneous, and germane. *Intrinsic cognitive load* is the inherent level of difficulty associated with a specific instructional topic (Chandler & Sweller, 1991, 1992). As it is inherent to the nature of what is being conveyed, an instructor cannot alter it. *Germane cognitive load* is associated with the processing and construction of representative schemas (Sweller et al., 1998). It relates to elements that an instructor can introduce in delivering the intrinsic load that helps the learner remember and understand what is being conveyed, so it is "germane" to the learning process. *Extraneous cognitive load* refers to the mode or way in which information that is not germane is presented, and may become a distraction by unnecessarily adding to the cognitive load. Because individuals' channels have limited capacity, and a lot of information may be difficult to retain over time (Peterson & Peterson, 1959), too much information across the channels causes cognitive overload,

which can lead to increased stress, decreasing confidence, and a declining ability to think effectively about subsequent tasks. So, to convey information effectively, the extraneous load should be limited and the germane load should be enhanced, especially when the intrinsic load is high (Ginns, 2006). CTML suggests that the addition of pictures in the communication of germane load may enhance learning if it reduces apparent intrinsic load, but it may be detrimental if it adds extraneous load.

Using these theories, we can surmise that the way strategy communication is received will be affected by its presentation, its *extraneous cognitive load*, particularly if the content, or *intrinsic cognitive load* and *germane load*, remains relatively constant. Cognitive load theorists suggest that communication modes that show interdependencies, such as pictures, are likely to be more effective in reducing cognitive load than discrete separated components, such as bullet points. While CLT has focused more on researching the benefits of incorporating audio communication in relation to communications that solely use the visualization of text, both CLT and CTML suggest that multimedia communications are more effective than single mode communications in promoting learning and recall. In terms of communicating strategy, we might contend that picture-plus-text can convey added information, allowing recipients to understand its complexity more effectively than through the use of text alone and facilitates better recall (Kosslyn, 2007). This leads us to our first hypothesis that multimedia communication of strategy, using picture and text, will provide a cognitive benefit in aiding recipients' recall more effectively than text-only presentation.

Hypothesis 1: Multimedia picture-plus-text presentations of a strategy are more effective in enabling recipient recall than monomedia text-only presentations.

CLT and CTML also suggest when a communication presents a high intrinsic load that is difficult to process and recall, it may lead recipients to be discouraged and their self-confidence to be eroded (Elen & Clark, 2006). However, where communications are able to buttress the recipients' thinking, in terms of constructing linkages to known representative schemas, this cognitive load may be mitigated. In this way, self-confidence may be preserved or even boosted. Therefore, our second hypothesis posits that multimedia picture-and-text communications of a strategy help reduce recipients' cognitive load and promote their feelings of confidence with respect to discussing or acting on that strategy.

Hypothesis 2: Multimedia picture-plus-text communications are more effective than monomedia text-only presentations of strategy in promoting recipients' confidence to discuss the strategy.

As introduced above, another stream of the research carried out in CLT and CTML exploring the workings of *germane cognitive load* relates to the processing and construction of representative schemas in recipients. This research leads us to posit that strategy communication may convey intrinsic load more effectively when it mitigates cognitive challenges through tracking and showing interdependencies and connections between strategy elements in such a way that make these interrelationships easy to see and recall (Sweller et al., 1998). Therefore, our third hypothesis focuses on whether strategy communication mode affects recipients' ability to perceive connectivity between different elements in, or parts of, a strategy, or what we term here "integration."

Hypothesis 3: Multimedia picture-plus-text presentations of a strategy enable recipients to more effectively perceive interrelationships between that strategy's elements than monomedia text-only presentations.

These three hypotheses broadly map on to the three categories of benefits attributed to the multimedia communication of strategies espoused by Eppler and Platts (2009) as described earlier: *cognitive benefits* (e.g., recall), *emotional benefits* (e.g., creating involvement, engagement, and providing inspiration or confidence), and *social benefits* (e.g., integrating and seeing interdependencies).

Although CLT argues that the greater the working load needed to process information, the greater the errors, and CTML responds to this problem by theorizing that multimedia communications can be used in teaching to allow more meaningful learning (Mayer, 2005), neither theory discusses the ways in which recipients may voluntarily recall those communications. For this reason, these theories do not comment on the consequences of different voluntary recall methods. For instance, it is not clear whether recipients receiving communications in one form or another will reproduce those communications in the same way, or choose another form. Also it is not clear what the consequences of reproducing received communications in a different form would be. If, indeed, multimedia communications are more effective for student learning, would that learning effectiveness be increased or reduced if recipients choose a different mode of reproduction? We suggest that participants receiving a single mode of communication may exhibit superior learning if this is

recalled in a different way, as this would be an example of accessing an additional different mental pathway. For instance, if a participant receives a text-only communication and reproduces this as a drawing, then the participant would have engaged in both a verbal and visual mental pathway (Mayer, 2005), and this could lead to higher quality learning. In a reverse case, if a participant receives a multimedia communication and only reproduces it in one mode, information might be lost by choosing to deploy just one mental pathway. This line of reasoning extends CTML to argue that multichannel processes are not only important for reducing cognitive load in acquiring knowledge, but equally important for recipient recall, confidence to discuss, and ability to show interconnections, the latter being a necessary part of indicating schemas in a germane load. Consequently, in testing our three hypotheses, we will comment on the modes of reproduction chosen voluntarily by participants to see if they have any moderating effects on learning outcomes.

METHOD

Experiment Design

A randomized experiment was viewed as the most appropriate method for addressing our three hypotheses, because it creates comparable treatment groups that are less likely to differ on any measured or unmeasured variables (Cook, Shadish, & Wong, 2008). It was implemented as follows by the authors of this study during strategy courses that they were teaching in universities in various locations around the world. The experiment took place before any strategy tools and frameworks had been taught in their courses. Each professor's role was to hand out an envelope to all students in the course and read out a set of standardized instructions at the beginning and end of the exercise. Specifically, students were asked to each open an envelope, take out the page inside, and read the instructions. Students were assured that this experiment was not part of any assessment and that they would not be required to provide biographical information, meaning the results would be anonymous.[1]

Inside the envelope was a representation of a company's strategy simplified to highlight five distinct but interrelated core elements, each with two subparts,

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[1] We detected no signs that participation in the exercise was interpreted by students to affect their course grades. No incentives to participate were given to students and the right of students to not participate was respected.

making 10 data points in total. While each page depicted the same strategy (i.e., the same 10 data points), different envelopes contained these in different presentation formats (see Appendix 1): two text-only formats in (1) bullet points and (2) a paragraph (the paragraph contained more detail and contextual load); and one multimedia presentation comprising a pictorial expression of the strategy with text: a hand-drawn adaptation of a Value Chain (Porter, 1980). The envelopes were distributed to students randomly, and students were not aware that they did not all receive the same strategy presentation format.

Students were asked to look at the strategy presented in their envelope and memorize it without consulting with other students and without making notes. After one minute had elapsed, they were asked to put the page back in the envelope, seal it, and place it to one side. After a predetermined interval (of either 5, 10, 15, 20, 30, 40, or 50 minutes during which students were focused on other tasks within the lecture), students were instructed to reproduce the elements of the strategy in whatever form they wished on the back of the original envelope (to avoid them tampering with the document), again without consulting others.

With this design, the experiment was randomized in that students may not have received the strategy in the presentation format most inclined or suited to their preferences, but they were also not channelled into a particular format of response when recalling the strategy. We recorded both the mode in which the students received the strategy as well as the mode with which students recalled the strategy.

Sample

The experiment was conducted by the researchers across numerous courses over 3 years involving a breadth of management students ($N = 1140$, see Table 1), spanning eight countries with most completing the course as part of a business degree. The sample was spread as follows due to the varying course sizes: Austria: 4%; China: 2%; France: 5%; Morocco: 12%; New Zealand: 32%; Tunisia: 9%; UK: 29%; USA: 7%. The primary nationality within each course matched the course location, although the UK and NZ undergraduate and UK/European-based MBA cohorts included a greater mix of nationalities. 70% of the courses surveyed (18/26) were MBA-type classes; the other 8 groups were undergraduate classes, with the eventual number of responses from each being 578 MBA students and 562 undergraduates. The average age of the MBAs was 34 years compared with 20 years for the undergraduates,

TABLE 1
Demographic Data of Experiment Participants

Year	Experiment Location	Primary Nationality	Number of Responses	Level of Study	Major	Average Age	Age Range	% Male	% Female	Interval (min)
2012	France	International	20	MBA	Business	32	22-50	60	40	20
2012	US	US	36	UG	Business	20	19-21	60	40	10
2012	Morocco	Moroccan	43	MBA	Business	40	25-60	88	12	20
2012	New Zealand	NZ	38	MBA	Business	40	30-50	60	40	20
2012	New Zealand	NZ	94	UG	Business	20	19-21	50	50	20
2012	UK	European	123	MBA	Business	29	25-46	65	35	10
2012	Tunisia	Tunisian	17	MBA	Business	35	26-55	70	30	10
2013	US	US	40	UG	Business	20	19-21	60	40	10
2013	Austria	Germanic	18	MBA	Business	33	29-41	80	20	10
2013	Morocco	Moroccan	38	MBA	Business	38	26-58	84	16	20
2013	Morocco	Moroccan	30	MBA	Business	37	26-60	83	17	20
2013	UK	UK	48	UG	Business	20	20-22	55	45	15
2013	France	International	18	MBA	Business	29	27-46	61	39	10
2014	France	International	24	MBA	Business	28	26-51	65	35	15
2014	Austria	Germanic	22	MBA	Business	32	28-43	66	34	10
2014	New Zealand	NZ	192	UG	Business	20	19-21	50	50	40
2014	New Zealand	NZ	40	MBA	Business	40	30-55	60	40	30
2014	UK	European	13	MBA	Business	28	26-38	65	35	15
2014	UK	European	75	UG	Business	20	20-22	56	44	15
2014	UK	European	58	UG	Business	20	20-22	55	45	50
2014	UK	UK	9	In company	Not specified	37	33-55	78	22	5
2014	Tunisia	Tunisian	36	MBA	Business	33	27-52	64	36	10
2015	Austria	Germanic	11	Exec MBA	Business	32	28-43	66	34	30
2016	China	Chinese	19	UG	Arts	22	20-25	40	60	15
2016	Morocco	Moroccan	31	MBA	Business	38	26-58	80	20	30
2016	Tunisia	Tunisian	47	Exec MBA	Business	32	27-51	60	40	12

although some MBA courses included a few students who were only slightly older than the 19–22 age range typical of undergraduate courses. The MBA students had typically worked in managerial roles and had greater prior familiarity with strategy frameworks such as the Value Chain. The MBA courses tended to have a higher proportion of males (average = 70%), whereas this average was lower for the undergraduate courses (56%). The average interval was slightly higher for the undergraduate courses (21.9 vs. 16.5 min), because some of these courses provided the best opportunity for including longer intervals in the experiment. The diverse nature of the sample, containing a breadth of nationalities and associated first languages, ages, and genders, suggests that any systematic differences associated with the strategy presentation and recall in the sample are likely to be generalizable to students in most countries in the world.

Forty-two percent of the students received the strategy in a multimedia picture-and-text format,

and 58% received the strategy in a monomedia textual format (a bullet pointed list or paragraph), with 23% of the monomedia group receiving the strategy by way of a text paragraph containing more words than the bullet-point version. The paragraph version was introduced later in the data-collection phase to investigate if the picture-plus-text version might have contained more information about the strategic issues and their integration than bullet points alone. The paragraph explicitly included discussion about strategic issue integration. The proportion of students receiving the multimedia version ended up slightly lower than 50% to gather more data about the effect of paragraphs.

Fewer than 2% of all students chose not to participate, did not complete, or "spoiled" the responses on the envelopes, and less than 9% did not answer all of the survey questions. Failure to answer all questions was highest in the MBA cohorts (for the question related to confidence to discuss). There was no

readily identifiable reason for this, as the response rate of over 90% suggested that the tasks were understandable and achievable within the timeframes utilized. A total of 1,060 students completed all tasks/questions in the experiment, and this slightly reduced subsample was used in the regression analyses.

Measures

Two main measures of learning effectiveness are used in CTML: Student recall and the ability to solve problems with what has been learned. While we recognize that recall relates to lower level aspects of Bloom's Taxonomy (Anderson & Krathwohl, 2001), we used it as our first measure of effectiveness because it could be more reliably operationalized and assessed independently in a large-scale experiment. Confidence to discuss and ability to perceive interrelationships (associated with our second and third hypotheses), which relate to higher levels of learning, could not be assessed on an independent basis given the scale of the experiment. Therefore, we relied on students' self-assessments in this regard.

Recall scores. Student recall was assessed on a 10-point scale based on the extent to which the ten elements of the strategy were evident in their responses (+1 for a correct recall and 0 otherwise). This scale provides a sufficiently broad gradation of the extent to which different elements of the mono-/ multimedia formats were being accurately recalled and enabled the reliability of coding. Two different coders, who assessed approximately 50% of the overall sample each, scored each of the students' envelopes and recorded the data. A randomized sample of approximately 30% of all envelopes across the two coders ($N = 326$) was assessed by a third coder to evaluate inter-rater reliability for recall scores, with the tests indicating a high level of agreement (86% equal or $+/-1$ of the original recall score and 98% within 2; Cohen's weighted kappa value of .723 indicating good agreement as well as Pearson's and Kendall's tau correlation coefficients of 0.95 and 0.88).

Confidence to discuss. Once students had reproduced the strategy on their envelopes, they were asked two additional questions. The first addressed their confidence to discuss the strategy: "You are about to go in to a meeting to discuss this strategy with a group of managers from the company. On a scale of 1 to 5, how confident are you to discuss the strategy in a convincing way?", with 1 being *not at all confident* and 5 being

extremely confident. Students were informed at this point that this is not asking about their confidence in the particular strategy, but their confidence in debating its merits with others. Stankov et al. (2015) report that such measures of confidence in one's knowledge related to a particular cognitive act have been used extensively. While empirical evidence shows individual differences can affect confidence ratings, internal consistency and reliability coefficients typically range between .75 and .90 across these studies. Although a single item, as we use here, has some limitations, Stankov and Lee (2008) concluded that confidence is a separate concept that can vary across individual characteristics such as national culture, and its measurement reliability remains high even when different numbers of test items have been employed (Stankov et al., 2015). The observed correlation between recall score and confidence (.33, see Table 5) is consistent with, although slightly lower than, previous validity assessments reported by Stankov et al. (2015) for similar relationships and supports convergent validity for our measure of confidence.

Extent of integration perceived. Given that all students received representations of the same strategy (varying only in terms of which of three formats was in their envelope), differences in the extent of integration perceived should provide a reliable measure for whether the format has a systematic impact. Thus, students were asked, again on a scale of 1 to 5: "How integrated do you think the elements of strategy were?", with 1 being *not at all integrated* and 5 being *extremely integrated*. They recorded answers to both questions on their envelopes. Integration and interrelationships across various strategy dimensions (e.g., customers, suppliers, internally) have long been argued to affect organizational performance positively (see Swink et al., 2005 for a review). This characteristic had been explained as part of the strategic management courses where the experiment was conducted in terms of alignment across functions and cooperation/collaboration with stakeholders, which matches how integration has been measured previously (O'Leary-Kelly & Flores, 2002; Swink et al., 2005).

Other measures. Binary variables (where 0 = monomedia and 1 = multimedia) recorded both the presentation (From P + T) and the recall mode (To P + T). Given that the sample covers multiple countries and strategy courses, a variety of factors associated with course demographics could be associated with differences in recall, confidence to discuss, and integration perceived, such as whether English was the first language of instruction for most students in the

course, their prior familiarity with strategic management concepts such as the Value Chain, their work experience involving the implementation of strategies, as well as the interval before the strategy was recalled. Thus, we also coded the sample for country location of the course (with the UK used as the contrast country), the program level (0 = undergraduate, 1 = MBA), and the interval before students were asked to recall the strategy (measured in min.).

RESULTS

Our analysis occurred in several stages. This initially involved understanding whether recall, confidence, and integration may have differed in terms of locational demographic factors noted in Table 1 as well as the mode in which the strategy was received and recalled. This was followed by the more specific tests associated with Hypotheses 1–3.

Recall

Average recall across different geographical locations ranged from 3.0 to 5.9 (out of 10) when receiving a text-only version of the strategy and 6.3 to 8.8 for the picture-and-text format. The highest average scores when receiving text were observed in an undergraduate class in the United States and the Executive MBA course in the UK. The geographical variation in average scores (between receiving picture plus text versus from text only) matches the overall contrasts reported earlier and was at or above +3 points across each subsample (except for Tunisia, where it was +1.7 points). This consistent difference suggests that the subsequent regression analyses should include explanatory variables to account for potential country-level effects as well as measures of covariate factors noted above (program level and interval before recall).

Table 2 provides the average recall scores across the full sample as well as by different formats of strategy communication and recall. There was no evidence that the students did not undertake the task of memorizing and recalling the strategy conscientiously, given only 5.5% of the sample failed to recall at least 1 of the 10 strategy components (matching the 6.4% who recalled all 10).

Average recall for those students receiving the strategy in a multimedia format (7.08 of 10) was 1.1 to 3.1 points higher than those receiving the text-only version (averaging 3.92 of 10). Numerous *t* tests for differences in these averages (see Table 2) are significant at a $p < .01$

level, with effect sizes at times quite large, ranging from 0.5 to 1.4 (using the pooled standard deviations). For those recalling the strategy using pictures and text, the average score was 7.28 versus 4.04 for those recalling the strategy via text only, with the *t* value (and effect size Cohen's $d = 1.4$), again suggesting a substantial effect across recall modes. While there appear to be substantial gains for those *recalling* the strategy in a multimedia format, the average recall in our sample for those *receiving* it in this format (7.37) is also significantly higher ($p = 0.002$) than when *receiving* it in a monomedia text format (6.25) (effect size 0.5).

Table 2 also illustrates that most students recalled the strategy in the same format as it was received (i.e., a strategy received in bullet point form would generally be reproduced using bullet points). While we provided two monomedia textual formats when communicating the strategy, bullet point lists were overwhelmingly the mode used for recall in this format. Very few students recalled the strategy in a richer extended textual form. However, some recipients reproduced the strategy in a different format (e.g., Figure 1). While 57.6% of the total sample had received the strategy in a text-only mode to consider and memorize, a significantly higher 62.5% of the recalled strategy representations were in the form of monomedia text, showing a potential predisposition toward text for strategy reproduction (Pearson $\chi^2 = 692$, $df = 1$, $p < 0.001$).

Most marked in terms of recipients reproducing the strategy in a different format were those who received the strategy as a picture. Of those 483 students who did, 89 (18.4%) reproduced the strategy using only text. This switching was more limited for recipients receiving bullet points or a paragraph where only 4% and 8.5%, respectively shifted to recalling it by including a picture and text. Students' individual preferences or inclinations for text and pictures are unlikely to account for this shift in recall mode, since strategy presentation formats were distributed to the students randomly. This suggests that many students, when faced with the task of recalling a strategy, view a textual description (and particularly lists of bulleted points) as the logical, most legitimate, or acceptable format, even when the strategy has been communicated to them in another mode.

Average recall scores were the lowest for those receiving the strategy in the monomedia paragraph form of text (irrespective of the recall format chosen), and significantly higher for both receipt and recall in the picture-plus-text format with effect sizes greater than 1 in both cases (see Table 2). The reverse also appears true. Incorporating pictures into a reproduction generates better average recall results

TABLE 2
Cross-Tabulations for Average Recall Scores and Frequencies

Reproduced Received	Monomedia Text	Multimedia Picture Plus Text	Total
Text (bullets)	3.84 (2.49) [$N = 484$]	6.45 (1.69) [$N = 21$]	3.95 (2.51) $t = 4.8$ [$N = 505$]
Text (paragraph)	3.60 (2.34) [$N = 139$]	5.92 (1.97) [$N = 13$]	3.80 (2.40) $t = 3.5$ [$N = 152$]
Text (total)	3.79 (2.46) [$N = 623$]	6.25 (1.79) [$N = 34$]	3.92 (2.49) $t = 5.8$ [$N = 657$]
Picture plus text	5.78 (2.11) [$N = 89$]	7.37 (2.00) [$N = 394$]	7.08 (2.11) $t = 6.7$ [$N = 483$]
Total	4.04 (2.50) $t = 7.3$ [$N = 712$]	7.28 (2.00) $t = 3.2$ [$N = 428$]	5.25 (2.81) $t = 23.2$ [$N = 1140$]

Note: Each cell contains Average Recall Score (*SD*) [upper left], [Number of cases, *N* lower right].

T values refer to differences in 2 adjacent cell averages either above or to the left.

than text alone. Students that received the strategy in picture-plus-text form and then reproduced it with only text exhibited lower recall accuracy relative to those who matched recall with the multimedia format that they received it in (5.78 and 7.37 respectively, $d = 0.8$). Overall, with respect to Hypothesis 1, this initial analysis suggests preliminary support, noting though that other potential influences are not controlled for in the *t* tests.
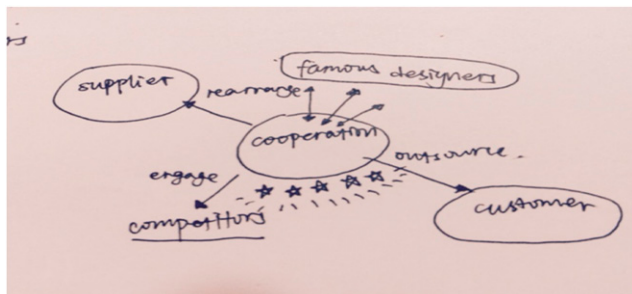
Confidence to Discuss and Integration

Confidence to discuss varied across countries and program levels, with Moroccan MBAs indicating particularly high levels, and NZ undergraduates low levels. Table 3 shows the average scores again reported by the format received and used for recall. In contrast to the numerous differences observed with respect to recall, we found only two statistically significant differences in average recipient confidence to discuss the strategy. These were for differences in aggregate, with slightly higher confidence when there was multimedia receipt or reproduction of the strategy (with 3.03 vs. 2.76 and 3.04 vs. 2.74, $t > 3.5$, $p < 0.001$). These effects are quite small

FIGURE 1
Example of Strategy Received as Bullet Points and Recalled as Picture Plus Text

(Cohen's $d = 0.2$) though, so it is less clear whether or how the strategy presentation or recall mode may be associated with a large change in confidence for the recipient (H2). No differences were found in confidence between the bullet points and paragraph versions of the strategy.

The extent of integration perceived varied marginally across the sample, although not as substantially as for other measures. With respect to communication and recall effects, the results (Table 4) again show few significant differences in averages, with the effect sizes for these correspondingly smaller than for the recall scores, ranging from 0.1 to 0.6. Recipients receiving paragraphs ($N = 152$) tended to perceive slightly more integration than those receiving bullet points (average scores of 3.16 and 2.91: $t = 2.5$, $p = 0.012$). Thus, the use of paragraphs may assist with perceiving integration across the strategy elements.

Overall, receiving the strategy as picture plus text exhibited higher average perceptions of integration among the strategy elements, and these scores were significantly different to receiving text only (3.36 vs. 2.97, $t = 6.0$, with an effect size of 0.4) thus, some initial support for H3. This low effect size, however, indicates that the probability is only about 0.6 that the integration perceived by a random student receiving the strategy in a multimedia form is higher than a student presented with a text-only version (see McGraw & Wong, 1992).

Regression Analyses

Although the univariate analyses provide insight and suggest some support for the hypotheses, a more robust assessment of the relationships can be achieved through multiple regression, because the effects of some other factors can be controlled for. Table 5 presents the correlation matrix, including means and standard deviations for the variables used in the different models.

TABLE 3
Cross-Tabulations for Confidence to Discuss [*N* = 1067]

Reproduced Received	Monomedia Text	Multimedia-Picture-Plus Text	Total
Text (bullets)	2.76 (1.26)	3.05 (1.32)	2.77 (1.26)
Text (paragraph)	2.69 (1.09)	2.31 (1.16)	2.66 (1.09)
Text (total)	2.74 (1.22) *t* = 3.1	2.77 (1.30)	2.74 (1.22)
Picture-plus-text	2.90 (1.09)	3.06 (1.22)	3.04 (1.19)
Total	2.76 (1.21)	3.03 (1.23)	2.86 (1.22) *t* > 3.5

Reported *t* values refer to differences in two adjacent cell averages either above or to the left.

The multiple regression models were developed in stages (see Table 6) initially adding the control and then the focal independent variables associated with the hypotheses. Most country-level effects were statistically significant and may simultaneously capture a range of facets associated with the locations of the courses as noted above. Most models explain a significant proportion of the variation in the dependent variable (*F* value > 20), although it is much lower for Model 6. In line with this lower adjusted *r* square, differences in Integration Perceived were not as evident across countries. All models were checked to determine if receiving the paragraph text-only form of the strategy had a separate systematic effect. Only in Model 6 was this estimated coefficient different (although only at a 5% level), suggesting that it is valid to aggregate the bulleted lists and paragraph into a pooled category of "From Text" in all models.

Tests for multicollinearity demonstrated little evidence of this having an impact on estimates, with variance inflation factors below 2.0, and condition indices below 10 (Hair et al., 2014) in the models reported. Endogeneity issues were also assessed (Semadeni, Withers, & Certo, 2014), while recognizing that the randomized nature of the experiment should help to reduce this. The potential for simultaneous relationships between the focal-dependent variables is likely the only concern, that is, Integration Affecting Recall and vice versa. However,

the use of a 2-staged least square regression procedure did not indicate different signs or significance levels for key coefficients. Checks for heteroscedasticity and non-normality of residuals indicate that these potential problems were not present either.

The regression coefficient estimates for program level were positive and significant for Models 1–4. This would indicate that experience in a business environment and greater familiarity with strategy concepts (as would be expected of MBA/executive students) enhances an individual's ability to comprehend, remember, and recall presentations of strategies, especially when the strategy has close alignment with a framework, such as the Value Chain, which most MBA students would have been more familiar with than the undergraduates in the sample when the experiments were conducted. This, in turn, could boost confidence. Therefore, this finding suggests that the *Active Processing Assumption* may hold, whereby multimedia presentation may aid effectiveness and confidence if it assists learners in connecting new knowledge to prior knowledge. The effect of program level though, is small relative to the variation in the dependent variable, about 40% of one standard deviation for recall.

The interval between experiment distribution and participant recall had a small negative estimated effect (significant in Model 1 only), likely reflecting memory lapses particularly when there was over 20

TABLE 4
Cross-Tabulations for Integration Perceived [*N* = 1129]

Reproduced Received	Monomedia Text	Multimedia Picture Plus Text	Total
Text (bullets)	2.89 (1.09)	3.36 (1.24)	2.91 (1.10)
Text (paragraph)	3.21 (0.95)	2.65 (0.90)	3.16 (0.96) *t* = 2.0
Text (total)	2.97 (1.07)	3.09 (1.16)	2.97 (1.07) *t* = 2.5
Picture-Plus-Text	3.24 (0.98)	3.39 (0.99)	3.36 (0.99)
Total	3.00 (1.06)	3.36 (1.01)	3.14 (1.06) *t* = 6.0

Reported *t* values refer to differences in two adjacent cell averages either above or to the left.

TABLE 5
Descriptive Statistics and Correlations [*N* = 1060]

Variables	*M*	*SD*	1	2	3	5	6	7
1. Recall Score	5.26	2.82						
2. Confidence to Discuss	2.86	1.22	.33					
3. Integration Perceived	3.13	1.06	.20	.39				
4. Program Level	0.47	0.50	.18	.21	.09			
5. Interval Before Recall	21.8	12.35	-.32	-.22	.02	.27		
6. From P + T	0.42	0.49	.54	.12	.18	-.06	-.17	
7. To P + T	0.38	0.49	.55	.11	.17	-.04	-.11	0.79

All correlations > |+/−0.08| significant at $p < 0.01$.

minutes before being asked to recall the strategy. The relationship appears linear with any effect size quite small. With regard to Integration Perceived (Model 6), a longer interval was associated with slightly higher integration scores, suggesting that a greater delay may lead students to forget aspects of intrinsic load relative to germane load; therefore, simplifying the message retained to one that appears more integrated on recall. Interval length had a similarly small effect size in accounting for differences in integration perceived.

Hypothesis 1. As can be seen in Models 2 and 3, recall scores for receiving the strategy by way of a picture plus text (From P + T = 1) were significantly and systematically higher (β = 1.5) relative to the default category (From P + T = 0, when the strategy was given to the students as a text only, either bulleted points or a paragraph). Similarly, the multimedia reproduction of the strategy (To P + T) coefficient was significant and positive. Separate tests for mixed receipt/recall modes indicate that these outperformed receiving

and recalling the strategy with text only. This suggests that the process of working with information about a strategy in text-only form, either as part of memorizing it or recalling it, has a significant effect (a 1–3 point decrease in recall on the 10-point scale).

Even where some students may have been inclined to recall the strategy textually, a multimedia pictorial presentation of the strategy benefitted them significantly in aiding their retention of the strategy elements in comparison to learning about the strategy by way of a paragraph or bulleted points and recalling it in this same type of format. Reproducing the strategy by way of a picture and text showed clear benefits for recall (evidenced in the positive significant To P + T coefficient), both when given the strategy in text or in multimedia picture-plus-text format matching the findings from Table 2.

The effects of textual presentation and recall of strategy were also tested separately in the portion of the sample where there was a shorter time interval (< 15 min) between receiving and memorizing the

TABLE 6
Multiple Regression Analyses and Estimated Coefficients

Dependent Variable	Model 1 Recall Score	Model 2 Recall Score	Model 3 Recall Score	Model 4 Confidence to Discuss	Model 5 Confidence to Discuss	Model 6 Integration Perceived
Constant	5.77*** (.281)	4.05*** (.234)	3.63*** (.315)	0.84*** (.144)	1.05*** (.154)	2.86*** (.128)
Country-Level Effects	Estimated and most significant	Estimated and most significant	Estimated and most significant	Estimated and most significant	Estimated and most significant	Estimated and most significant
Program Level	1.04*** (.247)	1.05*** (.197)	1.04*** (.195)	0.47*** (.090)	0.09 (.175)	0.06 (.093)
Interval Before Recall	-0.03*** (.009)	-0.01 (.007)	-0.01 (.007)	0.00 (.003)	0.00 (.004)	0.01[+] (.003)
From P + T		1.53*** (.202)	1.46*** (.201)	-0.16 (.096)	-0.22 (.175)	0.24[+] (.095)
To P + T		1.93*** (.205)	1.88*** (.204)	-0.06 (.099)	-0.11 (.010)	0.20[+] (.097)
Integration Perceived			0.28*** (.062)	0.44*** (.029)	0.44*** (.029)	
Recall Score				0.08*** (.014)	0.07*** (.016)	
Prog. level * Interval					0.02* (.008)	
From P + T * Recall Score					0.05[+] (.026)	
Adjusted R^2	0.141	0.455	0.464	0.341	0.348	0.080

Values reported are unstandardized β with standard errors in parentheses.
[+] $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ (two-tailed test).

strategy and recall, with the significant positive co-efficient estimate for From P + T being reproduced with a similar effect size. Thus, the constraining effects of textual presentation and recall dominate even when memory retention issues should be less present. We therefore find strong support for H1 that multimedia representations of a strategy are more effective than monomedia in enabling recipient recall. Our analysis adds to this finding, though, by suggesting that multimedia recall also has benefits for strategy recall effectiveness.

Model 3 assessed whether a student's perception of the strategy's elements being interrelated was associated with greater recall. This variable was positively related to recall and highly significant with an effect similar in size to program level for the average integration perceived. It represents a clear avenue for future research into ways to develop enhanced recall.

Hypothesis 2. Models 4 and 5 assess the students' confidence to discuss the strategy that had been presented to them. The strong association between the picture-plus-text communication format and recall score (Models 2 and 3) did not generate indications of multicollinearity problems when including both sets of variables here, with coefficient estimates remaining stable and variance inflation factors low. Checks with models using different combinations of variables found no substantial changes in coefficient estimates. Confidence scores for MBAs were at consistently higher levels than those of undergraduates, when other factors such as country factors are controlled for. This suggests that confidence may vary more based on each individual's characteristics as has been noted by Stankov et al. (2015). As with Models 1–3, the coefficient for interval suggests that a longer delay since first viewing the strategy had little effect on whether students were confident.

As would be expected, those students who were able to recall the strategy more accurately exhibited significantly higher confidence, with this variable accounting for about 20% of the variation explained. However, when this effect is compared with the larger magnitude for the coefficient for perceptions of integration in the strategy ($p < 0.001$), it suggests that an individual's confidence to discuss a strategy is only in part associated with their ability to recall the strategy elements accurately and to a greater extent dependent on perceptions about the strategy as a whole and connections between elements. In Model 4, there was no significant effect associated with receiving the strategy in a graphical format, which does not support H2 that multimedia presentation

is more effective than monomedia in promoting recipient confidence.

Additional tests were undertaken to understand this result, including considering whether some relationships with confidence might be moderated (Model 5). Two primary effects were considered: first, whether program level may interact with variables such as presentation mode or interval, and second, if the effect of a picture-plus-text presentation mode may be moderated by other factors such as recall score or whether integration is perceived. Standardized values were used for all variables associated with the interaction terms. These checks indicate that the negative effect of an increased interval before recall occurred mostly for undergraduate students in our sample (see Figure 2), with the MBAs not experiencing this decline in confidence. Stable confidence for MBAs again suggests that the *Active Processing Assumption* (mentioned earlier) may be occurring; that is, these students seemed able to build on connections between prior (such as the Value Chain) and current knowledge (greater experience). It is also possible that students in MBA/Executive programs could feel expected to demonstrate confidence when involved in strategic discussions irrespective of other facets, a social desirability effect. In either case, this result suggests that aspects of cognitive load may operate differently depending on familiarity with strategy, frameworks, and communication modes, which is consistent with cognitive load theory. A smaller effect of the combination of how the strategy was received and the student's level of recall on confidence was also found, indicating that multimedia presentation boosted confidence in combination with the students' recognition as to whether they had more effective recall. It is also possible that recall accuracy and integration perceived mediate the effect of strategy presentation on confidence, but such analysis went beyond our hypothesis.

Hypothesis 3. The regression analysis for the "extent of integration perceived" as the dependent variable [Model 6] resulted in a relatively low adjusted r square (0.08). It should, however, be noted that this variable exhibited less variance than the dependent variables in the other models. Significant estimated coefficients were primarily a few locational effects and interval before recall, but this effect was again very small. The multimedia presentation mode for the strategy coefficient (From P + T) was positive and significant, suggesting that receiving a strategy pictorially aids in perceivng interrelationships and integration between the strategy elements. The coefficient estimated for recalling the strategy with pictures and text (To P + T)

FIGURE 2
Moderated Relationships for Confidence to Discuss
With Respect to Interval and Recall Score
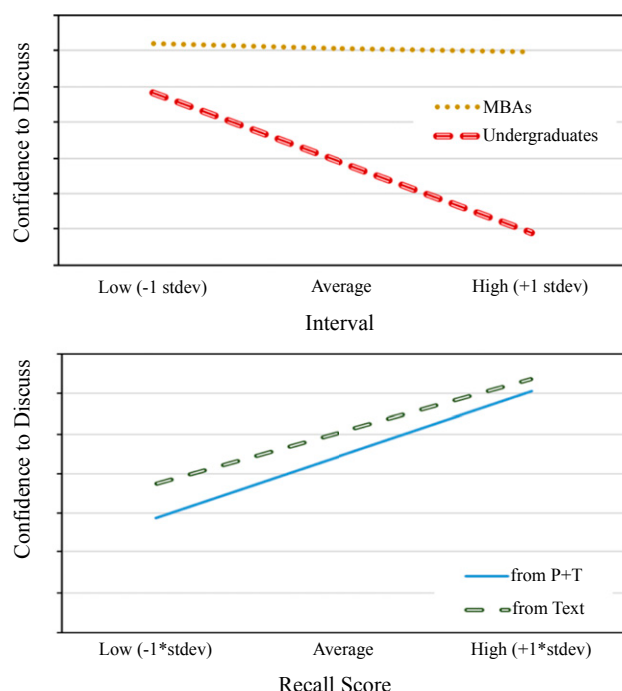
was positive but only significant at a 5% level. Thus, there is some support for H3 that multimedia presentations are more effective in enabling recipients to perceive strategy interrelationships. The small effect sizes and low amount of variation explained, though, suggest that future research should seek to better understand how central characteristics of a strategy as a whole, such as integration, can be communicated most effectively. This could include adding questions that assess the different types of strategy integration that are perceived to be present.

DISCUSSION

Overall, our experiment provides strong evidence in support of using multimedia picture-plus-text presentation, rather than text only, for communicating strategy, but not necessarily in the ways that we hypothesized. It has enabled us to test assumptions and advance our theoretical understanding of how students' learning can benefit from the multimedia presentation of strategy, but also identified some of the challenges for doing so.

First, our results confirm Hypothesis 1 that picture-plus-text communication of strategy is superior to text-only communication in terms of student recall. This was as much as 3.3 points (of 10) better overall than with bullet points or paragraph forms of text-only communication. There are some variations across the sample in terms of different educational levels, where those with more experience (MBAs) show greater recall, and some countries exhibing higher scores, but these effects do not alter the veracity of this general finding.

In addition, we established that variations in recall were explained by the mode in which participants chose to reproduce the strategy. Where students received the strategy as a text and reproduced it by combining drawing and text, their recall performance was significantly higher than those who reproduced the strategy in a text-only format. Conversely, where students received the strategy as picture plus text but chose to reproduce it as text only, their recall performance was significantly lower than those reproducing a picture plus text. Second, the extent to which the integration of strategy elements was perceived had an effect on recall scores. Picture-plus-text communication was associated with higher perceived integration scores, confirming Hypothesis 3, and this echoes findings from clinical trials in the psychology literature (Dansereau & Simpson, 2009). Overall, superior recall of strategy communication is explained by the mode of receiving the strategy, the mode of recall, and perceptions of integration.

In contrast, for our second hypothesis, we posited that the receipt of a strategy communication in the form of a picture plus text would lead to greater student confidence, but we found no support for this. This is surprising, as students receiving strategy communications as picture plus text are likely to have superior recall to those receiving the communications as text only, and are likely to have a higher ability to perceive interdependencies. This suggests that the advantages of using multimedia picture plus text are more social (in terms of perceiving integration benefits) and cognitive (in terms of easing recall), than emotional (in terms of building confidence). However on closer inspection, our results also show that students demonstrated lower confidence with the multi-multimedia format, than with text only, when recall levels are low.

One explanation for this is that the text-only recipients' lower level of competence robs them of the metacognitive ability to recognize their low recall or its significance. Our results suggest that text-only communication provides fewer clues to

poor performing recipients than picture and text to the complexity of a strategy, and so presents more opportunity for false optimism and errors. This is now referred to as the Dunning-Kruger effect (Kruger & Dunning, 1999) whereby a subject's lack of understanding actually increases their confidence. Or, as Charles Darwin (1871: 3) put it: "Ignorance more frequently begets confidence than does knowledge."

Limitations

Although a strength of our study is that it is based upon a large number of responses, a limitation is that the measures associated with Hypotheses 2 and 3 are based on self-reporting of ability. Podsakoff and Organ (1986) note that such self-report responses are asking students to engage in a higher order cognitive process and can be affected by consistency motifs and social desirability problems. A mitigating factor in our experiment is that these perceptions are not removed in time from the task on which they are based, and thus, in terms of self-reported confidence, this may be less of a limitation because students were immediately reflecting on their ease/unease with engaging in a proposed discussion. Social desirability (being seen to be confident) is more likely to be a concern, particularly for MBA students, and could have led to some systematic escalation in scores for both measures; however, this could be controlled for to a degree in our regression analyses. Problems related to a consistency motif are less likely given only two questions are asked and confidence and integration should not be associated with an immediate connection for students within the short timeframe for response. Nonetheless, these caveats suggest that our results for Hypotheses 2 and 3 should recognize that studies with students indicate a cautious "yes" (Pike, 1996) for self-report measures being closely aligned with independent measures. Finally, the typical length of teaching sessions (50 min) limited our ability to assess recall over longer periods of time.

Theory Development

Cognitive load theory enabled us to theorize how the often-promoted use of multimedia picture-plus-text forms of communicating strategy may be more effective than conventional text-only modes. Our results provide general support for CLT and CTML of communication in learning strategy. The strong finding that multimedia communications of strategy are superior to single media communications supports the *Dual-Channel Assumption* that we have separate channels in our working memory to process pictures and text, and engaging both can enhance learning by reducing overall cognitive load. In addition, we find support for the theory's *Active Processing Assumption*, as MBAs (who in our study were more familiar with the generic Value Chain framework, the basis of our picture), outperformed others in terms of recall. Using multimedia communications helps recall by assisting learners to connect the intrinsic load of the task to knowledge already held in their long-term memory, and this helps to build representative schemas. This can help us understand the value of, and reliance upon, frameworks in strategy development.

However, our findings did not confirm all our hypotheses, nor were our findings completely explained by CLT and CTML. CLT and CTML seek to explain learning when exposed to different media of communication, but do not take into account how students may voluntarily recall communications potentially using different modes. Our results show that students do not always reproduce communications in the form they are received in as, in many cases, students chose to "switch modes." This resulted in significant variation in recall performance. In particular, students who chose to reproduce a text communication as a picture and text, demonstrated superior performance both in terms of recall and perceptions of integration. Although CTML has not taken into account voluntary recall modes, it may nevertheless help explain this result in terms of whether students chose to use one or two mental channels. Where students draw on two mental channels to better understand a strategy, they may also find it beneficial to use the two channels to reproduce it, as two cognitive channels may reduce overall cognitive load. For instance, performance improvement likely occurs because drawing a picture in addition to writing encourages people to construct the data in ways that enable them to better perceive and articulate interrelationships. Using multiple channels can highlight omissions in their memory, prompting a guided search to piece things together to fill the gap, and sparking memory recall.

This effect might also work in a detrimental way if recipients receiving a picture-and-text strategy choose to reproduce it in a text-only format. Over 18% of those recipients in our experiment chose to do this, and it resulted in a significantly lower recall performance than those who reproduced a picture and text. This confirms our thinking, related to

CTML, that reducing the number of mental channels to just one in the act of reproducing a strategy leads to a loss of information. Therefore "mode switching" in terms of recall can affect learner performance both positively and negatively, and should be taken into account in CTML.

CLT and CTML also do not take into account student levels of confidence once the communication of something as complex as a strategy has been received. Our results highlight an inverse relationship between overall performance (recall and integration awareness), and student confidence, which is significant for weaker students. While the cognitive load of understanding a strategy may be reduced through the use of dual-mode communications, we theorize that it may also convey a greater sense of the complexity of the strategy. The *Dual-Channel Assumption* may create greater dissonance in students by prompting them to think that they cannot remember everything they should.

In other words, having seen a multimedia picture-plus-text representation of a strategy may make it easier for students to recall that they have forgotten key elements of that strategy. In this sense, there may be an interaction effect between different channels so that the *Dual-Channel Assumption* may not have entirely positive outcomes if student confidence is an important consideration in reproducing learning. This insight directs attention to a social element to the learning process: That students may need to further communicate their learning to others, and this may cause them to "mode switch." In our experiment, most mode switching occurred from the receipt of a multimedia strategy communication to a text reproduction (18%), with many fewer switching from text receipt to picture reproduction (5%). The dominance of mode switching from picture and text to text-only reproduction may have been a result of students seeking a format with which they feel more confident. By reproducing information at the lowest level on Bloom's Taxonomy, students may have felt more confident of accuracy about the "main points" and felt they were avoiding the complexity of higher order concepts of interconnections. This might have reduced their social exposure to error, and there may even be the thought that, by presenting knowledge as bullet points, the audience will "join the dots" for themselves, thus avoiding potential conflicts of interpretation. Furthermore, bullet points may feel more comfortable as a legitimate communication technique for strategies, unlike drawing, as their experience would predominantly have been textual descriptions. Of course, it might also be that some of the students in question failed to see the importance of integration, a crucial part of understanding any strategy, perhaps due to a "spot-light" effect of learning to see data points only, rather then relationships, and this would be critical for teachers to recognize and address.

The tension for students exhibiting superior performance in terms of recall and integration, and yet not showing higher levels of confidence, highlights a limitation of CLT and CTML, as these theories do not take into account the ways in which students may prefer to communicate their learning. Those theories focus on individual student performance in terms of recall competence and ignore student confidence to communicate to, and engage with others, which are higher levels of outcome in Bloom's Taxonomy. We might suggest, therefore, that there may be other student characteristics as well, such as emotional states, that also play a role in students' capacity to communicate their learning. CLT and CTML could be extended to take into account student capacity for conveying learning.

Practical Implications for Strategy Educators

Strategy is complex and difficult to communicate, and there have been suggestions that visual representations aid learning for managers and students (Kaplan & Norton, 2000, 2005). Our results provide strong empirical support for the use of multimedia communication of strategy by strategy educators. Interacting with picture-plus-text modes of strategy communication, like frameworks, will greatly improve recipient recall over the use of text alone. In addition, as strategy is generally multidimensional in nature and connections are critical for understanding the whole, our results also show that multimedia communication enables students to perceive higher levels of integration than using text alone. For these reasons, strategy educators should be encouraged to make greater use of picture-and-text presentations of strategy and resist recoursing to monomedia presentations, such as the lists of bullet points, common in PowerPoint presentations.

We also found that students perform better if they subsequently communicate their learning in multimedia forms, although, contrary to what advocates of multimedia strategy communication have promoted, there can be a loss of confidence among weaker students who are receiving and communicating strategy in multimedia formats that include pictures. The art of drawing is generally marginalized in formal business education (Bridgman et al., 2016), so students may be far less comfortable using this form of expression. Our

study revealed a general predilection for students to recourse to text-only reproductions of strategy. It may be that they are less familiar with the media, feel that drawing is more difficult and could interfere with their estimates of the correctness of their solutions (Efklides, 2013). We show that this automaticity of representation in text is damaging to learning about strategy, as text-only communication can reduce recall, reduce perceptions of integration, and may instill false optimism, or the Dunning-Kruger effect.

To mitigate this, strategy educators should legitimate students, not just at receiving strategy in multimedia formats, but also in communicating it by drawing their understandings to help them develop their skills. Just as proponents of design thinking advocate learning through prototyping, questioning, and pivoting (Dunne & Martin, 2006), strategy students can be encouraged to prototype solutions to cases or problems in pictorial formats, perhaps using strategy frameworks as a basis, but customizing these to incorporate their own insights and discussions. While this can be challenging and lead to declining confidence in the solutions presented at first, we believe it is far better to build up confidence in this way than unwittingly promote a false optimism based on superficial monochannel understandings.

Indeed, if the aim of strategy educators is to enable students to become more competent and self-assured in understanding, developing, and communicating strategy, then much greater engagement with drawing as a method of communication and reproduction could be an extremely helpful pedagogical approach. There has been much written in recent years about strategic management courses having become mere "kit bags" of generic theories and frameworks, suffering from poorly thought-out theoretical grounding, and how strategy education should be made more practically applicable. Some researchers have advocated less emphasis on theory-based approaches and more on practical skills and implementation toward this aim; others have advocated using better theory. The research reported on here suggests that the greater use of multimedia communication of strategy by teachers and students can help us achieve both of these solutions.

We can achieve a more theoretically grounded and practically applicable education that enables students to see similarities and differences between organizational strategies and to understand general themes, but also to probe and question them in the light of particular differences and practical realities. Strategy educators can do this by actually using and applying multimedia communication and encouraging students to actively draw and annotate their workings. Indeed, we argue that presenting and interrogating a strategy using pictures and frameworks, using technology like whiteboards, flip charts, tablets, and document cameras, would be an excellent way of promoting "critical thinking that can lead to sound judgements" in a strategy classroom—as has been called for recently by others writing in this journal (Priem, 2018: 1).

There is a strong argument here for students drawing, rather than reducing content to bullets and text, and drawing "freehand" on paper or a tablet, and not being constrained by generic graphics packages. The freedom to think and express through drawing also has the benefit of allowing students to interrogate strategy communications received as bullets or text only through the construction of pictures to identify linkages, and also to reconceive pictures and text, where received pictures may be reproductions of generic strategy frameworks. These multichannel processes encourage higher levels of engagement from students so improving learning and critical thinking, and these are a higher order on Bloom's Taxonomy. This approach can mitigate the criticisms made against the current state of strategy teaching as merely generic boxes of tools that participants memorize but do not know how to use (Mintzberg, 2004; Bell et al., 2018), the need for more practically applicable strategy education (Albert & Grzeda, 2015; Clegg, Jarvis, & Pitsis, 2013), and an emphasis that is less theory-based and more oriented to practical skills (Grant & Baden-Fuller, 2018; Lindsay, Jack, & Ambrosini, 2018). Encouraging students (and managers) to engage in multimedia strategy communication with their peers, incorporating pictures and text, will allow them to benefit from what cognitive psychologists are starting to describe as a "drawing effect" (Wammes et al., 2016). This drawing effect promotes better recall, increases critical insights, greater awareness of connectivity, enhanced creativity (to think in addition to and beyond generic frameworks), may build confidence, and should make people less subject to false optimism: all things that will help them become more capable strategists.

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APPENDIX 1

DIFFERENT REPRESENTATIONS OF THE SAME STRATEGY USED IN EXPERIMENT

Option 1. Strategy in Bullet-Point Text Form

- Continue to outsource distribution to customers to reduce costs
- Develop preferred supplier arrangements with three key suppliers
- Investigate cutting out retailers and selling direct to customer groups
- Work with famous designer to create high-end complementary brand
- Engage in viral marketing to drive demand from customers to our retailers

Option 2. Strategy in Paragraph Form

Our strategy for the future is to continue to outsource our distribution through partner organizations to help us to reduce our costs and pass on lower prices to customers. We will continue to develop preferred supplier arrangements with three of our key suppliers. We will further investigate cutting out retailers in areas no longer regarded as a priority to sell direct to customers in these areas. Another key aspect of our strategy will be to employ a famous designer to create a high-end brand that will be complementary to our existing brands. And, finally, we will engage in a viral marketing campaign to drive demand from some customer groups who will put pressure on existing retailers to stock our products.

Option 3. Strategy in Picture-Plus-Text Form
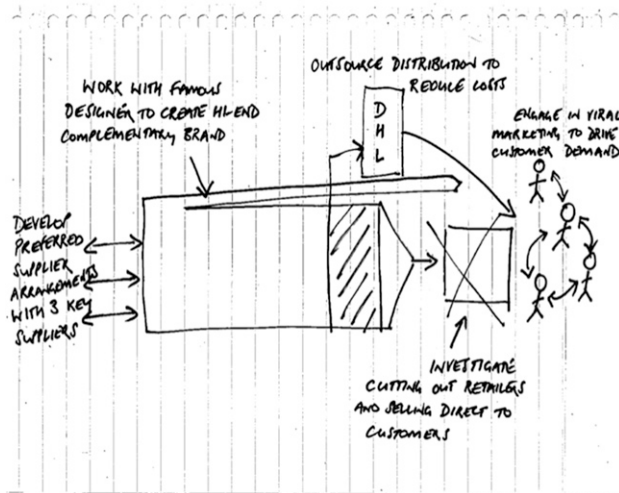
defending the university from neoliberal weaknesses is the deconstruction and reconstruction of entrepreneurship education. These actions may be possible by giving students a space for critical resistance to neoliberalism, albeit with an affirmative attitude toward finding new, more collegial, and democratic modes of entrepreneurship.

Second, special mention goes to the contribution by Anna Wettermark, André Kårfors, Oskar Lif, Alice Wickström, Sofie Wiessner, and Karin Berglund. Their text shows how important it is to learn more about anti-neoliberal mutual learning of entrepreneurship between students and teachers that happens in classrooms. The hyperindividualism of profit-oriented entrepreneurial selves increases the level of shame and guilt over potential failure. Instead, Wettermark and colleagues foreground how collaborative learning may offer the right resistance strategy to become a reflexive decision-maker. Hence, socially conscious entrepreneurship—based on compassionate capitalism—enables a reduction in the exclusion of those who do not play the neoliberal games, which in turn pushes them to the margins of the mainstream entrepreneurial discourse. Moreover, the ethical approach to the Other and learning from her is a way to deconstruct the entrepreneurial self and disengage from playing the capitalistic games. Thus, discussing moral dilemmas of entrepreneurship with students and giving them the right to question the authority of teachers may create an emancipatory space of disobedience toward neoliberal principles.

Revitalizing Entrepreneurship Education is a valuable book founded on careful reflection about critical entrepreneurship education with specific examples of reflexive approaches enacted in the classrooms; that is, resisting the hidden agenda of neoliberalism through increasing responsibility for the Others by focusing on the affirmation of new entrepreneurship strategies presents us with a chance for effective performance in harmony with ethical vulnerability. One of the basic implications of this book is that, when denaturalizing entrepreneurship, we should strive to find a balance between the deconstruction and reconstruction of entrepreneurship education; that is, between the reflexive critique of entrepreneurial self and the development of practice-oriented alternative ways of socially relevant actions. Moreover, the book reveals that much work remains to be done to resist the mainstream approach of treating universities and business schools as places of entrepreneurial, market-driven consumption. Until universities become tools for human emancipation, currently obscured by the false conviction of direct relationship between education and the job market, the reproduction of forgetting the Others in entrepreneurship practice will continue.

This book allows us to draw the following agenda for academic teachers and higher education policy-makers:

- We should differentiate critical entrepreneurship education as an emancipatory field of uprooting entrepreneurship from ethically false, neoliberal values, which narrow the education to a mechanism of capital reproduction;
- We should develop an ethical dimension of entrepreneurship as crucial for the reflexive practice, which allows us to better understand the accompanying moral dilemmas and engage in socially relevant actions;
- We should introduce collaborative learning in courses on entrepreneurship along with innovative didactic methods based on art performance, which will allow us to shift from entrepreneurial selves toward responsibility for Others;
- We should support the humanistic models of university reforms, based on the Humboldtian model of higher education, with a strong focus on the social relevance of teaching and research, which will allow us to develop civic attitudes in the classroom instead of reproducing market-oriented consumerism.

To summarize, I propose at least one way to build upon *Revitalizing Entrepreneurship Education.* If we want our society to be built upon critically oriented citizens, ready to take responsibility for the Others—in contrast to profit-oriented ignorants, focused on fulfilling egoistic demands—teaching and learning responsibility through entrepreneurship practice, collective ethical action, and engagement in solving social problems needs to be the key part of the new, humanistic model of business education and of university for the common good. The sooner we revise entrepreneurial model of education, the better for the quality of democracy.

American Indian Business Principles & Practices, by Deanna M. Kennedy, Charles F. Harrington, Amy Klemm Verbos, Daniel Stewart, Joseph Scott Gladstone, and Gavin Clarkson, 2017.

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Ethnic minorities in the United States remain underrepresented in a number of occupations and higher positions (Yelamarthi & Mawasha, 2008). This

is even more true for American Indians, perhaps due to the historical biases they have withstood since the arrival of Europeans to North America. One indication of these ensconced prejudices by mainstream society pertains to business and leadership dynamics and the lack of understanding of ethnic and cultural differences that American Indians face (Gambrell & Fritz, 2012). As urban Indian migration continues to affect both the reservations and villages from which they come, in addition to the communities they relocate to, having a stronger understanding of American Indian business becomes more vital. Rarely has mainstream culture worked to understand, much less teach about how American Indians realize, conduct, and culturally align the creation, maintenance, and work within a business setting. *American Indian Business Principles and Practices* attempts to bridge a number of these aspects encircling American Indians' businesses and practices. "Most modern Native communities have high levels of individual and social problems that need attention … economic development in Indian Country is weak, while economic resources are needed to address Indian community problems" (p. ix). The book not only touches on a number of key topics for American Indian business, but more importantly, it works to balance the need for economic development, the long history of American Indian entrepreneurship, and the sometimes-assumed juxtaposition between traditional culture, values, and fiscal development.

The contributors of *American Indian Business Principles & Practices* have done a very effective job of creating a business and management book that spans not just the various topics related to business including entrepreneurship, strategy, finance and economics, law, gaming, human resources, marketing and service management, but also covering these topics in a culturally competent way. Because there are over 570 federally recognized tribes in the United States alone, the authors have provided a number of examples from different American Indian perspectives, while still trying to honor a larger picture of the challenges Native people have doing business.

The book begins by immediately shattering potential stereotypes regarding American Indians' business practice, making an astute historical observation regarding the long practice of entrepreneurial Natives. In his chapter "A Brief History of American Indian Business," Harrington wrote: "Native people created and sustained numerous and complex trade and barter alliances that provided for their various needs" (p. 3). He went on to say that "American Indian trade has historically been

characterized as the web of economic relationships between Europeans and their successors" (p. 5). As the author posits, a more accurate view of these business transactions would be an already "existing and well-established trade practice that was firmly in place long before European contact and colonization" (p. 5). This perspective lays the groundwork for the rest of the chapters, demonstrating that American Indians' businesses have been working more recently to move past what has been "essentially a transfer economy," with the principal focus having been on the federal governments' funding of grants and allotments since colonization (p. 9). In addition, the contributors lay a solid framework in that American Indian business is not only a historical fact, but also that by the mere nature of being an AI/NA business, creates a unique intersection of culture, race, tradition, and legislative complexities that other groups do not experience. Thus, the book works to both build up the premise that American Indians have been doing business successfully for centuries, as well as tear down the stereotypes that have often plagued the success of American Indian businesspeople. Both presuppositions are positioned, intentionally and artfully, in the historical and current challenges that American Indians have faced.

One of the several strengths of this book is that it covers a wide spectrum of American Indian outlooks on culture, historical, and geographical influences. For example, the chapter, "Business Ethics and Native American Values" discussed American Indian groups such as the Diné, as well as the Anishinabek Seven Grandfather/Grandmother Teachings, weaving in cultural lessons as a part of the business ethics conversation (pp. 143–146). Another example is the chapter on "American Indian Leadership Practices," which discusses the more collectivist perspective that American Indians tend to practice where leaders are more community oriented and politically distinct (p. 128). Black and Birmingham comment that the "[i]ndigenous community values leaders who are community oriented and look toward the welfare of the community even over performance benchmarks" (p. 128). This worldview is often contradictory of Western society values, where individualist and competitiveness tend to overshadow an interconnectedness that American Indians tend to favor (Gambrell, 2015).

It is in these methods that the richness of culture and even paradox of business and traditions are brought to life. These examples help confirm the intricacies and balancing efforts by American Indian

readers, who have been contemplating these nuances for years, but it also demonstrates the complexities of American Indian businesses for the non-Native readers. Other examples, such as the chapter on "Native Americans and Marketing" bring other ongoing dynamics to awareness. For example, one of these challenges, cultural "misappropriations," has plagued the AI/NA community for decades. Not only has American Indian folklore and imagery been "woven into the tapestry of American history," but "depictions of Native American stereotypes exist throughout American culture," perpetuating an often damaging and inaccurate picture of them (p. 200).

The contributors worked to paint a solid picture of the many dynamics that come into play for AI/NA business owners and employees, but they do so in a way that non-Native readers can gain not only cultural insights, but also a variety of business acumens as well. As such, this is a helpful text for the newer business student, as well as those working to become more culturally aware. The editors have astutely addressed a major gap in literature by assembling this manuscript and created a valuable contribution to business scholarship as well as a transdisciplinary realm. This book creates not just a dialogue in the classroom with chapter end questions, but also posits a number of future endeavors for scholarship for American Indian Business.

American Indian Business Principles & Practice has several potential uses. First, and most obvious, is for those studying or teaching business practices from a broad range. Although none of the chapters goes into great depth regarding marketing, strategy, finance and the like, the chapters do create a solid foundation for those newer to business. Second,

the text also presents a number of challenges due to the intersection of ethnicity, culture, and business. These dynamics present real-life trials, but do so in a diverse manner, creating the opportunity for ample dialogue opportunities as well as assumption checking for its readers. Last, and perhaps most important, these chapters weave in a rich cultural perspective of a number of different Native American groups and provide the opportunity for American Indians to see themselves in a manuscript that has been created specifically with an Indigenous cultural epistemology in mind. "Recent studies of Native American leadership observed that many individuals made references to their cultural history and racial/ethnic identities as being extremely important in their leadership perspectives" (Gambrell, 2015: 294). The editors posit that there is a void in research literature regarding American Indian contributions to business. This piece does a wonderful job of trying to address this need.

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