Attraction Theory
Revisiting How We Learn

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TENSIONS AND CHALLENGES HAVE ALWAYS PERVADED EDUCATIONAL SETTINGS. Early in the 20th century, calls for intensified and rigorous educational research were based on the desire to develop a systematic analysis of knowledge (Ayer, 1952; Suppe, 1977). Particularly in the field of literacy, the search for the Holy Grail of instructional strategies has continued for more than a century without resolution (Ortlieb, 2012). Ample consideration has been given to not only strategies and interventions (Dewitz, Jones, & Leahy, 2009; Keene, 2008; Pearson & Gallagher, 1983), but also curricula (Apple, 2004; Hirst, 1975; Tyler, 1969), environmental considerations (Fountas & Pinnell, 1996), and even demographics (Luke, 2003). Meanwhile, students still struggle and teachers grow increasingly discouraged at their lack of progress.

The ebb and flow of what to include as content and how to deliver it has fluctuated alongside policy changes. Bishop (2014) attests that "literacy is a political battleground" (p. 51). The enormity of reading struggles has no limits with over one third of fourth graders and one fourth of eighth graders not reading at a basic proficiency level (National Center for Education Statistics [NCES], 2005). These difficulties do not magically disappear; they continue into adolescence and adulthood, where approximately 23% of adults in the United States meet only basic reading proficiency levels (Pressley, Graham, & Harris, 2006). These statistics alarmed the public, leading to policy initiatives that emphasize the needs for effective approaches for teaching reading, particularly for struggling readers (Rapp, Broek, McMaster, Kendeou, & Espin, 2007). Furthermore, the recent inception of the Common Core State Standards across 43 states resulted in uniform expectations for students in an effort to raise achievement for all. Yet, the crux of the matter remains to be addressed: we cannot solely focus on what to teach without also consideration of how students learn.

To radically change an educational system that is saturated with existing failed policies and practices, a simultaneous revolution and evolution from traditional notions of curriculum and instruction is required. Yet, a reformation is difficult considering the political and societal pressures to relate curriculum to its traditional and historical contexts (Banks, 1988; Marsh, Day, Hannay, & McCutcheon, 1990). Aligning curriculum to cultural ways of learning requires a structural change far removed from previously kept routines and components. Pinar (1978) further states, "What is necessary is a fundamental reconceptualization of what curriculum is, how it functions, and how it might function in emancipatory ways" (p. 211).

Instead of teaching curriculum, it is time that pedagogues teach children using instructional techniques in accordance with how the human brain functions. By first examining brain functionality, we can better understand the mental structures related to knowledge formation. Addressing salient questions such as: "How does memory function towards the organization and retrieval of knowledge?" and "How is new knowledge synthesized with existing knowledge?" enables for a rich discussion necessary to provide a strong footing for structural change. Though these types of questions have been central to the field of cognitive psychology/science, they have not led towards improvements in daily curricular practices (Ortlieb, 2014). This paper attempts to connect understandings of thinking/learning processes with instructional design to foster meaningful learning and knowledge formation.

History of Learning Theories

Learning theories have emerged through sundry perspectives with some focused on the acquisition of skills learned such as reading and writing (e.g., Freebody & Anderson, 1981; LaBerge & Samuels, 1974), while others have attended to the creation and transformation of knowledge (e.g., Judd, 1908; Wertheimer, 1959); thus, they have historically been labeled as scientific or educational.

Scientific Understandings

Ideas have surfaced around implicit learning and informal learning, or acquiring information without conscious effort or recollection of having acquired it (Graf & Schacter, 1985). Reber (1993) found a common process that underlies implicit learning—the rapid, effortless, and untutored detection of patterns of co-variation among events in the world. This type of learning occurs in multiple domains including social (attitudes, beliefs, customs), physical (motor response, muscle memory, dexterity) and mental (language processes, knowledge construction) and has broad implications for education.

In 1996, a conference entitled *Bridging the Gap Between Neuroscience and Education* was held in Denver, Colorado to bring together experts to address the disconnect between research in the related fields. At the time it was thought to be a bridge too far to cross, though several articles and texts resulted (e.g., Bruer, 1997, 1999; Gopnik, Meltzoff, & Kuhl, 1999). Educators continued posing questions such as "What are the advantages of knowing how the brain functions? and "What can we do better in our classrooms from having that knowledge?" Few researchers thought that neuroscience would impact curricular structure or learning environments, at least not without further research collaborations.

Three tenets outline why neuroscience plays a valuable role in educational settings: 1) there are scientific principles that define when, how, and why learning occurs; 2) learning can precede behaviors (Tremblay, 1999) and thus, not always be obvious to the observer; and 3) behaviors that appear similar can involve different mechanisms, causes, and consequences. Utilizing neural and behavioral aspects of learning within new educational theories is necessary for complementary growth. Theories must consider current notions of science and education while extending to new orientations that not only hold current relevancy but also prospective potential.

Educational Understandings

In the 1970s cognitive scientists supported the idea that knowledge is organized within units and stored as information. This knowledge, or schema, is necessary for subsequent learning and for connections to be fixated to existing levels of understanding. To exemplify this notion, take the word horse. Within that schema one has general knowledge about horses (they neigh; they have four legs, teeth, hair, tail, and hooves) and perhaps other specific knowledge about Arabian (oldest breed, high tail carriage, 17 pair of ribs) and Appaloosa horses (mixed breed, leopard-spotted coat, striped hooves). In a greater context horses are part of the animal kingdom, requiring food and water for survival. One's knowledge of horses might also extend into their classification as mammals—being warm blooded and bearing live young. Those with personal experiences with horses might also know of their appeal to ride and potential dangers associated with this domesticated animal. With each new experience, the context is further developed around one's understanding of horses as schema is enhanced.

The idea that multiple exposures and experiences with content leads to refined understandings has long been known in the field of literacy (Jenkins, Stein, & Wysocki, 1984; Stahl & Fairbanks, 1986). Experienced teachers know that not all educational experiences are created equal, that is to say that opportunities to learn differ according to the teacher's ability to match content with student needs and abilities to acquire content knowledge. Recent reports on teacher quality (National Council on Teacher Quality, 2013) have scolded teacher education programs for not adequately preparing educators for the gamut of responsibilities that comes with classroom instruction. Perhaps part of the disparity between current pedagogies and student needs is that instruction is often based on dated theories of learning.

Although schema theory has an important role in understanding knowledge acquisition, it does not provide directives for how to plan instruction so students can build their understandings and comprehension of subject matter. Outlining a pedagogical approach that uses a new theoretical platform for teaching and learning is necessary. These questions will be examined:

1) How does memory function towards the organization and retrieval of knowledge?"
2) How is new knowledge synthesized with existing knowledge?

What follows is a sequential approach to learning new information through the use of a model of understanding entitled *attraction theory*.

Examining Other Fields

Just as interdisciplinary learning is promoted with the Common Core State Standards (2010), we must also investigate non-educational sectors to borrow their understandings of cultural and societal customs. The retail sector, for example, prioritizes the notion of commercial attraction as a basic management strategy (De Juan, 2004). Several considerations like assortment (Gautschi, 1981), preference (Hauser & Koppelman, 1979), reinforcement (Byrne, 1971), and size/space (Stanley & Sewall, 1976) impact whether a consumer chooses to purchase goods from a merchandise store. The notion of consumer selectivity is at the forefront of most commercial decisions including store layout, marketing schemes, and daily operations; yet, schools do not always operate similarly. Instead, they too often rely upon presuppositions and convenience. This school model has failed and it needs to be overhauled.

Too many times we assume that students have to buy what we are selling. We assume they will be interested in our products (lessons). And we assume that what we are offering is the best fit for their needs; when in fact, learning is a choice. Attention (McVay, & Kane, 2012), commitment (Anderson, Wilson, & Fielding, 1988), engagement (Guthrie & Davis, 2003), interest (Estes & Vaughan, 1973; Ortlieb, 2010), and motivation (Doepker & Ortlieb, 2011; Ortlieb & Doepker, 2011; Ortlieb & Marinak, 2013) are heavily dependent upon what the teacher does in the classroom. Yet these learning considerations have not received considerable attention in the field of literacy education for almost 10 years (Cassidy & Ortlieb, 2011, 2012, 2013; Cassidy, Ortlieb, & Shettel, 2010/2011). These variables affect the attractiveness of new information and the extent to which a potential learner exerts effort to process those data.

Attractive pedagogy emphasizes emotive aspects of learning that are sometimes difficult to fully identify. The feelings that students experience in the classroom when they meaningfully connect with content and with ongoing activities last a lifetime; they are what is remembered (not memorized) during and after academic progression through the grades. Schachter and Singer's (1962) classic experiments provide evidence for the role feelings play in remembering, discovering that "individuals who find themselves in a state of physiological arousal give this state an emotional label by interpreting it within their current social context. Change the context and you change the emotion even though the physiological state remains unchanged" (Schwartz, 1987, p. 98). The classroom environment should not only be conducive to learning but also evoke emotional connections within students.

Schachter developed a theory from his self-experiments to represent a subjective experience of an emotion as the result of integrating information from current social context, past experiences, and autonomic arousal (see Figure 1). The social context, whether in literature, activities, or instruction, is quintessential to support internal reactions that spark the chain of thinking and learning (Rogoff, 1990; Wood, 1998). By investigating how students are attracted to content, we can gain insight into effectively provoking stimuli.

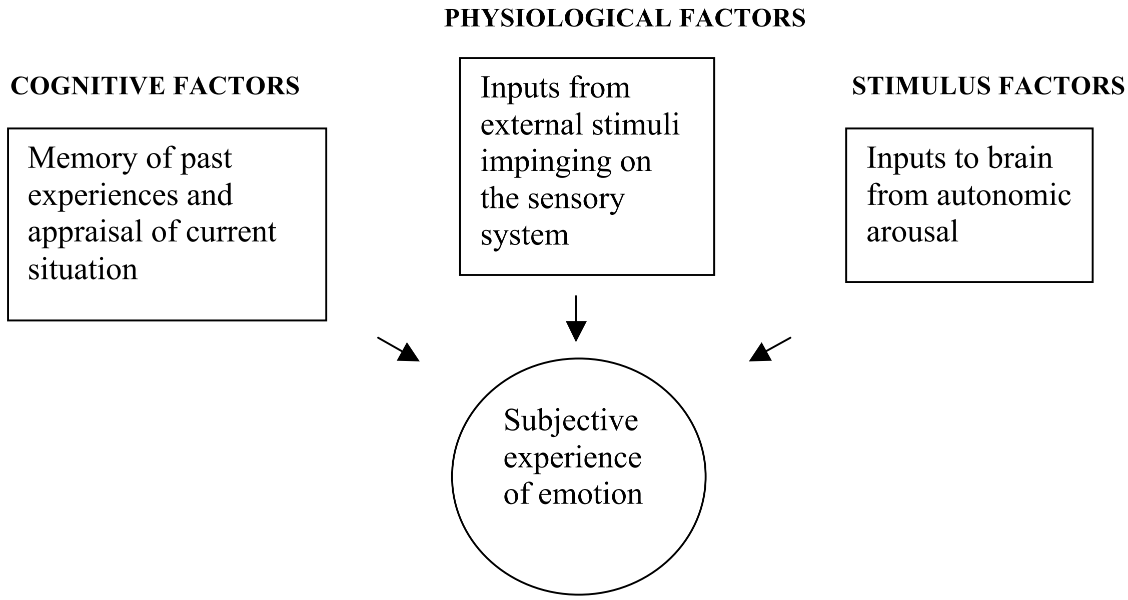

Figure 1. Subject experience of an emotion

Attraction Theory

Just as pollen is an attractor for bees, lessons must continually attract students' attention each day. Vygotsky (1956) proclaims that teaching is effective only when it "awakens and rouses to life those functions which are in a stage of maturing" (p. 278). Too many times lessons feature content-rich information with no hook to excite students or clear purpose for why students should be concerned. Without a stimulus learning is unlikely to occur let alone become ingrained with schemata. Energy for learning has to be fostered to bring forth systemic development. The first aspect of attraction theory is to target an emotional response in the learner (see Figure 2).
So how can this be done? Begin with a ***jolt*** to students' current level of understanding; this can be facilitated by but not limited to multisensory stimuli. "The potential of video for providing the context, or a starting point, for learning has been promoted by many educators and researchers" (Karppinen, 2005, p. 241). Generative learning environments involve in-context learning organized around authentic tasks and in turn, anchor

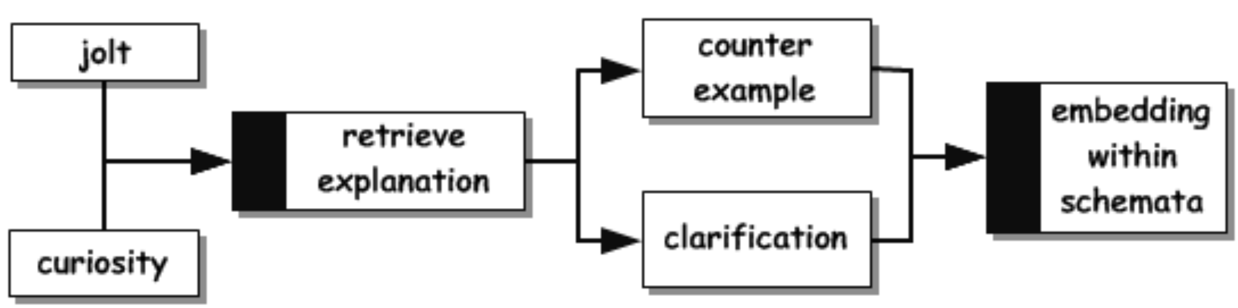

Figure 2. Attraction theory.

learning, according to the Cognition and Technology Group at Vanderbilt (1991). The dynamic nature of some concepts seems best portrayed through the process-oriented, interactive nature of videography. Videos have the capacity to depict speakers using linguistic devices and accents, which often provide language learners with additional information beyond the words spoken (White, Easton, & Anderson, 2000). Though not restricted to videos, jolts are particularly well suited for transcendent purposes, that is transcending time and space. Whether visiting historical sites and events or visiting places not easily accessible or nearby, videos have inherent benefits for educational usage (Mostert, 2002). Using a YouTube video, for instance, entitled *Fish That Walk* will likely cause an internal response and ensuing thought processing (see http://www.youtube.com/watch?v=FLh4ODMBGJE). The following transcription comes from the National Geographic video:

> Mudskippers which can be found in the Mangrove forests from West Africa to New Guinea are fish that spend most of their time out of the water. They walk, eat, and court on land. They are the only fish to do all this on land instead of in the big drink. They carry water in their large gill chambers, which they use in the exact opposite way you use scuba gear-you carry air to breathe in water; they carry water to breathe in the air. Since their eyes stick out on top of their heads, they act kind of like a periscope on a submarine. They have an amazing field of vision, made even greater because their eyes can act independently of each other. When their eyes dry out, they can roll them back into water-filled skin folds that remoisten them. One other thing mudskippers do on land, they fight each other over it. When a mudskipper shows its fins that means it is about to mud-wrestle over its piece of mud.

For this jolt to be successful, teachers will have to consider: What preparation will the class need? What kind of interaction is needed? What kind of questions will I ask? What kind of learning tasks will I combine with the video (Fawkes, 1999)? The jolt causes the learner to react; in turn, the students will be ***curious*** because this jolt disrupts their previous understanding. Instances of perturbation involve questioning, contradicting, and challenging (Duit & Treagust, 1998) previously held beliefs, understandings, and assumptions. The essence of constructivist learning is fitting new ideas into existing knowledge; yet, the original jolt is counter to one's existing understanding. Thus, meaning making, or making sense of the world, is a process and product of "puzzlement, perturbation, expectation violations, curiosity, or cognitive dissonance" (Jonassen, 2002, p. 45).

Abbott and Ryan (1999) proclaim that young people become deeply engaged when confronted with tasks that fascinate them. Their inquisitiveness is what drives their search for new knowledge to answer their own questions. This constant search for answers to questions which only brings forth more unanswered questions is part of the ongoing modification of understanding process. Instruction that begins with something that sparks initial curiosity within students is necessary for deep contextualization and for challenging what is already known.

Curious children ask questions; teachers must provide avenues for students to ***retrieve explanations*** for newly introduced information through internet searches, guided questions, social discussions in groups, and questions that challenge their previous understandings. In accordance with Vygotsky's zone of proximal development theory, children do not merely rely upon internal mediation to seek answers. They can also inquire of more competent individuals

(Gal'perin, 1969), which depicts the shifting relationship between self-directed and other-directed learning.

In this phase, the retrieving of explanations is coded and contextualized into that which is meaningful to the individual learner, whether in real-world applications or simulated environments. Hence, technology can play a vital role in proffering innumerable opportunities to retrieve explanations for the curious mind. A three-prong system underpins the utility of technology as a learning tool in this phase of attraction theory:

- representing and simulating real-world situations, problems, or contexts;
- representing the beliefs, perspectives, and stories of others; and
- supporting discourse among pupils (Jonassen, 2000, pp. 8-9)

A student's ability to retrieve an explanation is heavily affected by teacher actions. Guidance is pivotal towards student success. In sync with Vygotsky's (1978) theory of the zone of proximal development (1956), learning must be aligned with a student's current capacities. He furthers, "the distance between the actual developmental level of a child as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (p. 86). Other researchers have described the application of this concept as progressively withdrawn teacher support and gradual release of responsibility (Pearson & Gallagher, 1983). These perspectives focus on the importance of the environmental design rather than on what is taught. Scaffolding, first coined by Wood, Bruner, and Ross (1976), was described as the ideal role for the teacher. Scaffolding has also been referred to as teaching presence (Anderson, Rourke, Garrison, & Archer, 2001), which encompasses the design, direction, and facilitation of learning processes towards outcomes. Only through active teacher interventions can meaningful instruction and learning prosper.

Counter-examples will be found as students proceed in their quest to better understand the mudskipper (e.g., not all fish live on land; some fish do and they are known as *amphibious fishes)*. The transition between seeing a counter example and seeking clarifications revolves around knowledge monitoring. Distinguishing what is known from what is not known relies upon metacognition, according to Tobais and Everson (2002). First introduced by Flavell (1976), metacognition was a term used to illustrate how children acquire the ability to reflect, organize, elaborate, and control one's memory processes (Kreutzer, Leonard, & Flavell, 1975). This monitoring is related to both prior knowledge and new learning (Pintrich, Wolters, & Baxter, 2000). Other research findings suggest that metacognitive knowledge monitoring may be domain specific (Tobais & Everson, 2000) and that accurate knowledge monitoring is correlated to achievement in reading, mathematics, and academic grades.

McKeown and Beck (2009) wrote extensively on the role of metacognition towards supporting reading comprehension, saying that piecemeal strategy instruction does not lead towards lasting success in reading. Instead, tactics like questioning what you read as you read it carry forward to subsequent reading, providing active processing of knowledge construction during the process of reading and not just afterwards, which is the basis for many comprehension acquisition strategies.

Across multiple disciplines, trend analysis is essential. Is there a pattern? Examples and counterexamples provide the learner with opportunities to decipher characteristics of the topic (in this instance, amphibious fishes). Analyzing trends, though, applies in mathematics (e.g., theorems), science (e.g., climate), and social sciences (e.g., behavior) as well as in literacy (e.g., comprehension strategies, character profiling, text structures, word recognition). When to use particular graphic organizers, for example, is based upon characterizing the content and deciding which model best represents those principles. Though the purposes of stratifying information by patterns varies between disciplines, recognizing patterns holds a significant place in content knowledge acquisition and synthesis to existing frames of knowledge (Johnson, Watson, Delahunty, McSwiggen, & Smith, 2011). Using Friere and Macedo's work as a lens, Berthoff (2005) describes this recognition as "an active critical consciousness by means of which analogies and dysanalogies are apprehended and all other acts of mind are carried out, those acts of naming and defining by means of which we make meaning" (p. xix). That is to say that cognition is built upon recognition; and through critical thinking, one can distinguish between knowledge that represents a scheme from that which does not. Providing opportunities for mental perturbation is a necessary component of effective pedagogy.

In this continual search for understanding, both true understanding and pseudounderstanding emerge, as content knowledge founded upon theory and practice as well as misunderstandings form. As a result, counterexamples are essential to root out the latter. Smith and Neale (1989) provide an excerpt from a classroom teacher discussing this conceptual phenomenon:

> You want the child to see a certain result. You can take a lot from the children, and almost like brainstorming, they can come up with some ideas. Then you accept what they say for face value. But I think a lot of times in science, you can't leave it up to that. You can't brainstorm over, like, say when I did the unit of buoyancy, because you don't want them to go away with a false concept, so you might direct their thinking or what they are doing (She then went on to describe her giving children counter examples in order to contradict their ideas.). . . so they weren't going away with a mistaken idea about something. (p. 14)

Counterexamples are sometimes referred to as black swans (Marshall & Cossu, 1991), serving as exceptions to systems of language. If we consider when children map phonemes onto graphemes, they are beginning the process of discovering the explicit relationship between phonology and orthography. Though the English language is bound by rules and systematic conventions, there are innumerable exceptions for almost every rule guiding the language. Just as conventions are taught so must students also be exposed to multiple counterexamples to provide a context for when, how, and why these occur.

Yet, counterexamples are not arbitrary—they must be carefully chosen, as Angluin (1987) argues, "so they are central or crucial . . . in an attempt to speed convergence of the system to a correct hypothesis" (p. 87). Specific examples form the basis from which contextualization emerges, or in other words the sorting of that which fits and that which does not. Angluin furthers that this includes "general rules, explanations of significant and irrelevant features, [and] justifications of lines of reasoning" (p. 87). Learners use inductive inferencing, or hypothesizing a general rule from examples, when exposed to carefully constructed pedagogy (Angluin & Smith, 1983). For instance suppose that the fourth text in a book series was scheduled to come out. Children might expect the text to continue from where the first three sequential books left off; however, the author positioned it as a prequel. Discussing the nuisances and examples that are counter to expectations is seminal to developing one's current understanding.

Morais, Alegria, and Content (1987) put it simply—instruction in reading improves reading. What is needed though is a balanced approach that depicts related matter and unrelated matter to promote critical consciousness so students are better equipped to differentiate content in other contexts and apply those principles to learning outside school. Skilled readers are better prepared to recognize organizational patterns in texts, but discussing these can widely benefit less skilled readers to comprehend and create mental representations of information or discourse (Nelson-Spivey, 1990).

Clarifications are needed to re-fit and adjust where newly learned information should be organized within existing schemata. These contextual factors influence knowledge formation and subsequent retrieval. For instance, if clarifications are not provided on a topic such as a pyramid, one might be limited to make connections that a pyramid is simply a 2-D structure like other shapes (square, triangle, octagon) having simply read about pyramids in a book. However, clarifications would provide valuable information from which to compare pyramids to the realm of 3-D objects. As a result, a new organizational structure is formulated within schemata and given a fuller, more accurate representation.

In seeking out *clarifications* to their newly constructed knowledge on amphibious fishes, students learn: mudskippers use fins to move around (skipping), can catapult themselves in the air up to 2 feet, their gills store oxygen for respiration on land much like a scuba diver's cylinders store oxygen for underwater exploration, and they are found in Northern Australia, East Africa, and parts of China and Japan. But how can students learn this information in an engaging and enriching manner?

For practitioners to master the art of clarification, exhaustive planning, rich content knowledge, and effective pedagogy is needed to not only assess current levels of understanding but provide valuable clarifications to advance knowledge acquisition, filling in the respective gaps in knowledge development. This triad of attributes begs further examination. I typically ask my preservice teachers to put themselves in the shoes of a third grader. Now think for a moment: would you rather a teacher who has profound content knowledge and lacks pedagogical prowess, or would you prefer a teacher who has an instructional skill set but lacks needed content knowledge? Of course, this is a trick question because both are vital to effective teaching. However, in both instances, most teacher candidates could recall examples of both types of teachers at various points in their schooling. That is to say that not every teacher possesses a depth of content knowledge or pedagogical proficiency. When considering these notions, greater attention must be directed towards the triad (planning, content knowledge, and delivery) to confront any issues that may arise during instances of clarification in the classroom.

In some disciplines such as computer science, clarifications are provided to disrupt assumptions though reinforcement learning (RL) (Rieser, Kruijff-Korbayová, & Lemon, 2007). In this process the teacher aims instruction at the assumption in an effort to refute unfound assumptions and reaffirm others. This splitting of information is integral towards shaping knowledge acquisition towards a more accurate understanding. To a child who is two years old, any vehicle on the road is a car. But with clarifications over several years, the child learns that a car is one type of vehicle (car, truck, van) for which there are also sub-classifications (2-door, 4-door, automatic, manual, hybrid). The extent to which knowledge refinement is possible is limitless and thus, clarifications are always needed to purify our understandings towards making sense of the dynamic world that is today.

Clarifications are optimally provided when they are explicitly sought, meaning strategic readers seek out clarifications from innumerable sources as part of learning procedures. To accomplish this task, students must engage in metacognition, or the knowledge and control over one's cognitive processes. Readers who possess high levels of metacognition reflect and regulate, or code information through strategies such as think alouds and reciprocal teaching (Reading First in Virginia, 2010). Identifying that which is understood is virtually the same process as identifying that which is misunderstood, though the challenge remains for students who cannot easily differentiate between the two, or do not have the resources from which to clarify or confirm their understandings as valid. Since teacher support is not always available, students must be taught fix-up strategies to establish meaning for themselves during independent investigations. Techniques such as rereading, looking ahead or back for contextual information, restating information, using table/figure/picture clues can provide needed redirection for apprehending, contextualizing, clarifying, and synthesizing information within schemata. As Afferbach, Pearson, and Paris (2008) allude, these strategies do not work for every situation; instead, reader judgment and experience should dictate when to apply particular strategies depending on the goal at hand.

The rise of strategy use in the field of reading/literacy has skyrocketed since Dolores Durkin's (1978/1979) eminent study on comprehension strategies, as she sought to determine if comprehension instruction could be taught. Many of the strategies aimed at comprehension revolve around clarification, with none more important than questioning (Verlaan, Ortlieb, & Verlaan, 2014). Questioning is an active critical thinking process in which learners ask and sometimes answer their own questions. Asking questions is a skill in and of itself; students must become adept at this task as there is considerable skill in the creation of 'good' questions. Questioning encourages learners to become engaged with the text in a non-threatening way; as a result, students are better equipped to understand and remember information related to that which they were engaged.

Embedding of Schemata

The tenets of knowledge organization are multifarious in that new information is situated within existing entries. Much as a dictionary has an alphabetical order and entries with the same word parts, so too does information organization have a systematic way of archiving new information for retrieval. Rumelhart and Ortony (1976) refer to the foundational elements of schema as *subschema*. These structures have attributes upon which most other schemata are organized. Without the recognition of these subschemas, information would not easily be retrievable. Instead, new information is not represented in its entirety; instead the unique identifiers and references are used as classification strategies. For instance, if a student were introduced to the concept of a Toyota Corolla, s/he would use the category of a car (subschemata) and then remember a few unique details about this vehicle that separate it from others (e.g., longest running model of a foreign car in the United States, economical on fuel, reliability). Other information (e.g., has four wheels, has a radio, and comes in various colors) would not be helpful towards differentiating it from other vehicles and thus, those are not stored as separate schemata in association with the Toyota Corolla. These are sometimes referred to as *forgetting characteristics* (Craik & Lockhart, 1972). This notion is included in the analysis due to its frequently occurring nature. In a given day, we will process thousands of bits of data with most of them fitting the label- forgetting characteristics. The others continue on into the regimented and structural coding process.

This hierarchical structure is confounded with lateral paradigms, where subschemas can relate to one another. When an event occurs, our observations are guided and then grouped by our previous experiences and memory. For example, if we were to look at an image of four left hands together, our first inclination would be to recognize that those are the extremities of four individuals (even though they are not depicted in the image). This presupposes any embedding of a picture with four left hands in it. If these processes did not occur, there would be information overload regularly occurring as we would not know how to cross-connect subschema with what appears to be new information, even though it is merely known information represented in an alternative way.

Variables play a critical role in the embedding of schemata. Necessary to the synthesis of data is the human inclination to understand more than what is presented. When we hear of someone involved in a car accident, our reactions, at least in part, involve asking questions (where, why, or how). These underlying structures allow us to fully represent events to a much clearer degree than just absorbing the initial information provided to us. We fill in the gaps of new information by seeking unknown parts.

Degrees to which constructs relate to one another are known as associated variable constraints (Rumelhart & Ortony, 1977). Though the term, "break", clearly relays associations of becoming fragmented or not whole, there are variable forces needed to break objects that contain varying levels of hardness. Breaking minerals such as talc versus diamonds into pieces requires vastly different amounts of force and as a result, these schemata are not absolute. They depend in part on other related variables within a topic of study. Activating the schemata (breaking) along with variable constraints (the minerals' hardness) is similar to Craik and Lockhart's (1972) notion of depth of processing.

Differentiating types of memory store are commonplace and particularly salient in understanding how information is registered and stored (See Table 2). Multistore systems consist of memory systems that are activated by stimuli. Yet, these stimuli vary considerably. If we take a word for instance, it has visual, phonemic, and semantic features as well as an image and verbal associations. These representations are triggered for varying lengths of time depending on perceptual, attentional, and rehearsal processes. As the input signals awareness within the learner, it is matched with stored abstractions from previous learning. This pattern recognition process is the beginning of the extraction of meaning from the input. The greater the degree of analysis (cognitive or semantic), the greater depth

Table 2. Commonly accepted differences between the three stages of verbal memory.

Feature	Sensory registers	Short-term store	Long-term store
Entry of information	Preattentive	Requires attention	Rehearsal
Maintenance of information	Not possible	Continued attention Rehearsal	Repetition Organization
Format of information	Literal copy of input	Phonemic Probably visual Possibly semantic	Largely semantic Some auditory and visual
Capacity	Large	Small	No known limit
Information loss	Decay	Displacement Possibly decay	Possibly no loss Loss of accessibility or discriminability by interference
Trace duration	1/4- 2 Seconds	Up to 30 seconds	Minutes to years
Retrieval	Readout	Probably automatic Items in consciousness Temporal/phonemic cues	Retrieval cues Possibly search process

*Source: Craik & Lockhart, 1972

of processing. After initial stimulus has been recognized, additional processing may occur, whether enrichment or elaboration (Craik & Lockhart, 1972; Tulving & Madigan, 1970). Even perceptual notions exist during elaboration coding as sounds, sights, smells, and other sensory impressions (Morton, 1970) become associated with initial pattern recognition and stimulus enrichment.

Summary

The components of attraction theory work in unison to prompt students to take an initial stimulus and progress through critical thinking processes leading up to knowledge acquisition, organization, and synthesis. Becoming active learners is necessary for students to regain interest in furthering their education, personal literacies, and career opportunities. Looking at psychology for its sake alone, or doing educational research without a depth of understanding about how the brain functions, does not lead towards optimal outcomes. Policy initiatives often reflect the failures of the past, which are already known and have been known for some time. Instead proactive investigations and continued research can enrich our understanding of teaching and learning, provide answers for literacy development across content disciplines, and equip us with tools from which to select for unique classroom circumstances. It is time to become re-attracted to learning and in turn, reconceptualize curriculum and instruction.

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