From Mentoring to Individual Absorptive Capacity: The Gradual Release of Responsibility Model

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ABSTRACT

Individual absorptive capacity (IAC) addresses the ability of an individual to recognize and classify problem situations, to determine the kind of knowledge and skill she needs to address them, to quickly absorb the relevant knowledge and skills, and to adapt them as necessary to address the problem. This paper integrates two separate streams of IAC-related research. The first addresses a series of conceptual papers that grapple with the IAC concept from the perspective of service-dominant logic, from Marketing, discussing the process by which different kinds of operant resources provided by an educational institution interact with operand resources provided by the students to stimulate the development of IAC. The second stream addresses specific techniques developed and tested by the United States Military to develop IAC among military commanders, suggesting what an actual IAC program might look like in practice. The resulting integration is encompassed in a curriculum model (Gradual Release of Responsibility Model, or GRR) that is readily adapted to business school applications.

INTRODUCTION

In the 2020 ABSEL pre-conference, Ken Long presented the results of an on-going stream of research sponsored by the United States Army, seeking to increase the effectiveness of officers in addressing the rapidly changing range of problems they face in carrying out their missions. Long's specific presentation, conducted in conjunction with his colleagues, Rich McConnell and Jason Ballard, addressed a teaching approach he characterized as "educational speed dating." Drawing on an adaptation of the social dating technique to activities currently in use by universities as a tool for building a research culture (Muurlink & Matas, 2011), the approach involved a series of experiential activities through which a teacher facilitated the officers' interactive involvement in increasingly self-directed problem-solving and analysis. The shift in educational responsibility from the teacher to the officers themselves was embodied in what Long characterized as the Gradual Release of Responsibility (GRR) model, an adaptation of a teaching approach originally developed to facilitate reading comprehension (Pearson and Gallagher, 1983). In military parlance, the speed-dating activities were educational tactics supporting the larger GRR strategy.

GRR can be seen as a process for developing what Cannon, Feinstein, Friesen and Yaprak (2013) refer to as *individual absorptive capacity* (IAC). That is, it presents a program for moving military officers from a position of dependence on military doctrine to one of self-directed leadership competence, where they are capable of quickly recognizing the capabilities and limits of doctrine in the context of new and unanticipated conflict situations, determining the information they need, acquiring it, and acting upon it in a timely and decisive manner. Just as managers are increasingly faced by unanticipated opportunities and threats, growing out of world characterized by accelerating change, so are military officers, but often with much more deadly consequences. In this sense, military officer training presents a particularly compelling application of IAC principles.

IAC is a derivative of Cohen and Levinthal's (1989, 1990) concept of organizational *absorptive capacity* (OAC) representing a firm's ability to value, assimilate, and commercially utilize new, external knowledge (Cohen & Levinthal, 1990, 1994). Lane, Koka, and Pathak (2006) characterize OAC as "… a firm's ability to utilize externally held knowledge through three sequential processes: (1) recognizing and understanding potentially valuable new knowledge outside the firm through exploratory learning, (2) assimilating valuable new knowledge through transformative learning, and (3) using the assimilated knowledge to create new knowledge and commercial outputs through exploitative learning" (p. 856).

Cannon et al. (2013) address this sequence, but on the level of the individual manager. Whereas the OAC literature has focused on technology transfer (Zahra & George, 2002), Cannon et al.'s concept of IAC addresses the ability of managers, or students who aspire to become managers, to recognize the kinds of organizational knowledge and skills they need but do not yet possess, assimilate them, and use them in ways that will enable them to function effectively in whatever role they are filling within an organization.

It is interesting to note that in the seminal article introducing absorptive capacity to the management literature, Cohen and Levinthal (1990) actually began their discussion with an extensive discussion of individual absorptive capacity, suggesting that it is a

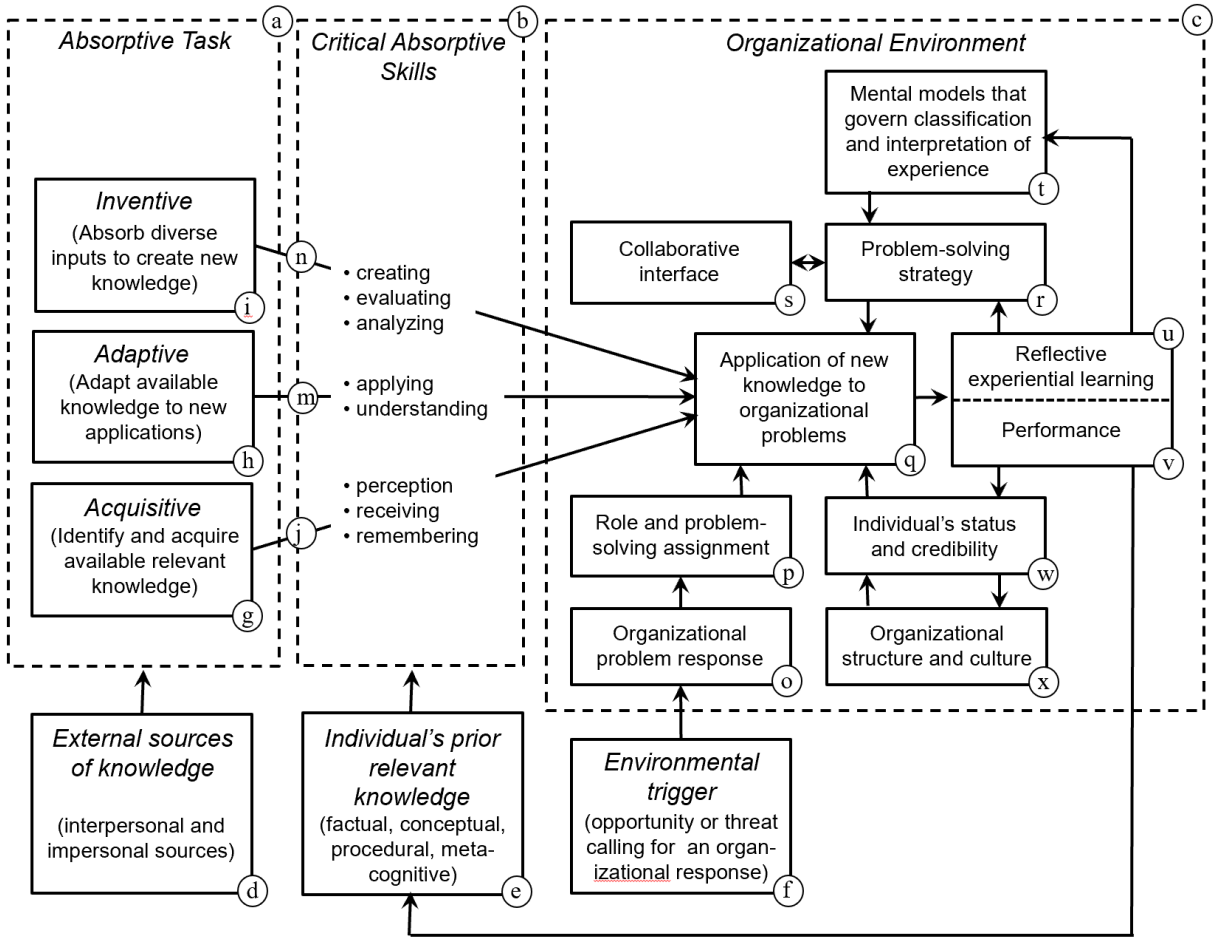
necessary, but not sufficient, part of its organizational counterpart. In context, however, it apparent that they were addressing the capacity of individuals to absorb technical knowledge, not managerial knowledge and skills. The difference between Cohen and Levinthal's concepts of IAC and OAC was that OAC included the organizational structures and processes that control the flows and utilization of information throughout the firm. Indeed, Kogut and Zander (1992) argue that facilitation of information-flow efficiency reduces transaction costs and provides the economic rationale for organizing firms as opposed to simply relying on the interaction of individuals in the marketplace to carry out the production function. But, if the organizational structures and processes that control information flow and utilization within a firm are an important element of OAC, why would Cohen and Levinthal limit IAC to technical information? If organizational structures and processes are not static within a firm, IAC must include the ability to absorb new knowledge relating to them. This is even more true for IAC as we seek to develop it in the Business school. As a rule, Business schools are not seeking to prepare students for any particular organization or industry, but for organizations in general. This means that an essential element of IAC education must be development of the ability to quickly analyze the structures and processes that control information flow in organizations with which students have no prior experience. The study of these structures and processes constitutes one of the major foci of modern management theory. Cannon et al. (2013) argue that the ability to recognize the importance of these theories, absorb them, and use them effectively as needed constitutes a major part of IAC.

Ironically, beyond the limited acknowledgement found in Cohen & Levinthal (1990), IAC has received virtually no attention in the management literature. Perhaps this neglect stems from the notion that IAC is a natural byproduct of a good education. Cohen and Levinthal (1990) appear to support this view, suggesting that individual absorptive capacity is a function of prior knowledge. On the individual level, the role of colleges and universities is commonly viewed as promoting student knowledge acquisition, and responsibility for research regarding knowledge acquisition is generally seen as the province of Schools of Education.

Cannon, Geddes, and Feinstein (2014) offer an alternative view. While they agree that prior knowledge is an important component of IAC, they argue that knowledge itself should not be the goal of education. Rather, the goal should be the ability to acquire knowledge as needed. This is the essence of IAC. Nor should the study of IAC be relegated to Schools of Education. While researchers in Schools of Education have addressed what we are labelling IAC (cf. Miner-Romanoff, Rae, & Zakrzewski, 2019), they do not determine the curriculum for Schools of Business. If the development of IAC should be the primary objective of Schools

EXHIBIT 1:

How individual absorptive capacity functions within an organization



Source: Hugh M. Cannon, Bryon C. Geddes, and Andrew Hale Feinstein (2014). "Experiential Strategies for Building Individual Experiential Capacity." *Developments in Business Simulation and Experiential Learning, Volume* 41, p 379.

of Business, Schools of Business should logically be studying its nature and requirements.

Consistent with this reasoning, the purpose of this paper will be twofold: First, it will analyze Cannon et al.'s (2013, 2014) view of IAC, breaking it down into its key components and examining them for their validity and relevance to military officers. Second, it will use the resulting analysis as a lens through which to evaluate Long et al.'s GRR model and associated techniques to determine whether they can be generalized as a method for developing IAC among business students. Throughout our discussion, we will use the term "teacher" to be consistent with the literature. However, we will use it in the sense of a mentor or learning facilitator, as described by Cannon, Cannon, Geddes, and Smith (2020).

CONCEPTUALIZING INDIVIDUAL ABSORPTIVE CAPACITY

We have noted that Cannon et al.'s (2013, 2014) conception IAC concerns individuals' ability to recognize the kinds of organizational knowledge and skills they need but do not yet possess, assimilate them, and use them in ways that will enable them to function effectively in whatever role they are filling within an organization, in our case, the military. This concept is broad enough to encompass both the acquisition and assimilation of knowledge. It is also broad enough to transcend organizational settings. IAC would encompass the ability to work with community groups, political organizations, military organizations and individuals from other countries, or common citizens in the countries to which an officer might be deployed.

As we have noted, Cohen and Leventhal (1990) ascribe IAC to the acquisition of prior related knowledge. Lane and Lubatkin (1998) found that the level of OAC in an interorganizational setting depends on the similarity of knowledge bases, organization structures, compensation policies, and dominant logics. This presents a problem for the development of IAC in the broad sense that Cannon et al. (2013, 2014) have conceived it, and particularly for military officers. While the United States'military has a relatively homogeneous system of knowledge bases, organization structure, support services, and dominant logics, military officers of all levels are increasingly being placed in positions where they must interact with people and institutions that reflect a totally different culture, political, and economic system, often with little or no time to prepare. From a training perspective, this suggests the need for a set of meta-capacities officers can acquire that enable them to quickly recognize, assimilate, and utilize the characteristics of the particular cultural setting in which they must work.

Cannon et al. (2014) address this need for meta-capacities by drawing on Bloom's taxonomy of cognitive learning objectives (Bloom, Englehard, Furst, Hill, & Krathwohl, 1956), along with corresponding taxonomies of affective (Krathwohl, Bloom, Bertram, & Masias, 1964) and psychomotor (Simpson, 1974) objectives. Bloom's revised taxonomy (Anderson and Krathwohl, 2001; Krathwohl, 2002) is particularly useful in that it distinguishes between knowledge and the cognitive processes by which the knowledge is assimilated.

Exhibit 1 contains a diagram of Cannon et al.'s (2014) model, providing a generalized view of how IAC might work to enable a manager, or in our case, officer, to quickly recognize, assimilate, and use the kind of knowledge she needs to confront any given type of organizational or cultural problem. Boxes a, b, and c represent the three stages through which the officer exercises absorptive capacity. In the first stage (box a), she searches for progressively more abstract representations of the problem from box g to h to i in order to find analogous situations that might provide potential insights into the solution. External inputs of knowledge (box d) come from interpersonal sources (what we commonly think of as networking) or impersonal sources such as Internet searches or exposure to other archival media.

In the second stage, the officer assimilates the newly gathered information by applying progressively more sophisticated absorptive skills (arrows j, m, and n). These skills are drawn from the cognitive processing dimension of Bloom's revised taxonomy (Anderson & Krathwohl, 2001). According to the revised taxonomy, the processing dimension consists of six progressively more sophisticated levels (remembering, understanding, applying, analyzing, evaluating, and creating), the application of which depends on the level of cognitive sophistication needed to address the problem. Perception comes from the psychomotor taxonomy (Simpson, 1974) and receiving from the affective taxonomy (Krathwohl et al., 1964). The officer's prior relevant knowledge (box e) represents stored knowledge of analogous situations that might help the officer. This draws on the knowledge dimension of Blooms revised taxonomy (factual knowledge, conceptual knowledge, procedural knowledge, and meta-cognitive knowledge). In discussing the diagram, Cannon et al. note that the various absorptive capacities are not necessarily evoked in sequence, or even in hierarchical fashion. "Faced with an acquisitive, adaptive, and/or creative task, the [officer] has to visualize a holistic end solution with sufficient clarity that s/he can pursue the necessary information and sell the [relevant organization] on investing the resources necessary to transform and exploit it" (p. 382). This leads us to the third stage of IAC, the right-hand side of Exhibit 1, where an environmental trigger (Box f), consisting of some kind of opportunity or threat, activates an organizational response (box o).

From the standpoint of IAC, the focus of the officer's activities is the application of the new knowledge to the problem she faces (box q). This is where Cohen and Levinthal's (1990) conception of IAC and OAC diverges. The individual's role (box p) determines to a large extent the type of contribution the officer will be able to make, regardless of the knowledge she possesses. However, in situations of empowerment she will be working to refine and implement the problem-solving insights (developed during stage 2, box b). Generally, this will be done in conjunction with other members of the team or leaders of the relevant population (box s) and the efforts will be both guided and constrained by the mental models (box t) of the people involved. Mental models are sets of underlying assumptions and patterns of thinking that shape the way people in an organization, and the organization itself, conceptualize and solve problems.

Exhibit 1 suggests two ways problem-solving affects the population: First, it solves problems (box ràbox q). Second, it provides an opportunity for reflective experiential learning (box u) at both the individual and group level. This grows out of an on-going cycle of experimentation, observation of results, and corrective action (box r à box q à box v àbox u àbox r). This often results in what Argyris (1976) calls "double-loop" learning, where reflective experiential learning leads decision makers to question their basic goals and/or assumptions embodied in their mental models (box u,v à box t). For instance, notwithstanding a highly successful military campaign, the officer might find herself faced with a hostile citizenry, resentful of the hardships imposed upon them by military operations. This might lead the military to rethink its goals, incorporating measures of citizens' satisfaction into its criteria for success.

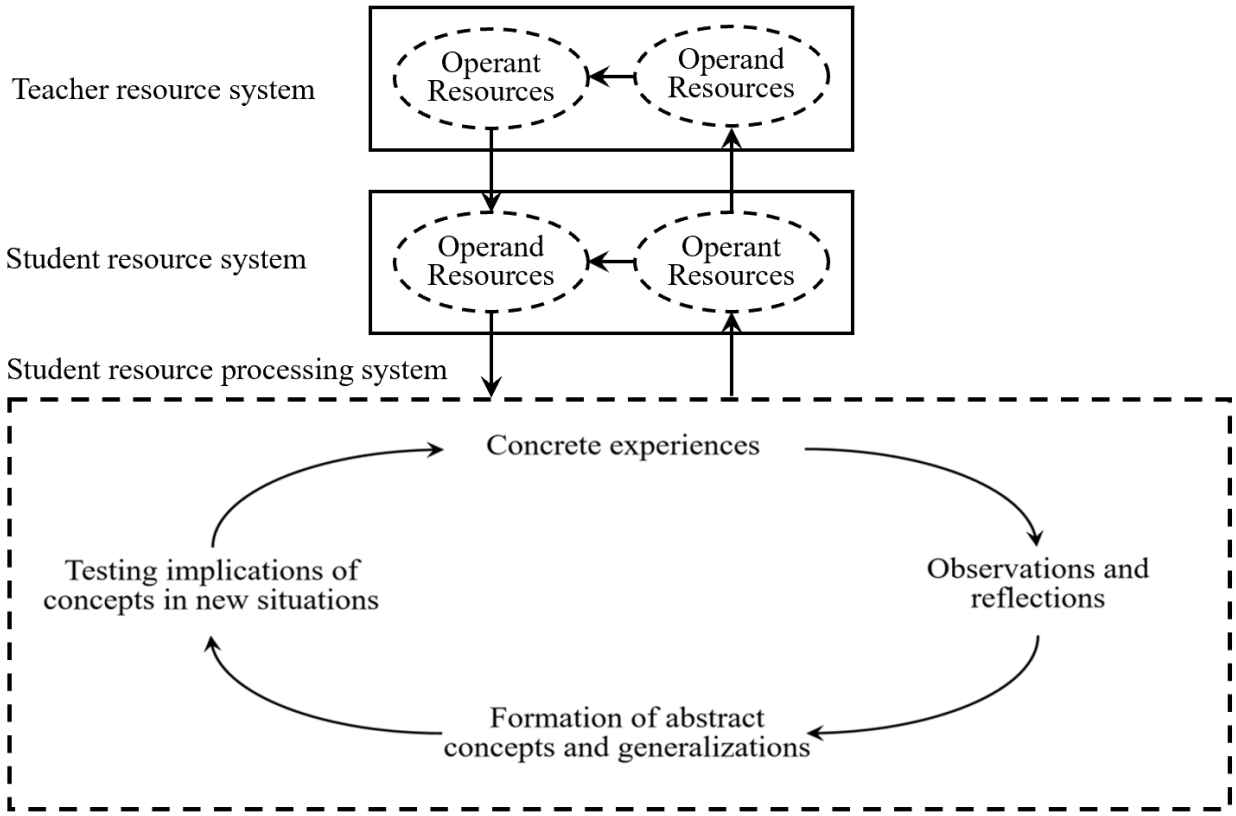
On the individual level, performance feedback and reflective experiential learning can have a similar effect on individual knowledge and goals. This is reflected in the officer's mental models (box t), problem-solving strategy (box r) and collaborative interface (box s), as well as the officer's repertoire of prior relevant knowledge (box e). The officer's performance also affects her status and credibility within the larger military organization (box w), which, in turn, can have an interactive effect on the organization's structure and culture (box x).

SERVICE DOMINANT LOGIC

Beyond the concept of IAC, a common theme underlying the work of Cannon and his colleagues has been the concept of *service-dominant logic*, or SDL (Geddes, Cannon, Cannon, & Feinstein, 2015). SDL comes from the Marketing literature (Vargo & Lusch, 2004, 2008). Eschewing the traditional focus on products and services, SDL portrays marketing as an active process though which marketers provide *operant* resources that interact with a consumer's *operand* resources to co-create satisfying outcomes for the consumer. From an SDL perspective, products are "pre-packaged" operant resources and services (plural) are prepackaged operant resources delivered in real time. Implicitly, they are purchased and consumed, whereas service (singular) signifies the active role of the consumer in co-creating benefits under the catalytic effect of the marketer's operant resources.

The implications for officer training are profound. Officer training is not "teaching" – knowledge, prepackaged or delivered in real time. Rather, it is the product of student learning, acting under the catalytic effect of an educator/facilitator (Cannon, Cannon, Geddes, & Smith, 2020). It is inherently experiential, in that it only happens in the mind of the officer being trained, where "experience" ultimately takes place. Geddes, Cannon, and Cannon (2017) portray this as an adaptation of Kolb's (1984) experiential learning cycle (see Exhibit 2).

EXHIBIT 2
The Co-Creative Model of Experiential Learning



Adapted from Bryon C. Geddes, Hugh M. Cannon, and James N. Cannon (2017). Conceptualizing Co-Creative Strategies in Experiential Learning: Individual versus Group Approaches." *Developments in Business Simulation and Experiential Learning, Volume* 44, p 60.

Exhibit 2 is necessarily an oversimplification of the co-creative process in that in that operant and operand variables are not as distinct as their definitions would seem to portray. Nor are their interactions as linear as the diagram would suggest. Again, the experience of learning ultimately happens in the mind of the officer. Concrete experiences (such as a simulation game or debriefing session) are ultimately perceived, encoded, and responded to as the officer thinks about the experience. She observes and reflects, forms abstract concepts and generalizations (theorizes) regarding what is happening, and tests the implications. This leads to another concrete set of experiences, perceived through her senses and translated into to abstract representations in her mind. But, in reality, each of these steps is rehearsed in countless iterations – mental simulations, if you will – testing different ideas before a final idea is accepted and the officer draws conclusions moves on to the next step.

The same type of iterative complex processing happens as the officer interacts with the Teacher. The officer's processing produces questions or other items for discussion (operant resources) for the teacher, as the upper portion of Exhibit 2 suggests. Implicit, but not portrayed explicitly in the exhibit, is the fact that the teacher goes through the same kind of Kolbian cycle shown in the bottom portion of the exhibit. The Teacher's thinking feeds back to the officer, and so the process continues.

Significantly, as the cycles continue, the officer becomes more adept at producing self-guiding operant resources (the horizontal arrow in the student resource system portion of the diagram). As a result, the student bears more and more of the educational burden

A PILOT PROGRAM

Exhibit 1 provides a useful overview of how IAC functions. This, in turn, provides a useful framework for identifying the skills students should acquire. These skills can be used to define the objectives of an IAC-based program. However, they do not define the program itself. We will now describe a specific program developed by the United States Military to prepare middle-grade officers for higher levels of command. Prior programs featured a traditional lecture-and-test mode of instruction, drawing on subject-matter experts who produced standardized lecture lessons that were taught across the many classrooms in a uniform manner and then student performance was measured on objective examinations.

The emphasis on subject-matter experts and standardized curricula grew out of the military's commitment to continuous learning and the adoption of best practices. However, over time, the effect was to create a culture of uniformity, standardization, and a suppression of individual initiative that was out of step with a world of accelerating change, where traditional practices were increasingly ill-suited to emerging problems. In other words, the military was facing its own version of the same conditions that gave rise to the concepts of organizational absorptive capacity (Cohen & Levinthal, 1990, 1994; Lane, Koka, and Pathak, 2006) in the organizational literature and individual absorptive capacity (Cannon et al., 2013, 2014) in management education. The result was the development of a pilot program based on the basic principles of IAC. Exhibit 3 maps program design requirements against the components of the IAC model shown in Exhibit 1.

Note that external (box d) and internal (box e) sources of knowledge are operand resources that students bring to the program. They operate as portrayed in Exhibit 2, where these resources (and the ability to use them) grow as the program progresses and students take on more responsibility for their own learning. The environmental trigger (box f) defines the objectives of the program. As we have noted, the world is changing rapidly, and at an accelerating rate. This is putting enormous pressure on the military to develop flexible, highly competent leaders, Conventional educational approaches are ill-suited for the task. They focus primarily on knowledge dissemination. While knowledge is important, and subject-matter experts still play an important role in disseminating it, the skill and judgment required to acquire and use the knowledge (i.e. IAC) take priority in the revised program. In terms of box f in Exhibit 1, IAC is the opportunity, and the burgeoning number and unanticipated nature of military crises are the threats. The organizational response is to institute a new training program, geared specifically to expand the level of individual absorptive capacity within the officer corps.

EXHIBIT 3

How elements of program design address elements of the Individual Absorptive Capacity Model

IAC model elements (with letters signifying boxes in Exhibit 1)				**Elements of program design**
a	**Absorptive task**	**g**	**Acquisitive**	Map mission essential professional skills to the list of required performance mastery goals and develop exercises to test them
		h	**Adaptive**	Design practical exercises and case study analyses that require students to perform discretionary decision-making in complex problem situations by adapting standard doctrine or established procedures.
		I	**Inventive**	Develop practical exercises and case study analyses that would require students to find and frame problems in entirely new ways before proceeding into problem-solving

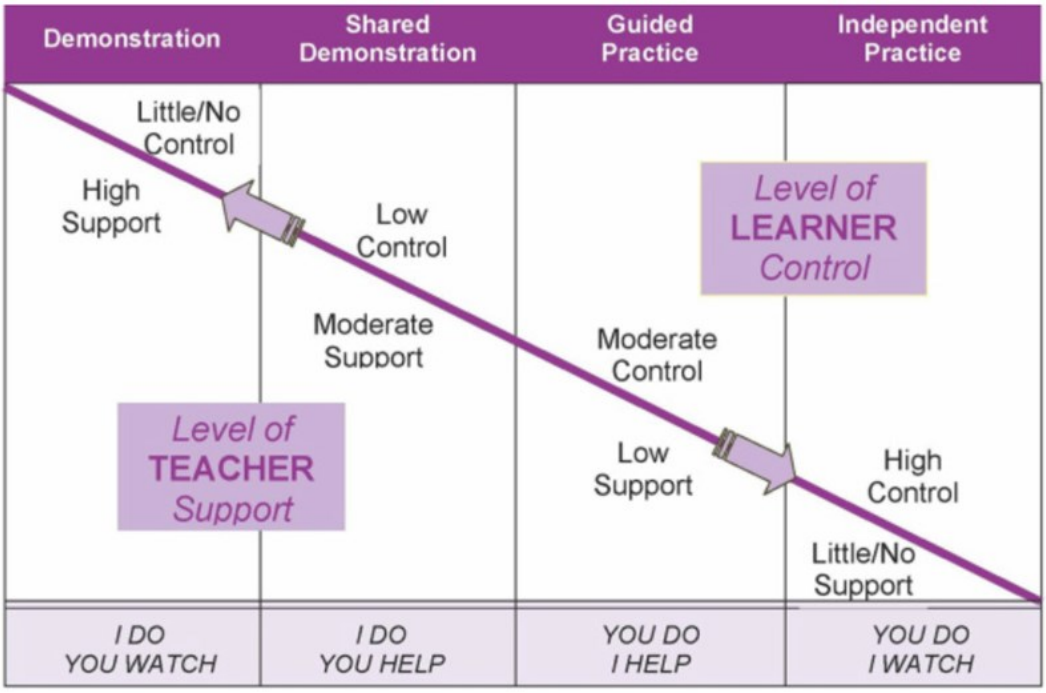
b	**Critical Absorptive tasks**	**J**	**perception, receiving, remembering**	Leverage existing curriculum products for use as planning references and procedural guides to ensure that student efforts are aligned with professional norms and standards.
		m	**applying, understanding**	Deploy decision-making exercises require students to develop solutions that pass the test of being suitable, feasible and acceptable to typical senior leader concerns. This would require them to demonstrate senior level understanding of complex environments
		n	**creating, evaluating analyzing**	Design exercises that feature student roles in the chain of command to make judgments between alternative proposals offered by student planning teams. This requires demonstration of mastery of creative problem-solving, trade-off decisions, and risk management at a senior level.
c	**Organizational environment**	**o**	**Organizational problem response**	Develop a curriculum that addresses the emerging environment of rapid change and uncertainty, including exercises based on realistic operational scenarios that challenge students in ways that foster the development of Individual Absorptive Capacity.
		p	**Role and problem solving assignments**	Ensure that all students have opportunities to play a variety of roles in high-level staff positions in order to give them experience multiple with perspectives in problem solving.
		q	**Applying new knowledge to org problems**	Bring students playing different functional groups together to address the common problem from the students' different role-based perspectives, drawing on the product of mental models (box t), collaborative interface (box s), and the resultant problem-solving strategy (box r).
		r	**Problem solving strategy**	Bring students together in different, but related roles with ambiguous fact presentations that require students to employ trade-off decisions in selecting effective courses of action.
		S	**Collaborative interface**	Incorporate multiple headquarters echelons in exercise scenarios in order to force negotiation and information exchange with a variety of actors in the decision-making environment.
		T	**Mental models for sensemaking**	Provide baseline instruction on multiple mental models from the profession and best practices from the civilian world that could be variously employed in structuring and solving problems.
		u	**Reflective experiential learning**	Use reflective learning through personal learning journal essays with follow-up group discussions with small student groups and faculty members using a structured analytical framework to help lock in personal learning insights.
		v	**Performance**	Measure the pilot program's student performance on each exercise, case study, and where appropriate, formal exams to gain a measure of objective assessment when possible and feedback to be used in subsequent interactions of the process.
		w	**Individual status and credibility**	Use outside observers and 360° assessments to provided individual-level feedback and to help determine optimal placement in future exercises
		x	**Organizational structure and culture**	Conduct debriefing seminars to address the issues emerging from each exercise, including the effects of social hierarchy, formal and informal roles, formal and informal organizational power structures and hierarchy, and the impact of personal leadership styles and personality characteristics.

Beyond the specific elements of program design summarized in Exhibit 3, the program was designed to explore a cultural shift, both in the mind-set of graduating officers and of the of the faculty of the Military College itself. Rather than focusing on established military doctrine and principles, the focus was on the creative application of the doctrine and principles to new and unanticipated situations. The theoretical basis was anchored in Lewin's (1947) action research model, in which actions were simultaneously directed at solving problems and generating useful feedback for modifying the problem-solving approach as needed. This is the same basic principle underlying the model shown in Exhibit 2, fusing the concepts of service-dominant logic and Kolb's (1984) experiential learning cycle. At each stage of the program, students were encouraged to actively experiment, committing themselves to a preliminary course of action based on their best understanding, then modifying it as necessary based on the feedback they receive.

THE GRADUAL RELEASE OF RESPONSIBILITY MODEL

The central pedagogical concept underlying the pilot program was an adaptation of the Gradual Release of Responsibility (GRR) model, originally developed by Pearson and Gallagher (1983) as a scaffolding approach for reading instruction. Subsequently, it has developed into a more widely applied approach to student-centric instruction. Buehl (2005) describes the model as an approach that "emphasizes instruction that mentors students into becoming capable thinkers and learners when handling the tasks with which they have not yet developed expertise." In the context of the pilot program, it is a mentoring approach, where the teacher begins by taking an active role in providing guidance to students, subsequently shifting to an increasingly passive role as students progress in the program and begin taking more responsibility for their education. Exhibit 4 summarizes the GRR model and its four phases.

EXHIBIT 4.
Four stages of the Gradual Release of Responsibility (GRR) model



In the largest sense, the steps provide a basic outline for an educational journey from traditional student to a high IAC life-long learner, which is the basic mission of the program. In the more immediate sense, the steps represent stages through which students will progress during the program. The focus is "behavioral" in that each step is anchored in specific behaviors, drawing on the co-creative model of experiential learning portrayed in Exhibit 2.

In the first stage, the teacher models the process the student will eventually be responsible for learning. The students' learning process is still experiential, in the sense portrayed in Exhibit 2, but the teacher is providing strong operant signals to stimulate their thinking process. As suggested by the lower portion of Exhibit 4, the teacher will prime the students' analyses by sharing her own thoughts and strategies as she guides their thinking process. She freely discusses her goals and the rationale behind her activities, providing specific instruction regarding the principles and procedures as appropriate.

Exhibit 5 provides a more detailed breakdown of teacher and student activities in each of the four stages of the GRR model. In stage 1, the teacher's activities include modelling the thinking process by "thinking aloud," providing direct instruction, explaining the goals she hopes to achieve and the larger purpose the goals are supporting. As a practical matter, the teacher might begin with a discussion of the model in Exhibit 1. This would be followed by a thought experiment – a specific military problem where the teacher faces a number of contingencies for which she has no clear doctrinal solutions. For instance, she might be tasked

with organizing a large troop movement in a foreign country without sufficient logistical support. She would "think aloud" as she reviews the model, trying to identify the key knowledge and skills she possesses that might be adapted to address the problem, the outside sources she might be able to draw upon, and then discusses what is going through her mind as she works through the problem.

EXHIBIT 5
A More Detailed Representation of the GRR Model

Gradual Release of Responsibility Model

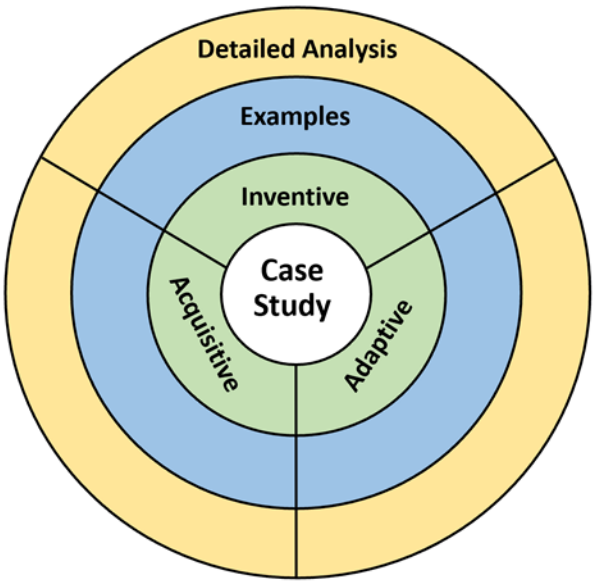
	I Do	We Do It Together	You Do It Together	You Do It Alone
Teacher	✓ Modeling ✓ Think-aloud ✓ Direct Instruction ✓ Goal(s) ✓ Purpose	✓ Guided Practice ✓ Prompting ✓ Questioning ✓ Facilitating ✓ Interactive Activities	✓ Give feedback ✓ Formative Assess ✓ Observe and Evaluate	✓ Clarify ✓ Support
Student	✓ Active Listening ✓ Note-taking	✓ Questioning ✓ Participating	✓ Application with small groups ✓ Partners ✓ Collaborating ✓ Interactive Activities	✓ Independent Practice ✓ Uses resources acquired through the other phases of the process ✓ Responsible for outcome

The thought experiment would begin with box d in Exhibit 1, where the teacher would think about how she would conduct a Google search and available military sources to get as much information as possible about analogous situations. What search terms would she use? How would she sort through the various sites coming up in the search, determining which are most credible and what information they might provide? Having conducted the search earlier, she could replicate the experience in real time with the students, again, thinking aloud about how she was processing the information.

Continuing with box d, the teacher would then walk through the possible interpersonal sources she might be able to tap for further information – other military officers, instructors from her various training commands, former classmates, and so forth. How would she approach them? What questions would she ask? How would they likely respond to various possible approaches? Could they be useful in actually implementing her solution without violating the chain of command?

Moving on to boxes g, h, and in Exhibit 1, Exhibit 6 provides a useful tool for guiding the discussion, the "spoke-and-wheel model" for developing progressively more creative forms of knowledge to address a problem. Again, the problem is how to organize a large troop movement without adequate logistical support. Exhibit 1 suggests that external information can be gathered, absorbed, and utilized to solve problems at three progressively more creative levels. At the lowest level (box g), the information

EXHIBIT 4
A Spoke-and-Wheel Model for Organizing External Knowledge



addresses how other people have solved the same or similar kind of problem in the past. This is the most efficient, and generally the most effective for routine problems, albeit ones that the students might not have had to solve in the past. The teacher would share this as she searches Google with something like, "successful historical troop movements with insufficient logistical support" and discusses people she knows who might have experience or special expertise in this area. For instance, historically, a common solution would be to commandeer civilian transportation.

The second level (box h in Exhibit 1) generally applies to situations where the more obvious solution doesn't apply, where there are no obvious tried and true approaches. For instance, the teacher might wonder (aloud), "What will I do if the location of the movement was politically sensitive, and the civilian population would resist the disruption and cost imposed by commandeering civilian transportation?" She might reason that the basic solution might still be used by conducting logical operations at night, using otherwise idle resources, and paying for their use so that the civilian population would benefit from the movement.

The third creative level (box i in Exhibit 1) is the most difficult, because there are no obvious precedents or simple adaptations to follow. Rather, the teacher would have to show students how to find analogies in seemingly unrelated bits of knowledge, leading to more radical solutions. For instance, what if the logistical movement could be disguised as or combined with humanitarian aid from an apparently neutral source, enabling her to build up stocks of supplies that would then be available when the troops began to move. Or what if the enemy logistical command could be infiltrated, and the supplies could be disguised as logistical support for a planned enemy initiative?

Note that the "wheels" in Exhibit 6 provide a useful guide for discussing the proposed "acquisitive," "adaptive," and "inventive" spokes in the case study. Once the teacher has identified a particular solution, she would then lead the students through examples of what the solution might look like in actual practice. This, in turn, would lead to a detailed analysis of the strengths and weaknesses of each approach. Given that the conditions leading to an acquisitive, adaptive, or inventive solution may not be known, the analysis would also discuss the nature of the risks versus potential payoffs associated with one spoke versus another.

Returning to Exhibit 5, in stage 2 of the GRR model, the teacher would continue to take a strong hand in guiding the learning activities, but the behavioral initiative shifts to the student. Rather than observing and analyzing the teacher's behavior, the student now seeks to emulate what she observed in stage 1. In terms of Exhibit 2, the interaction of operant and operand resources becomes more balanced, with the student taking a more active role in questioning and participating actively in the design and analysis of group learning activities, involving interaction with other students. Instead of modeling problem-solving behavior, the teacher acts as a coach, guiding and prompting, questioning, facilitating, and interacting with the students as they seek to replicate the process they observed in stage 1.

Stage 3 differs from stage 2 in that the students are now working in their own groups, or with partners, not only replicating the individual thought processes modeled by the teacher, but taking the initiative to begin practicing what they have learned, collaborating in interactive activities, much as they would in an actual field activity.

In the final stage, the students' activities actually take the form of command responsibility. Students act independently, using the resources they have acquired through practice in the prior three stages, taking ultimate responsibility for the outcomes they achieve, just as they would in the field. The teacher takes the role of a senior officer, or mentor, clarifying the implications of the students' performance and supporting them by providing the feedback they need for corrective action.

SUMMARY AND CONCLUSIONS

The foregoing discussion presents the underlying concepts and general structure of the pilot program designed by the Military College to infuse the concept of individual absorptive capacity (IAC) into its mid-range officer training curriculum. Our description was necessarily abbreviated, given the complexity of the embedded concepts and varied aspects of the curriculum to which they were applied. Nor was it possible to discuss the measures we used to evaluate program success. These must necessarily wait for future papers. The purpose of this paper was to provide a general description, but one with sufficient substance to guide the development of similar programs for other institutions, including conventional public and private business schools.

Speaking generally, we believe the pilot program was a success. This is encouraging. First, it gives us hope that our educational activities will help future military officers, and by example, the broader range of business leaders, rise to the challenge of a world characterized by accelerating change in virtually every aspect of our lives. Second, it provides a template for guiding future research. Each of program components addressed in Exhibit 2 merits a more in-depth analysis and testing, as do the concepts embodied in Exhibits 4, 5, and 6.

Finally, we believe that the general concept of IAC merits much more research, including research addressing programs designed to implement the concept. The Gradual Release of Responsibility (GRR) model addressed in this paper provides a good example. We offer it as a first step, with the hope and expectation that future research will elaborate on and test the various components of the program that we haven't been able to address here.

REFERENCES

Anderson, Lorin W. & David R. Krathwohl (2001). *A Taxonomy for Learning, Teaching, and Assessing. A Revision of Blook's Taxonomy of Educational Objectives*. New York: Longman.

Bloom, Benjamin S., N. D. Englehart, E. J. Furst, W. H. Hill, & David Krathwohl (1956). *Taxonomy of Educational Objectives – The Classification of Educational Goals, Handbook I: Cognitive Domain*. New York: David McKay Company.

Buehl, D. (2005) as cited by Doug Fisher and Nancy Frey (n.d.). *Gradual Release of Responsibility*. Retrieved from https://sites.google.com/a/mcoeapps.org/grr/ October 25, 2020.

Cannon, Hugh M., James N. Cannon, Bryon C. Geddes, and J. Alexander Smith (2020). Individualizing Experiential Learning. *Developments in Business Simulation and Experiential Learning,* 47, 181-192.

Cannon, Hugh M., Andrew H. Feinstein, Daniel P. Friesen, & Attila Yaprak (2013). The role of simulations in organizational learning: Building individual absorptive capacity. *Developments in Business Simulations and Experience Learning*, 40, 333-343.

Cannon Hugh M., Bryon C. Geddes, and Andrew Hale Feinstein (2014). Experiential Strategies for Building Individual Absorptive Capacity. *Developments in Business Simulations and Experience Learning*, 41, 378-389.

Cohen, Wesley M. & Daniel A. Levinthal (1989). Innovation and Learning: The Two Faces of R&D. *Economic Journal,* 99:397 (September), 569-596.

Cohen, Wesley M. & Daniel A. Levinthal (1990). Absorptive capacity: A new perspective on learning innovation. *Administrative Science Quarterly, 35:1* (March), 128-152.

Cohen, Wesley M. and Daniel A. Levinthal (1994). Fortune Favors the Prepared Firm. *Management Science*, 40:2 (February), 227-251.

Geddes, Bryon C., Hugh M. Cannon, and James N. Cannon (2017). Conceptualizing Co=Creative Strategies in Experiential Education: Individual versus Group Approaches. *Developments in Business Simulation and Experiential Learning*, 44, 59-72.

Geddes, Bryon C., Hugh M. Cannon, James N. Cannon, and Andrew Hale Feinstein (2015). Developing Educational Strategies for Experiential Learning: An Application of Service Dominant Logic from Marketing. *Developments in Business Simulation and Experiential Learning*, 42, 226–232.

Kogut, bruce and Udo Zander (1992). Knowledge of the Firm, Combinative Capabilities, and the Replication of Technology. *Organizational Science,* 3:3 (August), 301-441.

Kolb, David A. (1984). *Experiential Learning: Experience as the Source of Learning and Development.* Englewood Cliffs, NJ: Prentice Hall.

Krathwohl, David R. (2002). A revision of Bloom's Taxonomy: An Overview. *Theory Into Practice,* 41:4 (Autumn), 212-218.

Krathwohl, David R., Benjamin S. Bloom, B. Bertram, & B Masia (1964). *Taxonomy of Educational Objectives – The Classification of Educational Goals, Handbook II: Affective Domain*. New York: David McKay Company.

Lane, Peter J., Balaji R. Koka, and Seemantini Pathak (2006). The Reification of Absorptive Capacity: A Critical Review and Rejuvenation of the Construct. *Academy of Management Review,* 31:4, 833-863.

Lane, Peter J. and Michael Lubatkin (1998). Relative Absorptive Capacity and Interorganizational Learning. *Strategic Management Journal,* 19:5 (May), 451-478.

Miner-Romanoff, Karen, Amy Rae, and Christ E. Zakrzewski (2019). A Holistic and Multifaceted Model for Ill-Structured Experiential problem-Based Learning: Enhancing Stdent Critical Thinking and Communication Skills. *Journal of Problem Based Learning in Higher Education*, 7:1, 70-96.

Muurlink, Olav and Cristina Poyatos Matas (2011). From Romance to Rocket Science: Speed Dating in Higher Education. *Higher Education Research and Development*, 30:6 (December), 751-764.

Pearson, P. David and Margaret C. Gallagher (1983). The instruction of reading comprehension. *Contemporary Educational Psychology.* 8:3 (July), 317-344.

Simpson, Elizabeth J. (1974). The Classification of Educational Objectives in the Psychomotor domain. In Robert J. Kibler, Donald J. Cegala, Larry L. Barker, and David T. Miles. *Objectives for Instruction and Evaluation*. Boston: Alyn and Bacon, 107-122.

Vargo, Stephen L. and Robert F. Lusch (2004). Evolving to a New Dominant Logic for Marketing. *Journal of Marketing*, 68:1 (January), 1-17.

Vargo, Stephen L. and Robert F. Lusch (2008). Service-Dominant Logic: Continuing the Evolution. *Journal fo the Academy of Marketing Science*, 36:1 (March), 1-10.

Zahra, Shaker A. and Gerard George (2002). Absorptive Capacity: A Review, Reconceptualization, and Extension. *Academy of Management Review*, 27:2 (April), 185-203.