

Management Students Making Sense: Scaffolding Grand Challenges Through Threshold Concepts and Concept Maps

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Abstract

In this article, we demonstrate how the iterative use of concept mapping develops business students' competencies to analyze the complexity, uncertainty, and diverse views inherent in wicked problems and grand challenges. Focusing on the interconnectedness between business, government, and social actors, coupled with the iterative use of concept maps (as both a teaching technique and assessment tool) proved to be effective and powerful techniques to scaffold transformative deep learning in an international business course. Each subsequent experiential concept mapping exercise supported layers of sensemaking that resulted in deep learning. These layers included: (1) recalling pre-requisite foundation international business concepts and applying these to contemporary grand challenges, (2) sensemaking analytical interconnections between prior knowledge, and relationships between concepts, actors and institutions underpinning wicked problems, and (3) making connections between personal values, actions and worldviews and wicked problems, and drawing on current learning to

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conceptualize and construct possible future solutions to grand challenges. Our work reveals between-course and within course sensemaking obstacles that can be effectively overcome through scaffolding. We invite management educators to use visual pedagogies to scaffold deep learning and equip students with the confidence and skills necessary to sensemake complex wicked problems and address the grand challenges of our time.

Keywords

grand challenges, scaffolding, threshold concepts, visual mapping, visuo-textual assessment, wicked problems, learning outcomes, sensemaking

Introduction

There is a growing need for business leaders to respond to the Grand Challenges of our times (Alday et al., 2023). This implies a shift from individual or philanthropic responses (NobelPrize.org, 2006) toward viewing the concern for and ability to address grand challenges as core leadership competencies. These core competencies require developing alternative mindsets (Adler, 2006; Alday et al., 2023), creativity, and critical awareness (Baker & Baker, 2012) so business leaders and students appreciate the complex relationships between businesses, governments, and societies that lie beneath grand challenges. We present our use of concept maps in the context of an international business course as an example of a classroom practice that foregrounds adaptability, dynamism, and awareness. We believe concept maps help develop responsive mindsets that better prepare business students to both engage with wicked problems and design comprehensive business responses to grand challenges.

From a grand challenges perspective, all elements of organizations and businesses are viewed as interconnected with the institutional, societal, and natural environments (Colombo, 2023). Moreover, the multi-level complexity of the interactions between actors, institutions, and organizations requires an analysis of processes and interactions between stakeholders (Howard-Grenville, 2020). A grand challenges perspective thus prompts organizational decision-makers to see themselves as active participants in addressing “*the specific critical barrier(s) that, if removed, would help solve an important societal problem with a high likelihood of global impact through widespread implementation*” (George et al., 2016, p. 1881, emphasis in original). Because of the dynamic, nonlinear, contentious, ambiguous, and ever-changing nature of grand challenges, there is no single correct resolution (Dorado et al., 2022). Rather, business leaders must sensemake this complexity and consider a

range of flexible responses that reflect the multiple needs and perspectives of stakeholders in their efforts to respond to and contribute to resolving grand challenges (Ferraro et al., 2015). A dynamic and complex environment not only requires business leaders to think and act in new ways but also invites educators to better equip business students with the skills necessary to comprehend and address grand challenges.

Many of the grand challenges facing business leaders are, by definition, framed by wicked problems (Crowley & Head, 2017) requiring decision-makers to demonstrate critical and creative thinking. Wicked problems share many of the same elements as grand challenges and, in fact, are a foundation concept underpinning the theorization of grand challenges (Chatterjee et al., 2023; Dorado et al., 2022). Wicked problems are complex and not easily resolved by technical solutions or single-perspective thinking. A wicked problem framework invites a deeper contextual analysis by taking account of institutions, actors, and the natural environment (Raskovic & Takacs-Haynes, 2020). Wicked problems thus provide a language to sensemake and generate creative and less bounded ways of thinking about complex societal issues and grand challenges (Head, 2022). Recognizing and understanding wicked problems enables learners to grasp the complex relationships between government, business, and society, and to propose potential business solutions to grand challenges.

One difficulty in analyzing and developing responses to grand challenges and wicked problems is *sensemaking obstacles*, which affects “the potential for innovative and creative approaches” (Dorado et al., 2022, p. 1246). To overcome sensemaking obstacles and to better prepare future managers and leaders, business educators are encouraged to find ways to develop complex and critical sensemaking among our learners (Colombo, 2023) and incorporate the notion of interconnectedness into the classroom (Hermes & Rimanoczy, 2018).

Discussions around the need to shift business curricula and reorient graduate skills toward UN Sustainable Development Goals are now mainstream (Birnik & Billsberry, 2008; Burchell et al., 2015; Chatterjee et al., 2023; Fenwick, 2005). However, developing complex analytical skills is challenging within the context of curricula divided by disciplinary frames, packaged as courses, modules, and majors, and taught in time-based blocks. Curricula fragmentation makes it difficult to develop students’ appreciation for the complexity and interconnectedness of the grand challenges and wicked problems of our times and for learners to demonstrate and sensemake the critical skills and mindsets necessary to address them (Lehtonen et al., 2018).

In our experience, the disciplinary and temporal siloing presents as students entering the advanced international business course having seemingly

forgotten the foundation concepts presented the previous year. In addition, they struggle to make connections between the pre-requisite and current courses. Moreover, when delving into multi-perspective discussions, we observe that students often confine their analysis to the concepts covered in prescribed course readings and rarely draw on the wide range of perspectives encountered throughout their studies, across multiple disciplines, or indeed, from their own life experiences. Consequently, we found ourselves reviewing fundamental concepts while trying to challenge students to bring their broader knowledge and experiences to class discussions. These reflective observations were significant moments of a pedagogical epiphany (Eury & Hawk, 2023) leading to questioning how we might better scaffold students through the transition between pre-requisite and advanced courses and through the processes of building the critical analytical skills necessary to work with the complexities and messiness of wicked problems (McCune et al., 2023).

Drawing on previous experiences working with visual teaching methods, our response was to use concept maps as a creative yet structured approach to provide between-course scaffolding and skill building so students might devise creative responses to grand challenges. Therefore, in this article, we ask: *How do concept maps help scaffold between-course transitions, develop critical analytical and creative problem-solving skills, and facilitate sense-making of wicked problems?*

The remainder of the article is structured as follows. First, we conceptualize wicked problems as a language to understand grand challenges within the context of the management classroom. Next, the philosophical and contextual framing of both our teaching practice and the current study is presented. This includes a review of critical pedagogy, threshold concepts, and the usefulness of concept mapping as a scaffolding tool. The method, findings, and discussion demonstrate that concept mapping does help sensemake interconnectedness, which has implications for management education theory and practice.

Wicked Problems and the Management Classroom

Head (2022) suggests that the “language . . . of wicked problems” provides managers, leaders, and those engaged in “management studies and business strategy . . . a way to . . . make sense of rapid changes, disruptive conditions and divergent perspectives” (p. 29–30)—the very same conditions that underpin the grand challenges of our times. Synthesizing Rittel and Webber’s (1973) work, Head (2008) theorized that “wickedness” occurs at the intersection of: (1) high complexity in terms of the “elements [and] subsystems” of an issue, (2) high uncertainty regarding the “risks, consequences of action,

and changing patterns” of the issues, and (3) high divergence in terms of the extent of “fragmentation in viewpoints, values, and strategic intentions” of the multiple stakeholders involved in an issue (p. 103).

Because of this complexity, wicked problems are deemed to be more than a sum of their parts (Sydelko et al., 2021). Rather, wickedness emerges from the dynamic and complex interconnections and interrelationships between the parts. As Lehtonen et al. (2018) explain, “[i]nterconnectedness emphasizes the relational nature of things,” and from a relational perspective, “things exist and function only as relational entities” (p. 863). Using the case of sustainability, Lehtonen et al. illustrate the interrelatedness between local and global environmental action and the interconnectedness between cultural attitudes, socialization, and individual beliefs, and the ways in which individuals and society respond to wicked problems.

The dynamism between divergent multi-stakeholder perspectives, social complexity, and contextual fluidity makes it difficult to define the exact causes or nature of wicked problems; therefore, technical, linear, or dichotomous problem-solving offer few insights on how to address the issues at hand (Head, 2022). Instead, to sensemake and respond to wicked problems requires decision makers to understand the differences between stakeholder worldviews and values (McCune et al., 2023), be prepared to cross between differing perspectives (Veltman et al., 2019), comprehend the contextual nuances within and between the bounded spaces, and be willing to draw on existing and new ideas. In short, sensemaking wicked problems requires engaging in messiness, “ingenuity, creativity, counterintuitive thinking, and imagination” (O’Doherty, 2020, p. 367) and embracing interdisciplinary perspectives (McCune et al., 2023; Veltman et al., 2019).

Within this context, there is a call for managers and decision makers to develop the core competencies and skills necessary to navigate complex relationships, engage in creative and deep analysis (Head, 2022; Lehtonen, et al., 2018), and shift the emphasis from solving to managing wicked problems (Sydelko et al., 2021). To sensemake and respond to grand challenges requires a holistic awareness of interconnectedness (Lehtonen et al., 2018), critical thinking and adaptive mindsets (Sydelko et al., 2021); a willingness to engage with, capture, and debate multiple perspectives (Head, 2008); and an ability to draw on good information to reflect on alternate scenarios (Head, 2022).

Such complexity can be overwhelming for students (Bishop-Williams, 2020). Yet, like McCune et al. (2023) we believe that educators play a vital role in developing the skills that empower students to “learn how to work with” the messiness and complexity of wicked problems (p. 1524). Indeed, Hermes and Rimanoczy (2018) discuss their intentional development of a sustainability mindset among business students. They did so by carefully

selecting content and pedagogical practices that engage physical, cognitive, emotional, and reflective processes to foster the critical, analytical, technical, and moral capacities of students. The resultant deep learning and shift in worldview was evidenced by students sensemaking interconnections between institutional actors, divergent stakeholder views, and their own behavior, with sustainability outcomes. These learnings, they suggest, set the foundation for action oriented toward addressing and managing the wicked problems and grand challenges.

As management educators working within disciplinary silos, we explore contemporary, complex, and interconnected issues occurring between business, government, society, and the natural environment—issues that by their very nature, are “wicked problems” (Crowley & Head, 2017). Like Hermes and Rimanoczy (2018), we are purposeful in course design and content choices and are deliberate in our intent to avoid exposing students to “accidental encounter[s] with troublesome knowledge” (Hibbert & Cunliffe, 2015, p. 181). As presented below, our course design, content decisions, and teaching practices are inspired by Freire (1970, 1992, 1998) and critical pedagogical philosophies (Dehler, 2009).

Critical Pedagogy, Deep Learning, and Wicked Problems

The philosophical concerns and teaching practices associated with Freire and critical pedagogies provide an ideal framework for overcoming sensemaking obstacles and the complexities of wicked problems within the management classroom. Philosophically, these approaches tend toward enhancing social justice and democratic processes and transforming oppressive social relations that reproduce inequalities (Ayikoru & Park, 2019). Key to the critical view is the focus on unpacking taken-for-granted assumptions, ideologies, and practices that reproduce hierarchical power-relations and social stratifications with a commitment to creating fairer social arrangements and ways of being (Dehler, 2009). Part of the critical agenda is to contest truth claims by contextualizing knowledge within historic, social, political, economic, environmental, and cultural contexts (Dehler, 2009).

Applied to the management education, our focus is on experiential learning (Kolb & Kolb, 2010), and Freire (1970, 1992, 1998) dialogic and democratic pedagogical practices. Helpfully in the context of wicked problems, critical approaches contest the dominant values and ideologies informing management theory, with a particular emphasis on denaturalizing instrumental rationalizations and problematizing performative managerialist agendas

(Fournier & Grey, 2000). As with sensemaking wicked problems, however, the purpose of critique, Dehler (2009) assures us, is not to distinguish between right or wrong or reveal truths from a bed of falsehoods. Rather the focus is to move “from a problematic position to a more adequate one among alternatives” with the intent to engage in “critical but constructive action” to create a fairer world (p. 34). Moreover, critique with an agentic orientation necessarily acknowledges “the deeper problems and challenges that are intricately linked with management in various contexts” (Ayikoru & Park, 2019, p. 416).

Developing the skills to sensemake complex interconnections, question dominant ideologies, and unpack social injustice, invites an engagement with deep learning (Dyer & Hurd, 2016). This requires a shift from “passive instrumentalism” (Muddiman, 2018, p. 608) and surface learning (Entwistle, 2000) toward “critical reflexivity” and deep learning (Manning, 2024, p. 5). A passive instrumentalist orientation is concerned with achieving a specific end, such as passing exams or gaining accreditation, and like surface learning, involves memorizing and reproducing course material to achieve those ends (Entwistle, 2000; Muddiman, 2018).

Deep learning, with its focus on developing conceptual meaning, invites students to relate prior knowledge and experience to current course content, construct new knowledge, and apply conceptual learnings to new contexts (Ayikoru & Park, 2019; Hermes & Rimanoczy, 2018). Deep learning thus integrates all aspects of the experiential learning cycle of “experiencing, reflecting, thinking, and acting” (Kolb & Kolb, 2005, p. 205). With each iteration, experiential learning becomes a developmental spiral as each new concrete experience is “enriched by reflection, given meaning by thinking and transformed by action, the new experience created becomes richer, broader, and deeper” (Kolb & Kolb, 2010, p. 27). Experiential learning with the spiraling developmental opportunities founded on experiences can motivate and inspire students to take charge of their own learning.

Elsewhere, we detail the transformative educational experiences arising from our critically informed course design, teaching practice, and assessments (Dyer & Hurd, 2016, 2018). In this article, we present an example of developmental spiraling (Kolb & Kolb, 2010) arising from the repeated experiential use of visual concept maps. These maps are used to scaffold transitions between the pre-requisite and advanced international business courses and to develop sensemaking skills necessary for creatively managing the grand challenges. In accordance with our critical approach and interest in deep learning, we found that interconnectedness served in this case as a threshold concept.

Interconnectedness as a Threshold Concept

Threshold concepts are core disciplinary concepts (Donovan, 2017) that act as a “portal” enabling students to think about something in novel ways (Meyer & Land, 2005, p. 1). Without comprehending core disciplinary threshold conceptions students remain “stuck in a cycle of ritual memorizing ideas . . . without a foundation for their further study” (Donovan, 2017, p. 836). Moreover, a threshold concept approach to course, curriculum, and assessment design can help students “access prior knowledge and understandings, and guide students to overcome learning barriers” (Burch et al., 2015, p. 476). Because interconnectedness is necessary to sensemake and resolve wicked problems, framing interconnectedness as the core threshold concept resonated with our interest in scaffolding students through the multiple struggles of transitioning between-courses, drawing on prior learning and experiences, sensemaking, and responding to wicked problems.

Meyer and Land (2005) characterize threshold concepts as bounded, troublesome, integrative, transformative, and irreversible. Threshold concepts are bounded by specific disciplinary contexts with nuanced meanings that differ between contexts and from everyday use (Meyer & Land, 2005). They are troublesome because they challenge taken-for-granted assumptions and personal identity, and may destabilize students’ current frames of reference (Dyer & Hurd, 2018). Being integrative, threshold concepts illuminate connections between concepts, prior learning, and future possibilities. This integrative aspect may lead to new insights and a transformation in learners’ worldview (Burch et al., 2015) and a “repositioning of the self” (Meyer & Land, 2005, p. 374). The integrative and transformative aspects stimulate a shift from surface to deep learning (Meyer & Land, 2005) and thus, once gained, new insights are irreversible (Donovan, 2017).

Bounded to some degree by the disciplinary context of international business, interconnectedness may act as a portal that transforms students’ ability to analyze and sensemake the complexity of wicked problems underpinning grand challenges in the global business environment. Interconnectedness is certainly integrative as it sheds light on relationships between the elements of wicked problems and how these “interact with each other” to create “systemic behaviour” (Cairney, 2012, p. 348, cited in Head, 2022, p. 47).

As a learning process, threshold concepts involve moving from a pre-liminal space comprising existing perceptions, knowledge and values, crossing in to a liminal space and encountering new ideas, values, and concepts, and moving to a post-liminal space of reflexively engaging with threshold concepts, thereby integrating new ideas with prior knowledge, forming new insights, and experiencing a change in worldview (Dyer & Hurd, 2018; Land

et al., 2016). With learners potentially moving in, out, and between liminal spaces (Land et al, 2005), this is not necessarily a linear process. Teaching and assessment techniques can support the comprehension of threshold concepts and stimulate deep learning (Archer et al., 2024). As discussed below, we decided on visual concept maps as both a teaching and assessment technique.

Visual Concept Maps and Crossing Thresholds

A key skill for sensemaking interconnectedness and designing and implementing creative responsive policy frameworks is the ability to “map [the] inter-relationships” between the elements of wicked problems (Head, 2022, p. 47). Within the classroom setting, critical visual pedagogical techniques offer students charting tools to map connections between concepts and ideas, engage in deeper conversational insights, encourage reflection, invoke revision and recall, and enhance creative analysis. In short, visual techniques scaffold sensemaking, deep learning, and transformative action beyond the classroom (Brown & Collins, 2021; Shankar, 2014).

In the most structured form of visual techniques, concept maps present “a set of concept meanings within a framework of propositions” (Roessger et al., 2018, p. 11). Concept maps convey the structure of concepts and identify potential causality between a hierarchy of concepts within a particular domain. Concept mapping as a sensemaking tool is underpinned by the assumption of assimilation (Ausubel, 2012), reflecting learner tendencies to build on existing knowledge structures by relating new knowledge and concepts to what they already know. Consequently, concept maps provide a structure for learners to experience the safety of starting with the known, before expanding to the unknown. In addition to building on past knowledge, visual maps offer more creative and less restrictive approaches to clarify the multiplicity of connections between concepts, actors, and institutions in a domain (Roessger et al., 2018, p. 11).

Regardless of the formality of structure, visual techniques help students unpack the complexity of an issue, connect concepts, reveal new and unexpected connections, concepts and insights, and open pathways for creativity, relational, and empathetic ways of knowing to emerge (Katz-Buonincontro, 2015). Visual techniques, moreover, stimulate critical thinking by exposing ideas, objects, and sensemaking that “is in part indeterminate” (Mack, 2013, p. 289). These techniques reveal contradictions, paradoxes, and relationships that otherwise remain obscured when relying on writing and reading tasks (Taylor & Ladkin, 2009). Taylor and Ladkin detail additional learning benefits of visual techniques compared to traditional teaching methods. These

include encouraging students to develop skills they might not otherwise obtain, unlocking new ways of thinking, gaining deeper appreciation for the connections involved in a phenomenon, and exploring and reconciling personal feelings and assumptions about a phenomenon. Accordingly, visual techniques have the potential to render the subconscious visible and encourage deep reflection. These benefits make visual learning techniques particularly fruitful for uncovering the interconnectedness and interrelationships embedded in wicked problems, analyzing and addressing business issues that have an ethical dimension (Hamington, 2019), depicting boundary-crossing bridges that link differing stakeholder perspectives (Veltman et al., 2019), and facilitating movement through liminal spaces and augment deep learning (Land et al., 2014).

The unique blend of structure and creativity and the opportunities for sensemaking informed the design of three visual concept mapping assessments to scaffold students through the multiple struggle points (Burch et al., 2015) of transitioning between courses, sensemaking the complex elements inherent in wicked problems, and developing ways to address grand challenges. We now turn to the method used to assess scaffolding student transitions, sensemaking, and critical creativity.

Method

Contextual Background

The research and data are based on a third-year undergraduate international business course. The course is compulsory for students enrolled in an international business and strategy major and offered as an elective for other business majors. The compulsory second-year pre-requisite is structured around the PESTLE framework; therefore, the expectation is that students are familiar with the political, economic, sociocultural, technological, legal, and ecological issues shaping the international business environment. The course is advertised as guiding students to “[i]dentify, research and critically appraise the significance of contemporary business issues for firms operating in the international environment” (Course Descriptor). Learning outcomes are listed as an “ability to research complex issues in the global business environment, critically analyze a contemporary and complex issue, formulate business implications stemming from this analysis, and compose and present an argument on a selected contemporary and complex issue” (Course Outline).

Taking a critical position, and taught over a 12-week block, the course is organized around workshops and topical wicked problems used as “trigger[s]” to explore wicked problems and experiment with potential solutions to them

(Randles et al., 2022, p. 57). In Week 1, the concept of wicked problems, key features of the World Economic Forum's (2024) Global Risk Report relating to the international business environment, and the fundamentals of visual mapping are introduced. During this workshop, and working in small groups, students experiment with visual mapping, using one of the risks identified in the Global Risk Report.

In subsequent weeks, a broad topic theme and wicked problem discussion issues are introduced. For example, the broad topic theme introduced in Week 2 is the future organization of international business and the discussion issues include automation, AI, and the future of work. Conversations draw on critical and mainstream perspectives to explore the complexity, uncertainty, and diversity embedded in the wicked issues. Continuing with the Week 2 example, a range of possible futures for the shape and structure of organizations and the international business environment are examined in relation to the possible impacts of automation, AI, and the future of work. The full list of weekly topics and discussion issues is shown in Appendix A.

These weekly workshops are structured in three conceptual phases whereby, working in small groups, students: (1) familiarize themselves with the wicked problem, (2) create a visual map representing their sense-making of the issue, the actors, and the connections involved with the issue, and (3) present a 3-min synopsis of the visual map, highlighting their sense-making, and key insights gained in relation to the weekly topic. Workshop materials are drawn from media, commentary, documentaries, and other digital materials.

Assessments as Data

Reflecting the pre-liminal, liminal, and post-liminal threshold learning process, three assessments were designed to scaffold students through the course transitions, to sensemake wicked problems, and to develop critically creative responses. These assessments provide the data for this research. To scaffold course transitions and ensure students could draw on and apply the foundational disciplinary knowledge in weekly discussions, Assessment 1 required a one-page visual map of the PESTLE concepts covered in the pre-requisite course to be submitted at the beginning of Week 2.

Assessment 2 focused on scaffolding sensemaking interconnectedness and the complexity of wicked problems evident in the international business environment to develop creativity and critical thinking around an issue. The assessment, due at the course mid-point, involved identifying a current wicked problem featured in the international business media. The one-page visual map, depicting the actors, institutions, relationships, outcomes, and

Table 1. Participant Characteristics and Data.

Item	Details
Assessment 1: concept map	27 Submissions
Assessment 2: issue analysis	32 Submissions
Assessment 3: concept map + reflection	29 Submissions
International/domestic (including permanent resident)	International: 12 Domestic: 21
Completed prerequisite international business environment course?	Yes: 26 No: 6

causes of the issue, was supported by a 1,500-word essay describing both the analysis and the implications for international business. Assessment 3, with its focus on conceptual application, required a one-page visual map depicting the contemporary international business environment supported by a 1,500-word reflection on (1) the differences between their first and third maps, and (2) the implications of their learning for international businesses. The assessment details and rubric are presented in Appendices B and C, respectively.

In accordance with ethics approval requirements, to affirm voluntary participation, students submitted written consent allowing their assessments to be used as data. The Ethics Committee approved the use of deidentified course evaluations. Table 1 shows the number of scripts submitted for each assessment, the number of international and domestic students, and the number of students who had or had not completed the pre-requisite course. No other demographic data was collected.

Analytical Approach: Thematic Systematic Visuo-Textual Analysis

The thematic visuo-textual analytical framework designed by Brown and Collins (2021) was applied to the three assignments. Brown and Collins assert that visual textual data provide unique insights, and while interrelated, are not equivalent, therefore should be analyzed “separately and in conjunction with each other” (p. 1275). To do so, they propose a two-level analytical process. The focus of Level 1 analysis is to “notice and describe” key elements presented in individual participant visual-textual data in terms of: (1) the visual data, such as color, lines, or images; (2) the textual data, for example, the “use of language, words, or phrases”; and (3) the connections and relationality between visual and textual accounts (Brown & Collins, 2021, p. 1281). The focus of Level 2 analysis is to conceptualize key elements evident

in the full data set analysis in terms of identifying (1) “essential elements that unite” the participants visual data, (2) themes embedded in the text, and (3) and “connections between artefacts and themes” (Brown & Collins, 2021, p. 1281).

Using this two-level analytical strategy, a deductive and emergent thematic analysis (Braun & Clarke, 2006) was applied to the Level 1 and 2 analyses. For the deductive analysis of Assessment 1 (Concept Map), we noted how many PESTLE concepts were presented and sought emergent themes regarding representations of relationships between PESTLE concepts. These representations could include the form, number, or direction of relationships depicted in the maps or text presented in the maps. For Assessment 2 (Issue Analysis), the deductive focus was on concepts, causes, players, motives, and outcomes depicted, and emergent analysis sought themes regarding the implications for international business. Assessment 3 (Concept Map and Reflection) sought emergent themes discerned in the images and reflections in relation to the complexity of relationships and application of learning in terms of the implications for international business. A summary of the combined Level 1 analyses is presented in Table 2.

As summarized in Table 2, the concept maps become more complex as the students progressed through Assessments 1, 2, and 3. This complexity was seen in terms of the number, direction, and hierarchical nature of the relationships identified, the concepts referenced drawn on (including the integration of concepts from both pre-requisite and broader courses from their studies), and in the shift from comprehending connections to critical engagement, and sensemaking the interconnections in the relationships that shape wicked problems and grand challenges in the international business environment.

Using the pre-liminal, liminal, and post-liminal threshold learning process as an overarching framework, the Level 2 analysis identified conceptual themes that emerged within each set of assessments from the Level 1 analysis.

As we see in Table 3, the pre-liminal space was captured by the overarching theme of “passive instrumentalism” associated with surface learning and pictorially represented by simplistic, unidirectional relationships between the international business environment and PESTLE elements. The focus appeared to be demonstrating knowledge of the existence of each PESTLE element and completing the task. Entering the liminal space was captured by the theme of “making connections” as depicted by more complex, yet unidirectional relationships between institutions and actors, and more clearly articulated interpretation of the selected concepts used. The post-liminal space is captured by the theme of sensemaking interconnections which depict complex and multi-directional relationships between concepts, actors, and institutions within the international business environment.

Table 2. Level I Analysis of Assessments 1, 2, and 3.

Level I visuo-textual analysis
Assessment 1 concept map

Element 1 image analysis	Element 2 transcript analysis	Element 3 visuo-textual combined
14 students used a few concepts beyond PESTLE	6 students used PESTLE as a frame	8 students used purely instrumental terms
12 students had displayed unidirectional relationships	14 students had limited hierarchy of terms	6 students used known PESTLE concepts to organize sensemaking
8 students demonstrated some level of hierarchy between the concepts	16 students had incorporated limited inclusion of actors, or institutions	12 students displayed unidirectional relationships between the concepts

Level I visuo-textual analysis
Assessment 2 issue analysis

Image analysis	Transcript analysis	Combined analysis
15 images were more complex	21 described greater inclusion of actors and institutions	11 scripts demonstrated hierarchy of concepts
19 images were still largely unidirectional	11 described/included a hierarchy of concepts	5 scripts named connections
18 images showed multiple connections to/from each concept	15 described additional concepts incorporated in the text	3 scripts still showed limited interconnection
12 images showed tangled relationships showing ongoing sensemaking	6 used a known issue, or PESTLE frame as a starting point	15 scripts showed increased complexity
	5 named the connections between concepts and actors	12 scripts were disorganized/tangled

Level I visuo-textual analysis
Assessment 3 concept map and reflection

Image analysis	Transcript analysis	Combined analysis
18 images showed multi-directional (web-like) and multi-conceptual	18 demonstrated complex social relationships	18 explicitly mentioned interconnection of concepts
14 images were less tangled	18 demonstrated integration of business, politics, and society into the analysis	16 stated their first map was simplistic
19 images showed layered and complex relationships depicted between actors		6 linked explicitly to development of critical thinking
3 images were examples of using known (PESTLE) concepts		20 reflected their final map was more complex than their first map
		14 untangled relationship between actors, institutions

Table 3. Thematic Summary of Combined Visuo-Textual Analysis, Assessments 1, 2, and 3.

Thematic summary of visuo-textual analysis
Assessments 1, 2, and 3

Assessment 1	Assessment 2	Assessment 3
Standing at the threshold	Entering the liminal space	Crossing the threshold
Pre-liminal space		The post-liminal space
<i>Passive instrumentalism</i>	<i>Making connections</i>	<i>Sensemaking interconnection</i>
Task Completion	More complexity	Multi-dimensional
Simplistic overview	Unidirectional	connections
Uni-directional relationships	Starting with the known to make disorganized connections	Comprehending complexity and seeing solutions
Using the known to demonstrate knowledge acquisition/retention	Inclusion of actors and institutions	Challenging current thinking
	Hierarchy of terms	Visual mapping as a bridge

The combined analysis presented in Tables 2 and 3 demonstrates that three students remained “stuck” in the pre-liminal space, showing no evidence of progression beyond an application of the PESTLE elements. Similarly, a small number remained in the liminal space demonstrated by their ability to draw on course concepts to make connections between institutions and actors in the international business environment. Overwhelming, however, the evidence shows students moving through the liminal learning spaces with each subsequent assessment, culminating in depictions of sensemaking the complexity of wicked problems within the international business environment.

Illustrating the Analytical Distinctions between Maps

To illustrate the application of the analytical framework, one student’s (AK) maps from Assessments 1, 2, and 3 are presented in Figures 1 to 3. These maps were chosen to show (a) the differences between the pre-liminal, liminal, and post-liminal concept maps, and (b) the developmental journey of passive instrumentalism, making connections, and sensemaking interconnections evident with each subsequent map and assessment.

The unidirectional and simplistic linear relationships depicted between aspects of the international business environment presented in Assessment 1 is indicative of being in the pre-liminary space and synonymous with passive

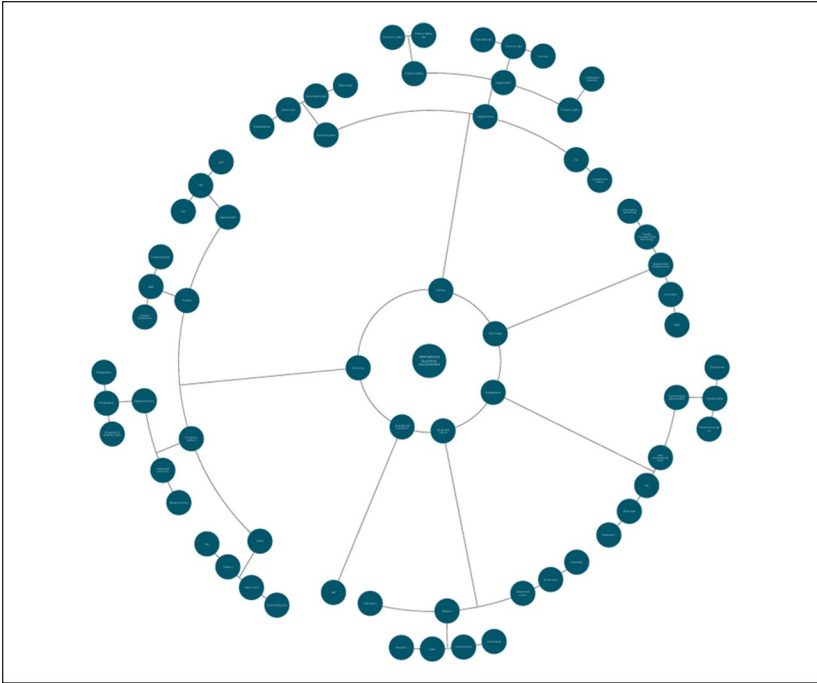


Figure 1. The pre-liminal space and passive instrumentalism (assessment 1, student AK).

instrumentalism (see Figure 1). Of significance is the focus on knowledge acquisition and task completion depicted by the array of points that are both devoid of explanation, and indeed, almost impossible to read.

Characteristic of being in the liminal space, Assessment 2, Figure 2, presents more complex depictions of relational connections between the institutions and actors. In this map, arrows and concepts are used to organize information and represent unidirectional and hierarchical connections between a wider range of institutions and actors.

Crossing the threshold and entering the post-liminal space and sensemaking interconnections are illustrated in Figure 3. Here we see complex, multi-directional relationships depicting interconnections between social systems, institutions, actors, and structures within the international business environment. Sensemaking the interconnections in the international business environment are further depicted by the harmonies and tensions between government, business practices, social norms, differentiated employment outcomes, pay gaps, and corporate use of personal data.

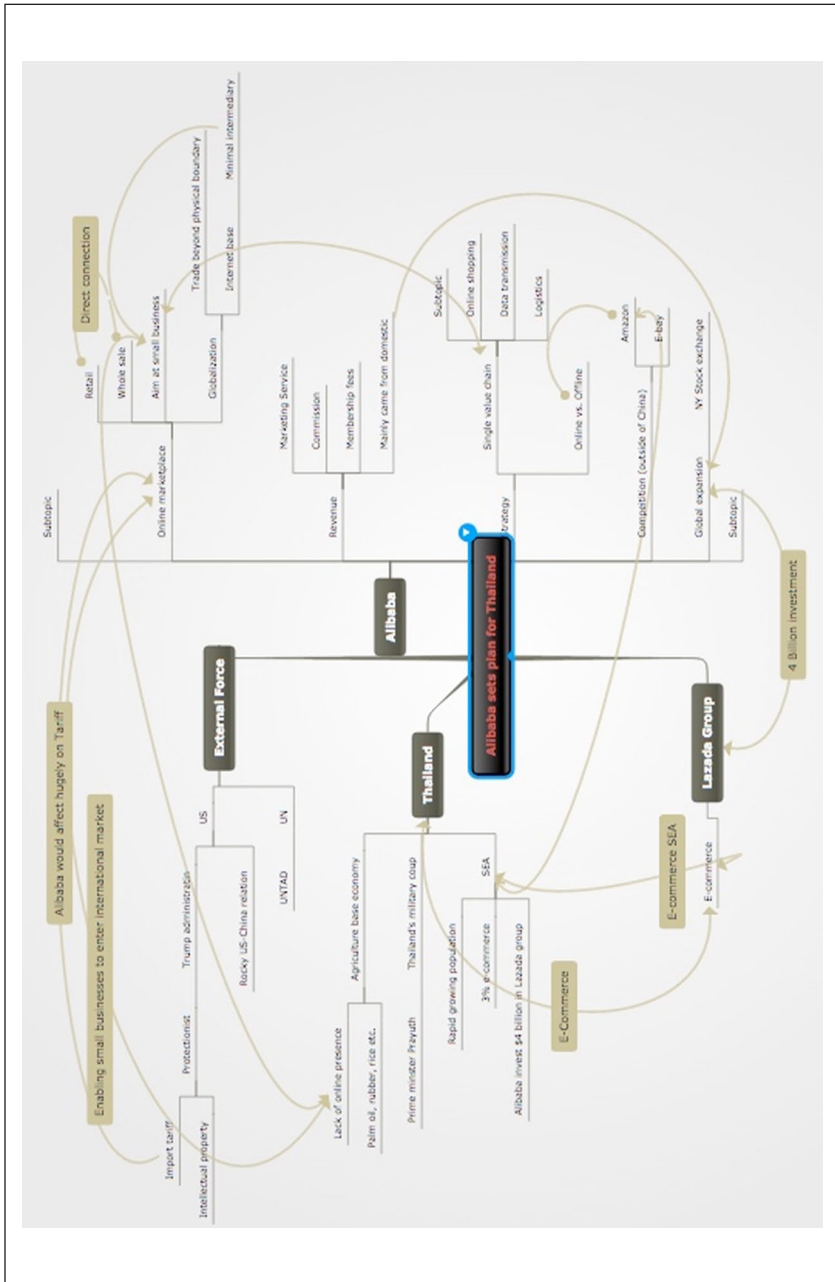


Figure 2. Entering the pre-liminal space making connections (assessment 2 issue analysis, student AK).

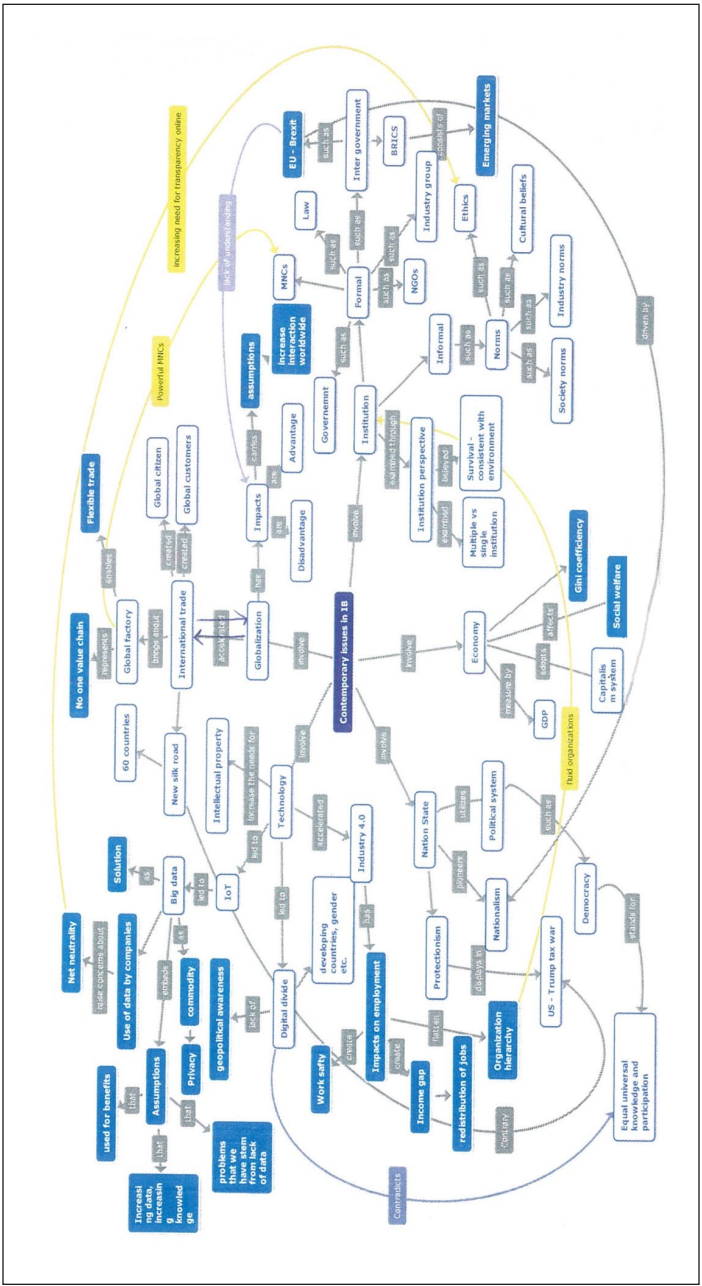


Figure 3. The post-liminal space and crossing and sensemaking interconnections (assessment 3, student AK).

In the findings section below, we present a more nuanced account of each assessment in relation to the liminal spaces and developmental learning journey. Concept maps and quotes are drawn from across a wider range of student assessments and are purposefully selected for their illustrative value.

Findings

Assessment 1: The Pre-liminal Space and Passive Instrumentalism and Surface Learning

Assessment 1 was explicitly designed to refresh students' familiarity with the foundation concepts linked to the PESTLE framework from the prerequisite course. By not providing instruction on what to include or how to structure maps, students were given creative license to compose their pictorial representations.

Unsurprisingly, students used the macro-level political, economic, socio-cultural, technological, legal, and ecological terms as frames of reference, that is, the PESTLE framework, to group concepts and demonstrate their knowledge. Examples of these maps are shown in Figure 4.

Our Level 2 conceptualization of these maps as representations of knowledge acquisition and passive instrumentalism is evident in the concern for task completion as expressed in Assessment 3 reflections, as highlighted here:

The concept map drawn at the start of semester was taken lightly by me. I did only the PESTLE [factors] as I knew only about the macro-environment. (ST1)

Moreover, and reflecting information absorption and demonstrating knowledge acquisition, these visual maps typically present simplistic overviews of the PESTLE framework. Demonstrating surface-level learning, these overviews were presented as lists of concepts connected to each of the PESTLE dimensions as covered in the pre-requisite course, without any attempt to define the concepts listed. Moreover, the Assessment 1 maps were devoid of any depiction of actors or institutions within the international business environment. Rather, as illustrated in Figure 5, in these maps discrete lines were used to depict unidirectional relationships between specific concepts to a PESTLE dimension. Likewise, discrete lines were used to directly connect each known PESTLE concept to the central theme, which students invariably described as “*the international business environment.*”

Assessment 2: Entering the Liminal Space and Making Connections

In Assessment 2, students employed the PESTLE framework alongside a known issue in the international environment as the starting point for their analysis. By drawing on their acquired knowledge, students could demonstrate connections between key macro-level PESTLE elements, actors, and institutions relating to their chosen contemporary international business issue. Moreover, these images increasingly depict relationships between key concepts, institutions, and actors, including in some cases, attempts to show the hierarchical nature of these relationships. However, the use of PESTLE often remains the focal point. The focus on the PESTLE framework detracts from the actual issue, making the maps appear as generalized commentaries rather than an analysis of the selected issue. An example of this approach is seen in Figure 6.

In addition, the use of unidirectional, discrete, and oftentimes disorganized lines indicated some students were beginning to recognize connections between specific concepts, institutions, or actors. This greater complexity in the imagery presented in Assessment 2 symbolized a shift from passive instrumentalism and knowledge acquisition toward applying existing knowledge of the PESTLE elements to the new situation. An example of these maps is presented in Figure 7:

Assessment 3: Crossing the Post-liminal Space and Sensemaking Interconnections

By Assessment 3, students were making explicit multi-directional interconnections between their contemporary international business issues, institutions, and actors. These developments were pictorially represented in the maps with more complex conceptual relationships between the immediate business environment and the PESTLE elements. This included multi-directional arrows indicating interconnections between business issues, wider society, and political frameworks governing society. These complexities and interconnections are illustrated in the two maps in Figure 8.

As part of Assessment 3, students were required to reflect on the differences in their first and third concept maps. In this written assessment, students reflect on their personal development in terms of understanding the interconnected complexity in wicked problems evident in the international business environment. This awareness is captured in the following reflective comparison between the first and third assessment concept maps:

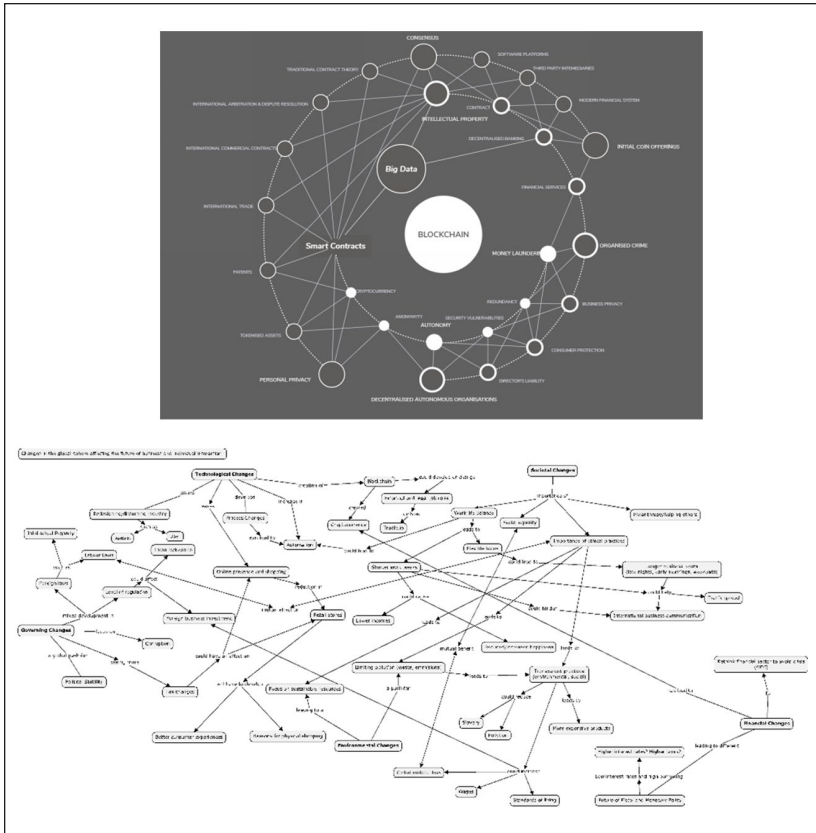


Figure 7. Maps with knowledge application and relational connectivity.

My new map, which is a lot more web-like, shows considerations to not just business, but society and democracy, which was not part of my first map. (GR)

The shift from listing, to making connections, to engaging with the complexity of multi-directional relationships is particularly evident in the reflections of students who felt personally interconnected with and affected by contemporary international business issues:

Seeing the interconnected nature of all the contemporary issues meant that you could not isolate yourself [from the issues] considering the implications to [both] society and international business. (DM)

Students reflected that it was the process of engaging in visual mapping that enabled them to move from “*basic understandings*” (LP) and offering simplistic overviews, as evidenced in their first maps, to challenging their own taken-for-granted assumptions and “*become more opened minded and interested on what goes on outside my own little bubble*” (KT). In turn, the process enabled them to engage in deeper conceptualizations and sensemaking, as poignantly illustrated here:

At the beginning of the course I only really understood cultural dimensions of international business but as the semester progressed, I began to understand that there is a lot more behind contemporary issues than just culture. (QW)

Significantly, students attributed the process of mapping to providing them with a structure to develop their analytical skills and for comprehending multi-directional interconnections:

It helps me organize the structure of an issue as a whole, then I can find the connections and therefore [help] with logical thinking. (TP)

Moreover, some students attributed the course and assessment design to developing their criticality and confidence to articulate their analysis to others:

[the course and assessments structure] . . . has allowed me to . . . develop the skills of critical thinking, which I have never learnt before. . . my thinking process has developed. . . along with my confidence to write and speak about issues, which I have never had. (GR)

This newfound criticality in turn developed students’ capacity to conceptualize the complexity within wicked problems, and while revealing possible solutions, also highlighted their discovery of compounding issues:

The concept map lays the clear relationships between the factors involved in the issue together with [revealing] the solutions from them. However, the solutions . . . reveal other issues and form other loops of wicked problems. (SV)

Importantly, some students described their experiences of the process of visual mapping as providing a bridge between their prior knowledge and newly developed future-oriented sensemaking, between the current course and with other courses in their program of study, and between what they are learning at university and their wider worlds. In this sense:

The concept map and the way of learning (once I wrapped my head around it) . . . helped the way I see things, and I think has also helped my writing in different papers as well. I feel like I can hold conversations about business and the things happening with my parents and friends—without feeling out of my depth. (course evaluation)

We draw on the threshold pre-liminal, liminal, and post liminal learning process to frame the discussion of our findings.

Discussion

We agree with the calls for business leaders to become actively engaged in responding to the grand challenges of our times (Adler, 2006) and for business schools to actively develop graduate competencies and skills necessary to do so (Colombo, 2023). In line with recent debates (Raskovic, 2021) our response has been to design a course that foregrounds wicked problems underpinning the grand challenges evident in the international business environment.

Yet, like Bishop-Williams (2020), we observed at the start of each course, students seemed overwhelmed and struggled to recall their foundational knowledge of international business concepts. As such, our students had no frame of reference to grasp the relational complexities (Donovan, 2017) or competing perspectives (McCune et al., 2023) to effectively analyze the interconnections between the political, institutional, and organizational environments in which grand challenges reside and in which students must formulate organizational responses to wicked problems.

Conceptualizing this interconnectedness as a threshold concept enabled us, as management educators, to both re-view these observations of students' seeming ill-preparedness, and to challenge business students' apparent preoccupation with surface learning (Muddiman, 2018) as a between-course transitional liminal space inherent in fragmented and siloed curricula frameworks. The structured and repeated iterations of experiential visual concept mapping, as both a teaching technique and an assessment tool, scaffolded course transitions and deep learning (Dyer & Hurd, 2016; Entwistle, 2000; Hermes & Rimanoczy, 2018). This, in turn, helped students develop the skills to unpack the ethical complexities inherent in wicked problems, "challenge existing knowledge" (Ferraro et al., 2015, p. 369), formulate possible solutions, and identify potential actions.

The timing of the three concept map assessments, at the start, midpoint, and conclusion of the course, captured the spiraling development (Kolb & Kolb, 2010) and student engagement with the experiential learning cycle

(Kolb & Kolb, 2005). Across the three assessments, students increasingly demonstrated their deepening critical competencies to draw on, reflect, think about, and transform knowledge. The start and mid-point assessments, of revision and application, culminated in many students constructing new knowledge and ways of thinking about and dealing with wicked problems and grand challenges in their final assessment. In so doing, students were making sense of divergent values, uncertainty, and the complex interconnections between the relationships, concepts, actors, and institutions inherent in wicked problems, enabling them to consider creative responses to grand challenges.

Significantly, by the third assessment, students began to sensemake interconnections between their experiences, knowledge, and skills encountered across their whole-of-life and educational domains. More so, they began connecting personal values, behaviors, and knowledge with broader stakeholder groups, and the institutional arrangements that underpin wicked problems. It is precisely this ability to connect intrapersonal values, behaviors, and world views with the complexity of wicked problems, that sets the foundation for translating critical analysis into action to address grand challenges (Hermes & Rimanoczy, 2018).

Implications

Our experimentation with visual conceptual maps provided our students with a tool to engage in thinking about wicked problems and issues that affect their lives and the lives of those around them. The maps empowered them to recognize and analyze the complexity, uncertainty, and diversity of views in preparation for addressing the wicked problems in their lives. Moreover, our work with visual conceptual maps has implications for the ways in which management educators, engage with and prepare business students for the complexities posed by wicked problems and grand challenges that lie ahead. Identifying a between-course liminal space and appreciating the multiplicity of sensemaking obstacles experienced by students as they grapple with course transitions and encounters with new, complex knowledge, for example, invites educators to challenge their biases regarding management students' instrumental orientation to favor task and module completion (Muddiman, 2018). This insight highlights the crucial role that actively scaffolding course transitions has in reinforcing pre-requisite knowledge, setting the foundation to scaffold deep learning, and for developing the reflective critical capacities required to overcome sensemaking obstacles.

Conclusion

Preparing business students with the skills and competencies to sensemake the complex interconnectedness and interrelationships of wicked problems is crucial to ensure future business leaders can actively respond to grand challenges. Sensemaking requires drawing on experiences, ideas, and knowledge learned throughout life and an appreciation for the complexities within and between wider structural inequalities underpinning grand challenges.

Our use of visual concept maps in the management classroom demonstrates that through scaffolding, business students can and do engage in deep learning and overcome sensemaking obstacles and critically engage in analyzing the interconnectedness and complexity of wicked problems. We saw, firsthand, our students challenge and be challenged by the messiness of knowing, comprehending relationships, and exploring potential solutions, and developing the very skills and competencies required to address the grand challenges of our times. In short, visual concept maps help students to negotiate multiple sensemaking obstacles (Dorado et al., 2022) and grasp the nature and complexity of grand challenges and wicked problems within the international business environment. We encourage educators to experiment with visual methods in exploring wicked problems in their management classrooms.

Appendix A. Workshop Schedule.

Week	Weekly broad topic	Weekly discussion issue
1	Introduction: Analyzing the Global Landscape as one of Wicked Problems	Global Risks and Trends Concept Maps as a tool for analysis
2	The Future Organization of International Business	Automation, AI and Future of work
3	Public and Business Sentiment toward Globalization	Inequality within and between countries
4	National and International Political and Social Change	Rising Protectionism, Nationalism & Political Risk
5	Intersection of Politics and Global Capital	Lobbying, Tax avoidance and Corporate political influence
6	Special Economic Zones, Regional Innovation Systems and Industrial Clusters	The politics of cross-border development and innovation

(continued)

Appendix A. (continued)

Week	Weekly broad topic	Weekly discussion issue
7	No Longer the “BRICS”? Rise and Fall of Regions, One Belt one Road and the importance of China in the future of International Business	Future of BRICS and comparative future importance of key emerging markets
8	Financial Markets, Economic Growth/ Degrowth and Financial Inclusion/ Exclusion	Financial Inclusion/Exclusion Digitization of Banking
9	IP and Innovation in the context of Technological Change	Big Data, Development and “Ownership”
10	Integrative week	Ethics in the Global Value Chain
11	Integrative week	The social contract of International Business and Management Education
12	Assessment Week	

Appendix B. Assessment Overview.

Assessment 1: Concept map description

Students are required to prepare a one-page visual map of concepts covered in previous 2nd year pre-requisite International Business Environment course. If you did not take this course, please draw your understanding of the concepts included in the international business environment. Students are able to use online tools such as C-Map, or alternatively by hand, scanned and submitted.

Assessment 2: Issue analysis

Students will prepare and analyze a one-page concept map of a contemporary International Business issue they have sourced from quality media. This assessment involves two tasks:

1. To draw a one-page concept map illustrating the interlinked concepts/causes/ players/motives/outcomes involved in the chosen issue
2. To write a 1,500-word analysis of the issue, helping to describe how you have depicted the issue in your concept map. Your analysis also needs to discuss the implications for international business.

Assessment 3: Concept map + reflection

Students will draw a one-page map of their understanding of the contemporary international business environment. In reflecting on this, and the visual map drawn at the start of the semester, answer the following questions:

1. How has your understanding of the contemporary international business environment changed over the semester?
2. How might these insights be useful for international businesses to understand?

Appendix C. Assessment Rubric.

Concepts and structure	ACHIEVED WITH DISTINCTION	Indicators of ACHIEVED WITH MERIT	Indicators of ACHIEVED	Indicators of NOT ACHIEVED
Concepts and relationship between concepts	Large number of concepts included, covering a wide range of aspects related to the chosen issue. A number of perspectives included, reflecting a deep understanding of the issue. Relative importance of ideas is indicated and both simple and complex relationships are effectively mapped.	Identifies key concepts related to the chosen issue, but some may tend to be large categories (i.e., economy), rather than individual concepts (e.g., GDP per capita). Relationships between concepts are illustrated, but the relative importance of concepts is unclear.	There is evidence of general understanding of IB environment concepts, but the map tends to be made up of larger categories of concepts, and/or the relevance of some concepts to the chosen issue may be unclear. There may be little evident thought paid to relationships, these are not labelled, or the nature of the relationship is unclear.	Few concepts presented, or concepts not relevant to the chosen issue. Demonstrates little effort paid to revise and understand the concepts, or how they might interrelate.
Exploratory	Map demonstrates complex thinking about the relationship between ideas, themes and the overall framework of ideas.	Ideas are presented in a logical manner but may not always flow smoothly through the map.	The meaning is generally clear but there is little consideration paid to linkages between ideas.	Thought process which sits behind the map is not clear. May contain thinking which is clearly not the student's own thinking.
Communicating your ideas	Visual Information (Map) is presented clearly and allows for a high level of understanding.	Visual Information is presented clearly and allows for some understanding.	Visual Information is presented with some clarity, but additional explanation would be required to fully understand the map.	Visual Information is very difficult to understand and would require significant explanation to gauge the student's intended meaning.

(continued)

Appendix C. (continued)

Concepts and structure	ACHIEVED WITH DISTINCTION	INDICATORS OF ACHIEVED WITH MERIT	INDICATORS OF ACHIEVED	INDICATORS OF NOT ACHIEVED
	<p>The writing is clear, concise, and substantially the writers' own words: The analysis is presented in a form appropriate for 3rd year academic work, using a high level of academic English. Analysis is concise and does not draw on verbose language. Conventions of academic integrity are adhered to without exception.</p> <p>The structure of the discussion is logical, flows well, and transitions are provided between sections. Contains a clear introduction and conclusion/ summary.</p>	<p>Clear writing style, well proofed and edited with minimal grammatical errors, as expected for third year work.</p>	<p>A number of proofreading and/or spelling/grammatical errors which detract from the clarity of the writing. Some reliance on the ideas of others, through ineffective paraphrasing.</p>	<p>The writing may contain numerous grammatical and spelling errors, lack basic proofreading, and contain many unclear sentences. May not follow APA referencing style or relies heavily on the use of others' ideas.</p>
	<p>The structure of the discussion is logical, flows well, and transitions are provided between sections. Contains a clear introduction and conclusion/ summary.</p>	<p>Structure of the discussion flows well, but there may be some disconnection between sections, or a lack of transitions. May lack a meaningful conclusion/ summary or signposting in the introduction.</p>	<p>Some logical flow to the discussion, but a number of structural issues which detract from the clarity of the writing. May lack effective conclusion and introduction.</p>	<p>A lack of structure, logical flow, or transitions between sections. Discussion is difficult to follow and lacks a clear central thread throughout.</p>
Analysis	<p>Analysis adds significant depth of understanding to the concept map and is supported by quality academic sources which are fully utilized, demonstrating the student's ability to relate academic articles and theoretical concepts to discussion of current events.</p>	<p>Analysis adds some depth of understanding to the concept map and is supported by quality academic sources. May be some disconnect between the theoretical ideas and the discussion of the current issue.</p>	<p>Analysis is a useful addition to the concept map to aid understanding. Perhaps some of the ideas in the analysis are not well transferred to the map, or vice versa. The analysis does not add additional depth of understanding.</p>	<p>Analysis relies on the use of others' ideas or analysis, or is not connected to the concept map, or discusses unrelated concepts. May not use quality sources or is not well supported.</p>

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Ethical Approval

This research is approved by the AUT Ethics Committee (AUTECH) ref 18/141.

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