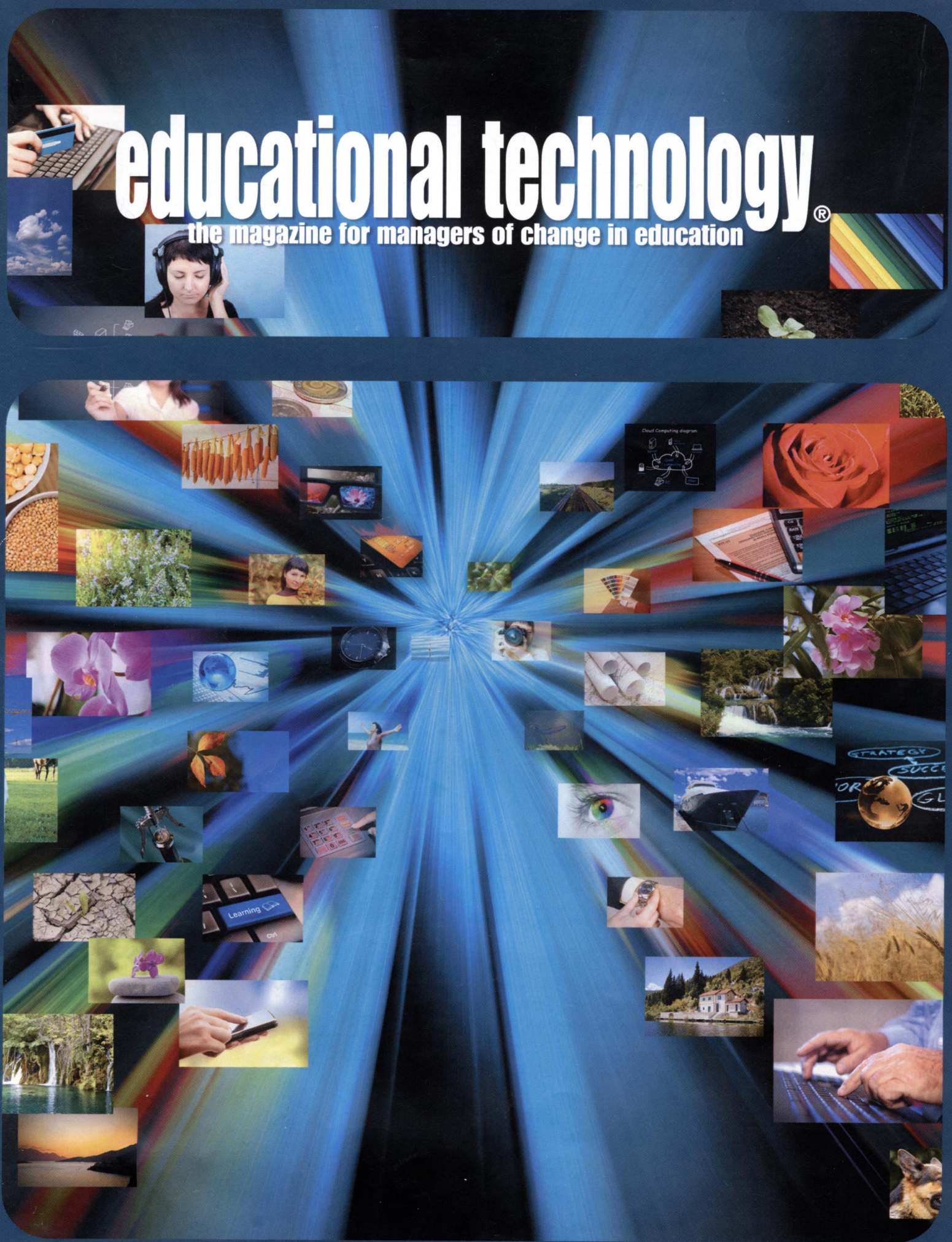


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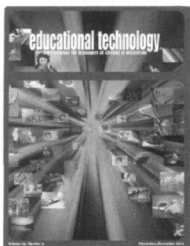


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A special issue examining the mythical retention chart and corrupted Dale's Cone; plus regular features

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The Mythical Retention Chart and the Corruption of Dale's Cone of Experience

Introduction to Special Issue

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Guest Editors

Goal of This Issue

The overarching purpose of this unprecedented special issue is to put to rest, once and for all, the egregious myths and errors associated with the many varied misrepresentations of Edgar Dale's *Cone of Experience* that contaminate certain sections of the literature within the field of educational technology. Often described as a "cone of learning" or a "learning pyramid," these are spurious combinations and permutations of Dale's *bona-fide* Cone, with the addition of unsupported percentage figures purporting to show rates of learning or retention. Over the decades, these fake models have unfortunately entrenched themselves in the consciousness of many trainers, educators, and even a fair number of unwary graduate students within our field, to the point of becoming a serious problem that we as a field need to definitively solve, in order to safeguard our collective credibility and to contribute towards fending off increasing attacks by public figures mischaracterizing educational research as pseudoscience.

Components of This Issue

The capstone article of this special issue—eponymously titled "The Mythical Retention Chart and the Corruption of Dale's Cone of Experience"—seeks to pro-

vide a more comprehensive and complete analysis of the issues surrounding these tortured constructs. The article puts forward four major claims debunking said constructs and provides documentary evidence in support of these claims. The subsequent articles in this issue provide the extensive supporting material necessary to present a comprehensive refutation of the aforementioned attempts to corrupt Dale's original model.

Our second article—"Previous Attempts to Debunk the Mythical Retention Chart and Corrupted Dale's Cone"—acknowledges and reviews the numerous past attempts by scholars within related fields to debunk the above myths. These include attempts to discredit the retention data themselves, as well as the illegitimate combination of these data with Dale's Cone.

Next comes an article titled "The Good, the Bad, and the Ugly: A Bibliographic Essay on the Corrupted Cone," which attempts to set the record straight regarding the sources frequently cited in the literature of the mythical retention chart and the corrupted Dale's Cone. The article points out citations that do not actually connect with relevant works; it provides correct citations of sources that are often cited erroneously; it adds references for overlooked works; and, finally, it examines the stories and works of individuals involved in this controversy—creating a unique "Who's Who" of the real people whose names appear in the panoply of citations—thus allowing the reader to better judge the credibility of these citations by coming to know a little bit about the credentials of these cited authorities.

The issue is rounded off with an article titled "Timeline of the Mythical Retention Chart and Corrupted Dale's Cone," which aims to help the reader follow the meandering streams of evolution of the retention data, Dale's Cone, and the corrupted cone. Using a table format, the article traces the chronological development of the concepts of (a) the mythical retention chart, (b) Edgar Dale's Cone of Experience, and (c) the combination of the retention data and the Cone into the corrupted cone.

The four articles making up this special issue are supported by a painstakingly collected and carefully constructed set of 16 Figures and 13 Exhibits. The Figures show the most common representations of the mythical retention data, Dale's Cone of Experience, and the many permutations of the Cone plus the data. Our treatment of these Figures may be considered somewhat unorthodox. Since it would be impossible to display each of the hundreds of variations of the corrupted Cone, we have thus created these Figures as "stereotypes" capturing the critical features of a whole family of similar visuals—as abstractions showing the critical attributes of the various versions of the Cone appearing in myriad forms, intentionally omitting features that might be distracting, such as colors and 3-D modeling, in order to focus on the essential elements. It is also

important to note that these Figures are numbered in the chronological order of the appearance of their related concepts in the literature, since that would be the most logical way to enumerate them. Furthermore, since many of the Figures are referred to in two, three, or more of the articles in this special issue, they are therefore presented together in a separate, dedicated section of the issue instead of being inserted repeatedly into each article. Besides, side-by-side presentation of these Figures in a common space makes it easier for the reader to compare the critical attributes of each version with others.

On the other hand, *Exhibits 1–12* have been employed as a way of displaying the many odd citations that have accumulated over the years as authors have reached for plausible-sounding sources for the figures they may well have copied off of a tea towel or filmstrip projector advertisement. *Exhibits 1–12* display each purported citation within its textual context because they are often stated in slippery terms, for example, “developed and revised by Bruce Nyland from material by Edgar Dale.” Meanwhile, *Exhibit 13* displays a letter attributing the mythical retention figures to a certain Paul John Phillips who was briefly affiliated with the University of Texas in the summers of 1939 and 1940. As with the 16 Figures described in the previous paragraph, these 13 Exhibits are also presented in a dedicated section of this special issue rather than inserting them repeatedly in each article.

Co-Authors of This Issue

All of the above articles in this special issue bear the names of the entire team of co-authors whose brief biographical sketches are provided below in alphabetical order. The four of us have worked separately and together over a period of several years on the subject of Dale’s Cone and the myriad misunderstandings surrounding it, trading ideas and amending each other’s works. As a result, these works have evolved so collaboratively that it would be artificial and unfair to assign authorship more narrowly.

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Anthony Karl “Tony” Betrus (b. 1971) is Professor of Educational Technology at the State University of New York at Potsdam, with a PhD in Instructional Systems Technology from Indiana University, 2000 (dissertation committee directed by Michael Molenda). He was one of the early critics of the “cone of learning” mythology; in 2002 he and Dr. Alan Januszewski presented “For the Record: The Misinterpretation of Edgar Dale’s Cone of Experience” at the AECT annual conference (Januszewski & Betrus, 2002). Professional interests focus on the motivational qualities of using simulations and games for teaching and learning as well as individualizing learning environments with appropriate

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Concluding Notes

We appeal to readers to appreciate the time and effort that the authors have expended to track down the many streams of this story. The story of the corrupted cone has innumerable blind alleys, dead ends, and petered-out paths that only a dedicated researcher would have the heart to continue to chase down. The "Who's Who" section within the bibliographic essay alone required all sorts of special expertise, including genealogical research and mining of the most obscure databases by Michael Molenda in order to check and cross-reference the facts about the characters in this drama. Also at this time we want to thank *Educational Technology* publisher Lawrence Lipsitz for the incredible patience he has shown over the years during which this special issue has gestated, and to acknowledge our colleague Alan Januszewski of SUNY-Potsdam for his keen editorial advice, given at a critical stage.

Finally, while this special issue aims to conclusively set the record straight regarding the myriad issues surrounding the corruption of Dale's Cone with the spurious retention/learning percentages within the "traditional" published literature in our field, in today's Information Age it is immensely difficult, if not practically impossible, to contain the spread of bad ideas within cyberspace. As we speak, the corrupted cone and its attendant "data" are akin to a living organism—a virtual 21st century plague—that continues to spread

and mutate all over the World Wide Web, most recently to China.

It therefore seems logical—and responsible—on our part that we would ourselves endeavor to continue our efforts to combat this vexing misinformation on the Web as well. To this end Anthony Betrus—on behalf of the four authors—has established www.coneofexperience.com. The purpose of this Website is to provide a living, breathing place where the authors can continue to address the issues covered in this special issue. It provides a series of timelines related to those presented in the articles, as well as links to other attempts at debunking the corrupted cone. Lastly, it provides a place for people to share their stories about encountering, using, or otherwise dealing with the authentic and/or corrupted Cone of Experience. □

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The Mythical Retention Chart and the Corruption of Dale's Cone of Experience

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In response to the wide-scale proliferation of “the cone of learning”—a fanciful retention chart confounded with Dale’s Cone of Experience—the authors make four major claims debunking this fantasy and provide documentary evidence to support these claims. The first claim is that the data in the mythical retention chart do not make sense: they clearly are not and cannot be construed as actual research findings, and, in addition, they are highly unreliable in that the percentages have been reported in dozens of permutations. Second, Edgar Dale’s Cone of Experience, even in its original form, has been misinterpreted and misused as a prescriptive guide, in ways not appropriate for a descriptive schema. Third, superimposing the mythical retention data on Dale’s Cone is completely unjustifiable. Fourth, both the mythical retention chart and the corrupted Dale’s Cone have murky provenances. Diverse versions of these concepts can be traced at least to the early 20th century (for the retention data) and to the 1970s (for the corrupted cone). Each of the sources proclaimed by others to be the correct one for the mythical retention data and the corrupted cone are examined and proven false.

The Problem: Myths Proliferating, Combining, and Metastasizing

Over the past century, the literature of education and training has been polluted by references to several constructs under the headings of “What We Remember” and “The Cone of Learning” that have been concocted, conflated, plagiarized, perverted, and misused in myriad

ways. The problem, although egregious, was somewhat more manageable in the pre-Internet age, when the publication of scholarly material was subjected to some measure of peer review or editorial discretion and the dissemination of trainers’ handouts was mostly hand-to-hand. With the blossoming of the World Wide Web, thousands of “authors” have been able to disseminate their misinformation without gatekeepers and without the constraint of physical proximity, and thus the problem has grown in scope, morphing into increasingly garbled fiction. Not only scholars are affected; learners—both face-to-face and distant—in classrooms, training centers, or homes are being subjected to lessons designed according to supposed principles that are both unreliable and invalid. In any profession this would be called malpractice.

Our objective here is to systematically deconstruct the various problematic concepts associated with the “cone of learning” and to cast light on the issues distorted by these meandering canards. We are not claiming to be the first to notice these problems or to address them directly in the scholarly literature. There have been several well stated critiques, beginning as far back as 1971 and emerging in force after 2002, as is discussed at length in this special issue (see “Previous Attempts to Debunk the Mythical Retention Chart and Corrupted Dale’s Cone”). However, we do claim to treat this problem more systematically, thoroughly, and comprehensively than previous efforts.

There are three main targets of our investigation. The first is the data table, shown in *Figure 5*,* which we refer to as the *retention chart*. The wording and numbers in the chart are those used in the version shown in DeForest G. Treichler’s article in *Film and Audio-Visual Communication* (Treichler, 1967), which some have cited as an early, credible source. We are treating this as the canonical version of the retention chart, the one to which others can be compared.

The second target is the visual classification schema devised by Edgar Dale, shown in *Figures 2 and 3*, which he called the Cone of Experience. *Figure 3* shows our abstraction of Dale’s Cone appearing in the second and third editions of his textbook (Dale, 1954, 1969); it is the earliest version of the Cone that contains all the elements created by Dale. We suggest that this be regarded as the canonical version of Dale’s Cone of Experience.

The third target is a visual that combines the data from the retention chart with the pyramidal arrangement of learning methods of Dale’s Cone. As we will demon-

* As explained in the *Introduction*, all of the 16 Figures referenced in the articles comprising this special issue are placed together in a separate, dedicated section of this issue rather than being dispersed across the issue.

strate, this is indisputably an illegitimate distortion of Dale's Cone; it is *not* Dale's Cone of Experience. We refer to it as the *corrupted cone*, since it inappropriately superimposes the mythical retention chart over the original Cone of Experience of Edgar Dale, badly distorting Dale's original idea. The version shown in *Figure 10* is typical of the hundreds of variants, the range of which is illustrated by *Figures 10 to 16*. There is no canonical version of the corrupted cone. As is discussed at greater length later, we have not been able to determine when or by whom Dale's Cone was first corrupted with the retention data, but it was probably sometime around 1970.

These constructs have been the subject of numerous misunderstandings and misuses, which we will explore in detail. *The four major claims we make are:*

1. The data shown in the retention chart cannot reasonably be construed as research findings; they are both invalid and unreliable.
 - a. None of the purported sources of research backing the retention data stands up to scrutiny; indeed, the retention data can be found in the public record prior to the existence of the purported research agencies.
 - b. The percentage numbers themselves (10, 20, 30, etc.) lack face validity as possible research findings.
 - c. The retention chart data hide or misrepresent the issues involved in evaluating the effectiveness of visuals for purposes of learning.
 - d. In addition, the actual numerical claims of the retention chart are highly unreliable; they have been altered many times to fit the purposes of various writers.
2. Dale's Cone of Experience even in its unadulterated form has been misused regularly in the literature of educational technology.
3. The retention chart has been overlaid illegitimately onto Dale's Cone of Experience; the two constructs have been fallaciously confounded, thus corrupting the original intent of Dale's Cone.
4. The retention chart and the corrupted cone each have a murky provenance.
 - a. The pursuit of the original source(s) of the retention chart and corrupted cone has been impeded by a plethora of erroneous citations.
 - b. Putting aside the false sourcing, the origins of neither the retention chart nor the corrupted cone can be firmly established by the evidence found up to this time.

Claim 1: Unreasonableness of the Retention Chart

The percentages shown in *Figure 5* purport to show the amount of something (facts? concepts? procedures? principles?) that people remember (how long?) as a

result of different teaching-learning treatments. These percentages have reverberated throughout the literature of training and in certain quarters have gained the aura of "accepted truth" or "conventional wisdom." Naïve designers looking at the retention chart might conclude that they could automatically enhance the achievement and retention of educational objectives by merely selecting one particular treatment or a certain combination of treatments associated with "90% retention." However, a closer look reveals that the data are virtually uninterpretable on their face as well as totally unsupported by actual empirical research.

Claim 1a: No Body of Research Supporting Retention Data

When the retention chart is trotted out it is often accompanied by a claim that it is a summary of some body of research—by the US Army, by Socony-Vacuum Oil Company, by the NTL Institute, by Forrester Research, by William Glasser, or by some combination of the above. A source sometimes cited as an early authority is Treichler (1967). In fact, Treichler only makes passing reference to "studies that indicate what people generally remember" (p. 29) with no hint as to who might have conducted such purported studies—as discussed elsewhere in this special issue in "The Good, the Bad, and the Ugly: A Bibliographic Essay on the Corrupted Cone." Treichler may have been one of many who saw the retention chart in a handout labeled TIM-151, associated with the University of Texas extension division. That version of the retention chart was created in Texas in 1947 by Paul John Phillips, coming from the US Army's Ordnance School, according to Cyrus (1963; see *Exhibit 13*).^{*} As discussed in "The Good, the Bad, and the Ugly: A Bibliographic Essay on the Corrupted Cone," the official history of the Ordnance School (US Army, 1943) makes no mention of research being conducted up to that time.

However, Cyrus (1963) says he recalls Phillips talking about research. That is the one scrap of evidence connecting the retention chart to any body of research. Balancing this claim of formal research is a statement made by Phillips himself, according to Curl (1971):

These percentages are clearly only approximations, but they do indicate where emphasis in training should be placed. We shall be much more certain of this, however, if we can find some practical proof. What, for example, did the Army find out about learning *in the vast laboratory of its experience* in training millions of men? [Emphasis added.] (p. 32)

^{*} As explained in the *Introduction*, all of the 13 Exhibits referenced in the articles comprising this special issue are placed together in a separate, dedicated section of this issue rather than being dispersed across the issue.

The phrase “vast laboratory of its experience” reportedly used by Phillips implies the accumulated wisdom gained through trial-and-error rather than through structured experiments. If Phillips had participated in or had other first-hand knowledge of US Army research on the learning effectiveness of different instructional treatments, would he not have mentioned it explicitly?

Further undercutting any claims of being based on research done by military services or oil companies is the simple fact that various versions of the retention chart data have been circulating since at least early in the 20th century, before the military services or oil companies had training research capabilities. Two examples:

- In 1914, R. D. Calkins, head of the geography department at the Central Michigan Normal School, made a presentation to the Michigan School Masters Club, which was subsequently published (Calkins, 1918). Speaking about the teaching of map-reading skills, he said “In addition they have the advantage of fixing in the mind the facts which they represent, for it is said we remember 10% of what we hear, 15% of what we read and 20% of what we see.” (pp. 22–23)
- In 1922, an Oklahoma newspaper story about county agricultural extension agents (County Agents, 1922) says “We know, as has been said before, that the average person retains only about ten percent of what he reads and about eighty-five percent of what he sees” (p. 8), after citing different figures earlier in the story.

Note that both these sources refer to the retention data as something already well known, not something newly discovered.

Other purported sources mentioned above—Forrester Research (*Exhibit 7*), the William Glasser Institute (*Exhibit 8*), and the NTL Institute (*Exhibit 10*)—each at some time was perceived to be the source of the research supporting the retention data, although none of these claims are found on their Websites in 2014. The claims and the evidence for each of these sources are discussed later in this article, but suffice it to say they are manifestly untrue, since the retention figures existed, at least in the form of folkloric maxims, before any of these organizations existed.

Claim 1b: Lack of Face Validity

Face Validity

It is immediately suspicious that the canonical form of the retention data (*Figure 5*) shows the retention results advancing neatly in increments of 10. Obviously, legitimate research (if the hypothesis implied in the retention chart *could* be tested by legitimate research) would not yield results of such neatness. Yet it is the very neatness of the data that makes this canard attractive and memorable. Units of ten are ingrained in the Western mind—

Top Ten lists, Athlete of the Decade, the Ten Commandments. Because both Roman and Arabic numbering systems use the Base 10 system, it is ingrained in our culture, so seeing things in groups of ten feels natural.

Reasonableness of Methodology

The reasonableness of the data can be questioned simply by asking the most rudimentary questions about the sort of research that might address the issues of “learning from mediated instruction.” To begin with, any research psychologist would understand that the measurement situation affects the learning outcome. If students are studying foreign-language vocabulary by listening to an audio recording and vocalizing their responses, it makes no sense to test them by written questions and answers. Conversely, people who learn by reading printed words could hardly be tested by asking them to vocalize their responses. Thus, the learning goal dictates the testing method, and two completely different types of learning (listening vs. reading) could not reasonably be tested by the same instrument. The two different types of instruments would not yield percentage results that could be compared with each other; it would be apples to oranges. For example, would you say that a boxer who wins 70% of his bouts is a better athlete than a golfer who wins 60% of his matches? The metrics are simply incomparable.

As early as 1978, Dwyer (p. 10) posed these questions about the retention data: What research methods were used? What sorts of learners were involved? How was the instruction presented? What sorts of learning objectives were pursued, and how they were measured? Those who uphold the retention chart provide answers to none of these questions. Frank Dwyer’s own program of rigorous and systematic research on learning from visuals is described in “The Good, the Bad, and the Ugly: A Bibliographic Essay on the Corrupted Cone” in this special issue.

More recently, Dwyer (2010) repeated his earlier methodological challenge, reiterating his claim of failure on the part of those who support the mythical retention data and citing specific recent studies—his own and others—that refute the retention chart generalizations.

Claim 1c: Hiding or Misrepresenting the Issues in Evaluating Visual Effectiveness

Comparison with Actual Published Data

There is within educational psychology a voluminous literature on remembering and learning from various mediated experiences. Nowhere in this literature is there any summary of findings that remotely resembles the fictitious retention table. On the contrary, generalizations about media treatments are difficult to draw. Those that can be drawn tend not to support the

mythical retention table. We could fill many pages with findings of actual research but will offer just a few representative examples.

When Fleming (1987) summarized findings about learning from visual displays, he concluded that:

- “Realism per se is not necessarily a virtue in instruction” (p. 242).
- “Pictures and words can be reciprocally beneficial; words can delimit and interpret pictures and pictures help define, exemplify, and make memorable words” (p. 242). But as Gagné and Glaser (1987) added: “However, it is not clear that adding images to material that is otherwise semantically well organized is always of benefit to retention...” (p. 60)

When Barron (2004) summarized findings on learning from audio sources, she concluded that:

- In terms of short-term memory “audio information...is recalled better than the same information presented visually.” (p. 958)
- In terms of long-term memory, “studies have produced conflicting results.” (p. 958)
- “It seems evident that there are many variables that influence optimal combinations of audio and visual information, including the type and complexity of the information, the attributes of the target audience, and the level of redundancy.” (p. 962)

Research on context-dependent memory—such as is reviewed by Smith (1988) and Bjork & Richardson-Klavehn (1989)—shows that the people are aided in memory retrieval when they perceive contextual stimuli similar to the stimuli they perceived during learning. This robust characteristic of human learning makes comparisons between the different contexts reported in the retention chart (i.e., hearing, seeing, reading) impossible to assess fairly. For example, if people learn a word and its definition by writing down the definition after seeing the word on a page, they will likely be aided in retrieval by seeing the written word on the page in comparison to hearing the word read aloud. So the question then becomes: What is the retrieval context—the testing situation—for the comparison between hearing, seeing, reading, doing, etc., and does it favor one over the other?

Suffice it to say, in the realm of learning from mediated instruction, generalizations are difficult to draw and if drawn are accompanied by caveats about what the subject matter was, who was being treated, and what learning objectives were pursued and how they were tested.

Claim 1d: Unreliable Representation of the Data

Making sense of the retention chart is made nearly impossible by the varying presentations of the data, the numbers in the chart being a moving target, altered by

users to fit their individual biases about desirable training methods.

First, since there is no original authoritative source, people have felt free to recast the retention chart in ways that fit their own purposes. For example, comparing *Figure 5* to *Figure 6*, the claim has shifted from “remember” to “learn,” three new categories are added or substituted, and one of those new categories has a new percentage—95%—not previously seen.

For a second example, comparing *Figure 5* to *Figure 7*, the categories have been totally changed and two new percentages introduced—5% and 75%.

In *Figure 8* the percentages are converted to a bar graph and one category is dropped with two new ones substituted, with “reading, discussing & doing” now taking over the 90% place. The 90% place is the favorite subject of creative substitution. Whatever is the method being advocated by the writer, that method moves into the 90% slot; some of the 90% occupants include: “what we teach to someone else” (*Figure 6*), “reading, discussing & doing” (*Figure 8*), “what they say as they do an activity” (*Figure 10*), and “teach others/immediate use” (*Figure 11*).

Holbert and Karady’s (2008) criticism of the misuse of the retention chart in engineering education shows that the numbers in the chart are reported highly unreliably, with six authors presenting six different versions of the numbers! (p. 4) One of the very earliest published sources (County Agents, 1922) manages to top that: the authors actually cite two completely different sets of retention numbers in the same newspaper article! (See “Timeline of the Mythical Retention Chart and Corrupted Dale’s Cone” for details.)

To summarize Claim 1, we have shown that the validity of the data in the retention chart does not stand up to the slightest scrutiny, either in terms of being framed in a sensible fashion or in terms of congruence with actual research findings. From what we know about visual and auditory learning, the purported data simply do not make sense. In addition, we have shown that the retention chart data lack reliability as well as validity. Authors have blithely altered the retention chart data to fit whatever purpose they were pursuing.

Claim 2: Dale’s Cone Misused

Edgar Dale’s Schema

Introduced by Edgar B. Dale in his textbook on audio-visual methods in teaching (1946), the Cone of Experience is a visual schema intended to depict his classification scheme for the various types of learning experiences. The organizing principle of the Cone is a progression from most concrete learning experiences (bottom of the cone) to most abstract (top of the cone), shown in *Figure 2*. The cone shape was meant to convey the gradual loss of sensory information

at each step upward toward greater abstraction.

Dale made minor modifications of the Cone in the second edition (1954), adding "Educational Television" (see *Figure 3*). In the third edition (1969) he acknowledged the growing influence of Jerome Bruner's cognitive psychology concepts by comparing Bruner's classification system for modes of learning—enactive, iconic, and symbolic—to his own categories, suggesting that his Cone's 11 categories could be grouped into a "threefold arrangement of learning possibilities"... "direct, firsthand participation to pictorial representation and on to purely abstract symbolic expression" (p. 108). This reinterpretation of his own schema may have been portentous, perhaps giving implied license to others to later make other "creative" adaptations.

Dale's own claims for the cone were modest and qualified, at least in the first edition of his textbook. The categories were not "rigid, inflexible divisions" (1946, p. 37) and should not be viewed as any sort of "hierarchy or rank order" (1946, p. 47).

Misuses of Dale's Cone

Not a Prescriptive Guide

The root of all the perversions of the Cone is the assumption that the Cone is meant to be a prescriptive guide. Dale definitely intended the Cone to be descriptive—a classification system, not a road map for lesson planning. He came close to drawing this distinction explicitly when he stated in the Summary of his chapter on the Cone: "The cone, of course, is merely an aid to understanding this subject...something to help explain the relationship of the various types of sensory materials..."(1946, p. 52). The key words are *understand* and *explain*. These words indicate a descriptive purpose, not a prescriptive one.

On the other hand, Dale himself sometimes fell prey to the urge to extend the descriptive construct to prescriptions, as pointed out by Subramony (2003). References to "uses" or "implications" of the Cone are scattered throughout Dale's textbook, especially the later editions (1954, 1969). An example from the third edition (1969): "When properly understood and used, however, the Cone can be a helpful and practical guide" (p. 110). With this sort of ambiguity from the author, it is not surprising that some of his readers attempted to use the Cone as a prescriptive guide to lesson planning.

Audiovisual as Superior to Verbal

When the Cone is used as a prescriptive guide, it can be misused in support of any mediated experience that is "lower on the cone" than another, for example, advocating the use of a simulation rather than a video presentation. This bias toward the more concrete activities is multiplied many-fold when the mythical data are superimposed. Now, the "lower" activities are suppos-

edly both more concrete and better retained! Of course, in Edgar Dale's day many of those who referred to the Cone were advocates for audiovisual media, and they tended to selectively emphasize those aspects of the Cone that supported their claims—audiovisual media being superior to verbal symbols. Thus, by the time of his third edition (1969) Dale found it necessary to devote six pages of the chapter on the Cone to "Some Possible Misconceptions" (1969, pp. 128–134).

Origins of the Cone's Concepts

The concepts of Dale's Cone were not entirely original to him. Parallel ideas appeared in the literature of education prior to 1946. Saettler (1990) points to *Exposition and Illustration in Teaching*, published in 1910 by John Adams, "which included the following 'order of merit' concerning concreteness: '(1) the real object, for which anything else is a more or less inefficient substitute; (2) a model of the real object; (3) a diagram dealing with some of the aspects of the object; and (4) a mere verbal description of the object'" (Saettler, p. 140).

Closer to the time of Dale's writing, the new philosophical paradigm of General Semantics had been introduced by Alfred Korzybski (1933); it influenced a generation of scholars in linguistics, communication theory, education, psychology, and many other fields. The greatest popularizer of Korzybski's theories was S. I. Hayakawa (1941). Borrowing from Korzybski's visual construct of "the Structural Differential," Hayakawa offered "The Abstraction Ladder," a visual schema illustrating the consequences of using words to describe a living object or event as opposed to pointing to the thing itself (pp. 126–127). Hayakawa used the concept of a ladder to show how as our representations move up from the concrete level to more and more abstract levels, they are more prone to misinterpretation, which is the core idea of Korzybski's General Semantics. The General Semantics movement was sweeping through North American scholarly circles at the time Dale was writing, and he certainly would have been affected by these revolutionary concepts.

However, a more direct antecedent of the Cone is a diagram created by Charles F. Hoban, Charles F. Hoban, Jr., and Samuel Zisman (1937), shown in *Figure 1*. They made the conceptual breakthrough of constructing a chart in which visual media are arranged along the y axis, while the learner's level of development—from the concrete level of thinking to the abstract level of thinking—is arrayed along the x axis. In applying the graphic to a particular case, one would locate the learner's current level of conceptual development (concrete to abstract) then trace up to the slope line and then horizontally over to the instructional treatment that intersects at the same point. Hoban, Hoban, and Zisman's categories were: total situation, objects, models, films, stereographs, slides, flat pictures, maps,

diagrams, and words. Although Dale's schema appears to be quite derivative of Hoban, Hoban, and Zisman's graphic, he does not explicitly acknowledge this source, although he makes several references to their book elsewhere in his textbook.

To summarize our Claim 2, we have shown that even without the overlay of the specious retention chart, Edgar Dale's Cone of Experience has been prone to misuse, even by Dale himself, primarily in terms of representing it as a prescriptive guide. Dale originally intended it only as a descriptive schema. Even as such, the schema was not original to Dale nor was its validity ever backed by any theoretical or empirical support, especially not for prescriptive use.

Claim 3: Combining the Retention Chart with Dale's Cone

The mythical retention data and the concrete-to-abstract cone evolved separately throughout the 1900s, as illustrated in "Timeline of the Mythical Retention Chart and Corrupted Dale's Cone." At some point, probably around 1970, some errant soul—or perhaps more than one person—had the regrettable idea of overlaying the dubious retention data on top of Dale's Cone of Experience; we refer to this concoction as the *corrupted cone* (Figures 10–16).

We do not know the identity of the first fabricator(s) of the corrupted cone, but it surely was not Edgar Dale, who reigned as the intellectual leader of the audiovisual field from the 1940s through the 1960s. He retired in 1970 and died in 1985, so he was neither around to gin up variations of his Cone nor to defend himself from those who did. After his retirement, a special issue of the journal *Theory into Practice* (Wagner, 1970) was organized as a tribute to him and his work; none of the 11 articles mention any modifications of the Cone, which were yet to become visible.

The earliest report we have found for a sighting of the corrupted cone is by James E. Stice (personal communication, April 14, 2014), who has provided a visual similar to our Figure 15, claiming "I obtained these data as a handout at a 'Train the Trainer' workshop held at the University of Wisconsin-Eau Claire in 1970. The source was listed as 'Socony-Vacuum Oil Company.'" Note that Stice is referring to the *retention data*, not the combination of the data with the Cone. It is not clear whether the document he transmitted to us was the same one he remembered receiving in 1970. It is unlikely because the document he sent had a source note running along the right margin: "developed and revised by Bruce Nyland from material by Edgar Dale." In 1970 Bruce R. Nyland was still in the first years of his stint as an instructor of philosophy at the College of William and Mary. He did not become a substance abuse educator until after he joined the staff of Fort Eustis in 1972, as discussed in "The Good, the Bad, and the Ugly: A

Bibliographic Essay on the Corrupted Cone."

Another version of the corrupted cone appeared in a book, a train-the-trainer manual prepared by Ann R. Bauman (1977, reprinted 1979), distributed by the National Institute on Drug Abuse. The version found in that manual looks like our Figure 14, including question marks in the top and bottom categories, with the note "***Question marks refer to the unknown." There is no clue in the narrative text as to why the mysterious question marks are inserted. The footnote says "See Wiman & Mierhenry's [*sic*] *Educational Media*, Charles Merrill, 1969, for references to Edgar Dale's 'Cone of Experience.'" (See Exhibit 12 for other examples of this bogus citation.) The entire narrative text accompanying the Cone says:

An important principle, supported by extensive research, is that persons learn best when they are actively involved in the learning process. The "Learning Cone," in the Resource Manual on page __, shows various learning activities grouped by levels of abstraction. The left column indicates their relative effectiveness as training techniques. (p. 1–39)

The fact that Bauman refers (inaccurately) only to a book that does not contain an image of Dale's Cone nor any version of the retention data suggests strongly that she borrowed the corrupted cone and the reference from some other source. We can be confident that Bauman is not the originator of the conflation, and she does not claim to be.

Another 1977 publication (Nutting) presents a quite different version of the corrupted cone, similar to our Figure 16, with the learning methods and retention percentages rounded into just three categories. The caption to Nutting's visual says: Adapted from Mildred Arnold, "How Children Learn" (unpublished) and Edgar Dale, *Audio-Visual Methods in Teaching* (New York: Dryden Press, 1946), p. 38.

This is yet another vain attempt to ground the corrupted cone in some respectable source. Of course, Arnold's "unpublished" document is nowhere to be found, and we know Dale's works do not include the retention data. Again, it is clear that the "cone of learning" shown in Nutting's book existed prior to Nutting's writing, but where and by whom we have not yet been able to determine.

Identifying the original culprit who thought of overlaying the mythical retention data on Dale's Cone is not critically important. Indeed, this inappropriate juxtaposition might have been dreamed up by several different people at different times. What we do know is that over the succeeding years the corrupted cone spread widely from one source to another, not in scholarly publications—where someone might have asked hard questions about sources—but in ephemeral materials, such as handouts and slides used in teaching

or manuals used in military or corporate training.

With the growth of the Internet, then World Wide Web, after 1993 this attractive nuisance spread rapidly, even virally. Imagine the retention data as a rapidly mutating virus and Dale's Cone as a host; then imagine the World Wide Web as a bathhouse. Imagine the variety of mutations and their resistance to antiviral treatment. A Google search in 2014 revealed 11,000 hits for "Dale's Cone," 14,500 for "Cone of Learning," and 176,000 for "Cone of Experience." And virtually all of them are corrupted or fallacious representations of the original Dale's cone. It just might be the most widespread pedagogical myth in the history of Western civilization!

Dale's Cone when combined with the fallacious retention chart may take many forms, making it difficult to talk about a single "corrupted cone." There are many, many corrupted cones, bearing a number of different names, but usually including some combination of the words Dale, Cone, Pyramid, Learning, and Experience. We have taken the dozens, if not hundreds, of variations and compressed them into seven stereotypes that capture the range of variations, *Figures 10 to 16*. These abstractions leave out the colorful and artistic embellishments that have been draped upon the corrupted Cone...and they are a wonder to behold. But most of the variations out in the marketplace of ideas are within "one degree of separation" of one of these stereotypes in terms of their critical attributes, if not in terms of their imaginative embellishment:

- *Figure 10*—Dale's categories are condensed into six categories to match the number of percentages available, and the content of the categories is substantially altered to more closely resemble the methods employed in contemporary classrooms.
- *Figure 11*—Treichler's percentages are expanded (adding 5% and 75%) and matched with learning activities considerably altered from Dale's original list. The 90% category focuses on teaching others, which is not mentioned anywhere in Dale's or Treichler's discussions.
- *Figure 12* creatively combines "remembering" outcomes and "learning" outcomes; the condensed categories are aligned with a set of learning outcomes, implying that methods lower on the cone, such as "saying as they do a thing" are more appropriate for higher-order objectives, just as they are better for retention.
- *Figure 13* supposedly addresses "Web Delivery Methods" (keeping in mind that the Web did not exist in Dale's lifetime) and proposes that Dale's categories could be aligned not only with retention rates but also with different learning styles.
- *Figure 14* expands Dale's categories, rather mysteriously adding question marks which "refer to the unknown," perhaps anticipating that other sorts of learning activities may be invented in the future.

In addition, the learning activity categories are clustered into groups based on "nature of involvement."

- *Figure 15* is similar to *Figure 14*, but omits the question marks and modifies the wording of the categories to more nearly match the intent of Dale's original categories; it also makes the groupings more explicit and adds yet another dimension, Active-Passive.
- *Figure 16* differs most dramatically from the canonical version, condensing Dale's 11 categories into three and condensing the usual half-dozen percentages into three also.

To summarize our third claim, the overlay of the retention chart onto Dale's Cone is totally fallacious. We cannot determine who was the first to fabricate the combination, but Dale certainly did not intend or approve of it, and no subsequent purveyor of the formulation ever provided logical or empirical justification for it. It is simply bogus—both invalid and unreliable, and the proliferation of variations demonstrates the instability of the corrupted cone construct; it can be shamelessly adapted to support any pet theory of instruction.

Claim 4: Murky Provenance

Although many of those who make reference to the retention chart imply that they know the source of the data and consider it to be trustworthy, in reality it is exceedingly difficult to trace the provenance of the data. We know that various versions of the retention data existed in folklore at least since early in the 20th century, and probably before. In the context of training and education in the US, the most popular early published reference is Treichler (1967), who presents the data in his 'Figure 5,' but cites no source for the data. He dodged any challenge to credibility by saying of his Figure 4 and Figure 5, both of which contained percentages, "If the latter two percentage figures are as valid as experience and research have shown them to be..." (p. 29). He treats the data as some sort of summary of conventional wisdom which is consistent with some unnamed research. Later he says "These figures, of course, are only approximate and subject to exceptions" (p. 29). The problem is that subsequent users of these data seem to accept them as valid results of actual empirical research.

Incidentally, Treichler was affiliated with the Mobil Oil Corporation. This company was known as Socony-Vacuum Oil Company prior to 1955, the Socony Mobil Oil Company between 1955 and 1966, and Mobil Oil Corporation after 1966; hence some users have referred to Socony-Vacuum or Mobil Oil Corp. as the sources of the percentages.

Where did Treichler encounter this so-called accepted wisdom? Prof. Frank Dwyer, when writing his book, *Strategies for Improving Visual Learning* (1978), contacted the Mobil Oil Corporation to follow up on

Treichler's article, since Mobil, Treichler's employer, appeared to be the source of the retention data. As Dwyer reported in a personal communication (February 9, 2007):

As I recall when I read the original article the percentage data depicted in the 4 tables was being distributed by the Socony-Vacuum Oil Company. I believe that I contacted the HR dept. at their headquarters in RI or NJ at the time and as a response I received a copy of the letter that I have provided a copy to you. Apparently, they had a number of inquiries before mine and had taken the time to draft the "limp" response.

The letter to which Dwyer refers was written to Michael B. Callahan, head, Training Aids Branch, Department of the Navy, by Charles Cyrus, training specialist, University of Texas, in November, 1963. A photocopy of this letter (Cyrus, 1963) was kindly provided by Prof. Dwyer, and a facsimile of it is shown as *Exhibit 13*. In the letter Cyrus explains the origins of a mimeographed handout, "Some Training Principles" (TIM-151). He attributes the retention chart figures to Paul John Phillips, who prepared training materials for the petroleum industry at the University of Texas in the summers of 1939 and 1940. Phillips then spent the World War II years as a training officer at the Ordnance School, Aberdeen Proving Ground, returning to Texas in 1947. Cyrus says: "The percentages...are those set down by Mr. Phillips shortly after he returned to this office." A brief biographical sketch of Col. Phillips appears in "The Good, the Bad, and the Ugly: A Bibliographic Essay on the Corrupted Cone" elsewhere in this special issue.

In an effort to ascertain whether the retention chart was based on actual research done at Aberdeen, one of the authors (Molenda) in 2003 contacted the historian of Aberdeen Proving Ground, Lt. Col. Peter S. Kinsvatter, and requested any records pertaining to Mr. Phillips or his training work. Kinsvatter (personal e-mail communication, February 28, 2003) responded:

As promised, I checked the history of The Ordnance School that I have. It covers the period of 1940 to May 1943. To my surprise, it discusses Lieutenant Colonel P. J. Phillips and his Training Methods Branch. His branch was responsible for training instructors and evaluating training. Unfortunately, the history does not discuss any work done by Phillips on instruction methods versus retention of knowledge, although that would certainly fall within his purview.

Neither Kinsvatter nor other searchers have been able to provide evidence that systematic research on instructional methods was conducted at Aberdeen.

The Ordnance School history to which Kinsvatter refers (United State Army, 1943) is discussed at greater length in "The Good, the Bad, and the Ugly: A Bibliographic Essay on the Corrupted Cone." Given

the dearth of historical evidence in the Aberdeen Proving Ground's own records, it is unlikely that proof can be obtained to relate the retention chart to specific research conducted there. Even if research had taken place, there is ample evidence that the retention percentages existed in folklore prior to World War II, as established earlier in this article.

Still, Phillips could possibly be the major source for the version of the retention data (*Figure 5*) that has proliferated in the American community of corporate training and thereafter in American educational circles more generally. We know that Phillips (who died in 1950) prepared training materials for the University of Texas extension division and that a major audience of this training was oil industry workers. People, such as D. G. Treichler, who later became trainers at American oil companies, could very well have encountered the retention chart through the handout to which Cyrus refers, since the handout was in circulation between 1947 and 1963, at least. From whatever the original source(s), the retention data most likely passed from person to person through handouts and slides used in various training centers. It is unclear whether Treichler's article was the source used by others that came after 1967. It is rarely cited directly, although Treichler's version of the retention chart and the "Socony-Vacuum" label recur frequently.

To summarize this claim, we have shown that the canonical American version of the retention chart data may be attributed, very tentatively, to Paul J. Phillips, but it cannot be demonstrated that Phillips based these generalizations on any body of scientifically conducted research. Further, there is no conceivable sort of scientifically conducted research that could yield the neatly rounded increments found in charts such as *Figures 5, 6, and 7*. The references to the chart by those who have used it over the past century suggest a serious scholarly deficiency in terms of applying even the minimal standards of critical analysis.

Claim 4a: Erroneous Representation of Sources

Tracking the sources of the retention chart is made all more difficult because previous writers have muddled the supposed sources, including by claiming they discovered the percentages themselves, and by knowingly concocting false citations as well as by unwittingly providing incorrect citations.

False Citations

In addition to cases in which writers play fast and loose with the retention data, there are many more cases in which writers attribute the mythical retention chart to erroneous sources. Januszewski and Betrus (2002) have identified 14 erroneous sources, but here we will discuss the eight most common mistaken attributions, including one that appears to be intentionally fudged.

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hapless authors reaching for authority decided to attribute the retention chart to William Glasser (see *Exhibit 8*). They are presumably referring to Dr. William Glasser, a psychiatrist best known as the author of *Reality Therapy* (1965) and *Schools Without Failure* (1969). However, he had no demonstrable connection with the retention chart, and its content did not lie within his area of expertise. In the early 2000s the William Glasser Institute Website acknowledged receiving many inquiries about the retention data. They denied ownership of the retention data and helpfully referred inquirers to "Dale's Cone of Experience which can be found in *Education Media [sic]* by Wiman and Mierhenry [sic], Charles Merrill Publishers, 1969; *Experience and Learning—Developed and revised by Bruce Ryland [sic]* from material by Edgar Dale" (see *Exhibit 5*). Unfortunately, this dog's breakfast of a citation would not lead the reader to any relevant sources.

It is possible that some of the people who clasp onto the "Glasser" source are actually thinking of Robert Glaser, an educational psychology researcher who wrote extensively about the psychological principles underlying educational technology, placing these principles under a "systems" umbrella (Glaser 1962, 1965, 1968). Occasionally the name "Glaser" is used instead of "Glasser." But, like Glasser, Robert Glaser did not invent or comment upon the fallacious retention chart or corrupted cone.

British Audio-Visual Society

A popular false attribution outside the United States is the British Audio-Visual Society (see *Exhibit 1*), found in sources from the UK and Australia. As with Glasser, this choice seems to be totally fabricated, with no plausible connection to the retention chart or corrupted cone. Indeed, there is no British Audio-Visual Society, nor has there ever been one. This one lies on the outer reaches of sheer fantasy.

Chi et al.

One of the more enterprising misattributions is intentionally misleading (see *Exhibit 2*). Thalheimer (2003) discovered a bar graph illustrating the retention chart data (see *Figure 9*), attributed to "Chi, M. T. H., Bassok, M., Lewis, M. W., Reimann, P., & Glaser, R. (1989)." There is a journal article by those authors, but the graph does not actually appear anywhere in that article. The lead author of that journal article (Chi) confirmed to Thalheimer that she had never seen it before. So the person who concocted this misbegotten representation of the retention chart actually searched the literature to find a plausible title and author to cite. Because of the conscious effort required to concoct it, this version could only be labeled as fraudulent.

Claiming Discovery of the Data

Although the majority of retention chart purveyors refer

to some outside source, some lead the reader to believe that they actually discovered the percentages through their research. For example, a slide from a Forrester Research Webinar shows the retention data in bar graph form (*Exhibit 7*), with figures virtually identical to those published by Treichler in 1967 (*Figure 5*). The slide says: "Source: Forrester Research." Forrester may be the "source" of this layout of the data, but it is not the source of the data. This Webinar has been deleted from Forrester's Website since Thalheimer's 2006 critique.

To summarize this claim: the purported information is widely and wildly attributed to a variety of sources, all erroneous and some intentionally so. As a partial remedy, we offer further analysis of these claims and claimants in the companion article "The Good, the Bad, and the Ugly: A Bibliographic Essay on the Corrupted Cone."

Conclusions

The retention chart and the Cone of Experience were created separately, the former by an unknown source probably around the middle of the 20th century, based on folkloric formulations of the retention data going back to the early 20th century or before. The retention chart cannot be supported in terms of scientific validity or logical interpretability. The Cone of Experience, created by Edgar Dale in 1946, makes no claim of scientific grounding, and its utility as a prescriptive theory is thoroughly unjustified.

Some person or persons, so far unidentified, overlaid the two constructs to form the corrupted cone, which possesses the deficiencies of both of the flawed constructs—scientifically unfounded and logically indefensible. In addition, the corrupted cone has no reliable form or content; it has been represented in hundreds of variations of structure and informational content. No qualified scholar would endorse the use of this *mish-mash* as a guide to either research or design of learning environments. Nevertheless, it obviously has an allure that surpasses logical considerations. Clearly, it says something that many people want to hear. It reduces the complexity of media and method selection to a simple and easy to remember formula. It can thus be used to support a bias toward whatever learning methodology might be in vogue. Users seem to employ it as pseudo-scientific justification for their own preferences about media and methods.

These mythical constructs seem to be popular mostly among education and training practitioners who have limited awareness of the research literature on visual and auditory learning, not among researchers or serious educational technology scholars. They seem to be yearning for a simple answer to the questions about how humans learn and how we can best teach. And so a myth emerges and evolves into different forms to suit the needs of different audiences. Unfortunately, reality does not

match up well with the myth. Practitioners who pass along this advice deceive both themselves and their gullible audiences and they perpetuate a significant embarrassment to the profession. Further, they do a disservice to the very people the profession has dedicated itself to serve—learners, whether they be school children, college students, military or business trainees, or adult citizens. □

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Previous Attempts to Debunk the Mythical Retention Chart and Corrupted Dale's Cone

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Critics have been attempting to debunk the mythical retention chart at least since 1971. The earliest critics, David Curl and Frank Dwyer, were addressing just the retention data. Beginning around 2002, a new generation of critics has taken on the illegitimate combination of the retention chart and Edgar Dale's Cone of Experience—the corrupted cone. Because the corrupted cone has flared up in the literature of different fields, we tend to see a variety of firefighters trying to beat back the brush fires in their own particular fields, including teacher education, engineering education, and educational technology.

Introduction

We are not alone in noticing the proliferation of the fictitious retention chart, and later the conflation of that chart with Edgar Dale's Cone of Experience, in the form of "the cone of learning" or "the learning pyramid." Scholars have commented on one or another of these aberrant constructs since the early 1970s, continuing up to the present time. They call attention to the murky provenance of the retention data, as well as the total implausibility of the data as a product of research, and then to the inappropriate overlay of those figures onto Dale's Cone. The purpose of this article is to document some of the most significant critiques that have been offered over the years and comment on their scope and reach.

Early Claims and Early Critics

Letrud (2014) has documented the appearance of primitive versions of the data that were later incarnated into the

infamous retention chart early in the 20th century. They appeared more and more frequently in published form in the years after World War II, roughly correlated with the growth of the audiovisual movement. The retention chart lent credence to the notion of superiority of auditory and visual media over simple verbal transmission. The neat and easy generalizations of the retention chart appealed to audiences unfamiliar with actual research on the learning process, so it is not surprising that usage proliferated among instructors in the large domain of non-formal adult education.

In the companion article, "Timeline of the Mythical Retention Chart and Corrupted Dale's Cone," we document versions of the retention chart in publications of the US Department of Agriculture, with diffusion to agricultural extension agents around the United States; in publications of the US Department of Labor and several of its units, such as Mine Safety; and in publications of the US Navy, particularly the Bureau of Naval Personnel.

Prior to the conflation of the retention chart with Dale's Cone, there was only a scattering of reference to the bogus retention data in the literature of K-12 or higher education, and it tended to be labeled as "an old maxim," not fresh research data. The audiovisual movement was gaining traction in formal education, but its advocates generally were conversant enough with educational research to know the difference between old maxims and experimental research findings.

Hence it is not surprising that the first published criticisms of the fallacious retention chart came from audiovisual professionals and were directed toward audiences in non-formal adult education.

David H. Curl

The earliest critic we have found is David H. Curl in 1971. He is speaking to an audience of training directors in his regular monthly column, "AV Training," in *Training in Business and Industry* (Curl, 1971). He presents the canonical retention statistics—10% of what they read, 20% of what they hear, and so on (see Figure 5),* but he does not cite any specific source, stating only that "they have appeared in textbooks, have been cited as gospel in countless training seminars and courses, and have been used to justify great expenditures of funds" (p. 12). It is important to note that at this point in time, 1971, there had been no examples that we have found of the retention data overlaid on Dale's Cone of Experience. Dale is mentioned nowhere in Curl's column.

Concerning the genesis of these figures, he notes that "I remember learning these figures (by rote) in a college course back in the early 1950s" (p. 12). And where did

* As explained in the *Introduction*, all of the 16 Figures referenced in the articles comprising this special issue are placed together in a separate, dedicated section of this issue rather than being dispersed across the issue.

they come from? Curl says "We were told that research by the Armed Forces had established those classic learning and retention figures and that Socony-Vacuum Oil Co. had substantiated their validity" (p. 12).

Curl is the first to locate the retention chart in the immediate post-World War II era and to connect it both with the military and an oil company, indicating that the retention chart was either codified or at least popularized by Col. Paul John Phillips, who served as a trainer at Aberdeen Proving Grounds during World War II and later taught extension courses related to the petroleum industry. Curl bases this origin theory on the form letter originating from the University of Texas sent out during the 1970s by the Mobil Oil Corporation in response to inquiries about a purported "Socony-Vacuum" research project (Cyrus, 1963; shown in full as *Exhibit 13*).^{*} This is the same form letter received by Dwyer (1978) and discussed in greater depth elsewhere in this special issue in "The Mythical Retention Chart and the Corruption of Dale's Cone of Experience." As is typical of research on this topic, Curl encountered this information in the draft of a report by a graduate student, John Pollak, circulated informally. There is no trace of a formal publication by that student on this topic, and Curl no longer has the draft document, so all we have is what Curl gleaned from that draft and reported in his column.

Still, Curl demolished the pseudo-scientific basis of the retention chart on logical grounds, and he also provided a plausible story about where the mythical data came from. But the myth did not die.

Francis M. Dwyer, Jr.

Frank Dwyer's 1978 book, *Strategies for Improving Visual Learning*, is not exactly a myth-busting source. It presents the retention chart (as in *Figure 5*) and discusses it in the context of naïve beliefs about visual learning (p. 11). However, since the caption on the chart does not explicitly refute the chart's claims (it merely says "How we remember"), a superficial reading might even leave the impression that these figures are worth consideration. This is in no way a legitimate interpretation of Dwyer's intent—which is to consign it to the scrapheap of naïve formulations—but it is a mistake that could be made.

Dwyer's source for his version of the retention table, which he refers to as "data distributed by the Socony-Vacuum Oil Company," is DeForest G. Treichler's 1967 article. Given Dwyer's status as a leading researcher in the field of visual learning, it is likely that his citation of Treichler and "Socony-Vacuum," unfortunately, lent confidence to later writers to view these sources as worthy of some credibility.

^{*}As explained in the *Introduction*, all of the 13 Exhibits referenced in the articles comprising this special issue are placed together in a separate, dedicated section of this issue rather than being dispersed across the issue.

In any event, after 1978 there is an absence of further critique of the mythical retention data in the literature of educational technology. It is fair to conclude that the issue had been put to rest among serious scholars of visual learning. Further critique only resumed in the 2000s after the retention data had been overlaid on Dale's Cone to form the corrupted cone, which gestated in the murky world of ephemeral literature and eventually bloomed profusely on the World Wide Web.

Conflation of the Retention Chart with the Cone

As is discussed in greater depth in "The Mythical Retention Chart and the Corruption of Dale's Cone of Experience," it is unknown exactly when and by whom the mythical retention data were overlaid onto Edgar Dale's Cone of Experience, but it was certainly before 1977, when Ann R. Bauman's manual (*Training of Trainers*, 1977) and Nutting's book (*Family Cluster Programs*, 1977) were published, displaying visuals similar to our *Figure 14* and *Figure 16*. Stice (2009) and others testify to seeing the corrupted cone in the early 1970s.

Once the two concepts were conflated, uncritical educationists were drawn to it like bees to clover. After all, Edgar Dale was a famous and serious scholar in audiovisual communications, so his name added extra credibility to what was already a most attractive factoid. Further, Dale retired in 1970 and died in 1985, so he was not around to defend himself. In the 1980s and 1990s the most common representation of the corrupted cone resembled our *Figure 11*.

The corrupted cone was not subjected to much scholarly scrutiny because it did not appear in published books or articles of a scholarly nature; it appeared mainly in the form of handouts given out by college instructors, corporate training directors, and adult educators and in the form of slide presentations given at conferences. The corrupted cone has tended to be used in situations in which the user could get away with a vague attribution or none at all. In papers where authors expect more scholarly scrutiny, they sometimes reach to connect the corrupted cone with some respectable source. Some mythical sources are created out of thin air, such as "British Audio-Visual Society" (*Exhibit 1*), an organization which does not exist, or "Chi, Bassok, Lewis, Reimann, & Glaser" (*Exhibit 2*), an article that exists but has nothing to do with Dale's Cone.

Other authors at least cite actual works by Edgar Dale (*Exhibit 3*) but do not go to the trouble of looking at the works to find out that they do not actually contain the fallacious percentages. Also falling into this category are those who cite "Wiman and Mierhenry" [*sic*] (*Exhibit 12*). If the users of this citation had actually looked at the book edited by Ray Wiman and Wes Meierhenry, they would have seen that the only—passing—references to Dale were made by authors other than Wiman and Meierhenry. And, of course, those passing references refer only to the

Cone of Experience that was actually devised by Edgar Dale (see *Figures 2 and 3*), and not the bogus retention data or the corrupted cone. This widespread erroneous attribution is discussed further in "The Good, the Bad, and the Ugly: A Bibliographic Essay on the Corrupted Cone."

Some authors—or their representatives—have the effrontery to claim ownership credit for the retention chart or the corrupted cone, for example, Forrester Research (*Exhibit 7*), Glasser (*Exhibit 8*), and National Training Laboratories (*Exhibit 10*). As we will demonstrate throughout this special issue, while the origins of the bogus retention chart and corrupted cone are cloudy, they were certainly not created by Forrester Research, William Glasser, or National Training Laboratories (NTL). The Forrester case is egregious as an act of knowing appropriation. The Glasser and NTL cases are more forgivable because third-party authors seeking some authoritative cover used Glasser and NTL as sources, and then the organizations decided to simply accept the accolade, even though they could not show any intellectual contribution to either the bogus retention chart or the corrupted cone.

The corrupted cone spread slowly in the 1980s and early 1990s, mainly via hand-to-hand transmission. However, once the World Wide Web gained traction in the mid-1990s, reaching over two billion users by 2012, ideas—both good and bad—could be disseminated to more and more people by more and more people. And so the phenomenon of so-called "Dale's Cone of Learning" or the "Learning Pyramid" took flight.

More Recent Critics

As the corrupted cone spread far and wide in the 1990s and 2000s, David Curl's 1971 critique and Dwyer's 1978 critique were lost in the distant haze. But a new generation of myth-busters began to speak out.

Lawrence J. Najjar

One of the earliest critics in the Internet Age is Lawrence J. Najjar, a psychology researcher at Georgia Institute of Technology, in 1996. His intent is to "determine whether there is empirical support for the assumption that multimedia information presentation improves learning" (p. 1). Najjar undertakes this quest because of the widely disseminated belief in the superiority of audiovisual presentation over verbal presentation, of which the infamous retention chart is only one example. So Najjar does not specifically debunk the retention chart, merely using it as a launching pad to examine the assumptions embedded in it. He concludes that although there is no general superiority of mediated presentation, there are specific situations in which specific types of auditory and visual presentation can improve learning.

Alan Januszewski and Anthony K. Betrus

A larger wave of critics emerged in 2002, including all of the authors of this special issue. At the 2002

AECT convention, Januszewski and Betrus, from the Educational Technology program at the State University of New York at Potsdam, presented an extensive review and critique of nine examples of the corrupted cone, including *Figures 4, 5, 10, 12, and 14*. They were the first educational technology scholars to comprehensively dissect the claims of Dale's original Cone, the original retention chart, and a wide range of corrupted combinations of the Cone and retention data. They demonstrated the fallacious nature of both the retention chart and a wide range of corrupted cones.

Deepak Prem Subramony

About the same time, Deepak Subramony, then a doctoral candidate at Indiana University, was writing his deep analysis (2003) of the original Dale's Cone itself and then the misuses of the Cone "as a practitioner's guide" (p. 26). He goes on to extend his analysis to include conflation of the Cone with the bogus retention data. He also adds five more examples of fallacious uses of the Cone beyond those examined by Januszewski and Betrus and Thalheimer.

Michael H. Molenda

Michael Molenda, in the Instructional Systems Technology faculty at Indiana University, was investigating the origins of the corrupted cone around the same time as part of an encyclopedia entry on the Cone of Experience (Molenda, 2003) that he submitted in November 2002. In it he focused on what Edgar Dale said about his Cone in the several editions of his textbook between 1946 and 1969. He added a brief discussion of the conflation of the Cone with the retention chart and reported his initial research into the origins of the retention chart.

Since Subramony's critique (2003) appeared shortly after, Molenda hitch-hiked on Subramony's article by writing a "Reader's Comment" that appeared in *Educational Technology* (2004) shortly after Subramony's article. In this "comment," he reported at greater length his inquiries into the origin story of the US Army Ordnance School during World War II, discussed at length in "The Mythical Retention Chart and the Corruption of Dale's Cone of Experience."

Will Thalheimer

Independently, and around the same time, Will Thalheimer, a leading research-based corporate training consultant, was preparing a devastating criticism of the retention myth. His blog, "Bogus Research Uncovered" (2003), appeared on his Website, "Work-Learning Research" early in 2003. In it, Thalheimer uses one of the bogus citations, *Exhibit 2*, as a particularly egregious example of the malpractice surrounding the corrupted cone. He goes on to examine other bogus citations, especially *Exhibit 12*, to trace their origins, and to demolish their credibility.

Jeremy E. C. Genovese

Busting the retention myth reached a mass popular audience in 2004 when Jeremy Genovese zeroed in on the retention chart in *Skeptic* magazine (Genovese, 2004). He was speaking to an audience interested in refuting pseudo-scientific claims that take hold in popular culture, such as UFOs and Ouija boards. To begin with, Genovese is bemused that the standard rendering of the retention data fall so neatly into rounded results—10%, 20%, 30%, etc. This clearly appears very suspicious. Then there is the projection of the retention data onto Dale's Cone. Genovese quickly grasps the absurdity of this, noting that Dale's works never mention any percentages. He notes that, indeed, Dale's Cone is describing a completely different dimension in its categorization of materials and methods. He concludes that "It could be argued that Dale's Cone presents a much more complex model that is trivialized when associated with the claim. All citations of Dale as the source of the [retention] claim are simply mistaken." (p. 56)

By the late 2000s many in the education community were beginning to smell a fish. Even though the corrupted cone was hardly ever cited in scholarly literature, it was polluting discussion of teaching methods *everywhere* on the World Wide Web. On November 1, 2007 a Google search for the search term Dale's Cone turned up 934,000 hits (individual results) and by November 1, 2008 it had risen to 1,100,000! The informal barbs launched by Subramony, Molenda, Betrus, and Thalheimer were beginning to be noticed by other educators and to stimulate them to serious analyses.

James P. Lalley and Robert H. Miller

Lalley and Miller (2007), speaking as education generalists, begin their debunking effort with an overview of the original Cone of Edgar Dale (*Figure 3*), then examine a dozen examples of the corrupted cone—often called "the learning pyramid"—citing several sources beyond those in the Thalheimer, Januszewski and Betrus, Subramony, and Molenda critiques. They do consider the internal inconsistencies of the data in these corrupted cones, but really focus on the issue raised by Dwyer in 1978: if you seriously wished to test learners' retention of presented information, how would you conduct the inquiry? They then proceed with a limited and selected review of recent well-conceived research on the sorts of teaching methods covered in the corrupted cones. Not surprisingly, they conclude that the literature does *not* support the claims of the corrupted cones: "The research reviewed here demonstrates that the use of each of the methods identified by the pyramid resulted in retention, with none being consistently superior to the others and all being effective in certain contexts" (p. 76).

Metiri Group

The bogus retention data have often been trotted out in support of commercial efforts to sell training products or services, as in the case of Forrester Research, discussed

earlier. It is to the credit of Cisco Systems, one of the commercial interests, that they sponsored a study (Metiri Group, 2008) to critically examine the claims of the corrupted cones; in their words, "There is a lot of misinformation circulating about the effectiveness of multimodal learning, some of it seemingly fabricated for convenience" (p. 2). The authors of this study comprehensively survey the same sources examined by Thalheimer, Januszewski and Betrus, Subramony, and Molenda. They include illustrations similar to our *Figures 9, 11, and 14*. They reach the same conclusions as Thalheimer, Januszewski and Betrus, Subramony, and Molenda, noting a plethora of inaccurate citations, unsubstantiated claims, and fallacious combinations of contrasting theoretical models. The bulk of the text, though, is devoted to the question, "Why do people find the Cone of Experience so compelling?" (p. 7). They conclude, for one thing, that "The person(s) who added percentages to the cone of learning were looking for a silver bullet, a simplistic approach to a complex issue" (p. 8). They then review the research on the learning outcomes of single-mode versus multiple-mode presentation, concluding that:

The reality is that the most effective designs for learning adapt to include a variety of media, combinations of modalities, levels of interactivity, learning characteristics, and pedagogy based on a complex set of circumstances. (p. 14)

Keith E. Holbert and George G. Karady

The last major myth-busting effort in this series speaks to a problem specific to the engineering education community. Holbert and Karady (2008) and Holbert (2009), presenting to the American Society for Engineering Education, demonstrate that the bogus retention table (*Figure 5*) has been widely—and wrongly—accepted within engineering education as a scientifically defensible generalization. They point out such absurdities as the fact that the numbers in the chart are reported differently, with six authors presenting six different versions of the numbers! The bulk of their argument is devoted to interpretation of the authors' flow diagram of citations of the bogus retention chart in engineering education literature. They show that the vast majority of authors who cited the retention data gave references that traced back to one article by Stice (1987). When Holbert and Karady contacted Prof. Stice to ascertain the source of his data, "Prof. Stice stated in an email that he received that Socony-Vacuum Oil Co. data 'as a one-page handout at a workshop I attended in the 1970s at the University of Wisconsin-Eau Claire.'" (p. 2) Holbert and Karady chide their fellow engineering education researchers for uncritically accepting bogus data, and appeal to them to expunge all reference to Stice and the "Socony-Vacuum Oil Co. data" as authoritative sources.

Prof. James E. Stice, the perpetrator so roundly criticized by Holbert and Karady, pleaded guilty in a conference presentation the year after Holbert and Karady's initial charges (Stice, 2009). He acknowledged that he could not

validate the percentages in the corrupted cone, and that "I obtained these data as a handout at a 'Train the Trainer' workshop held at the University of Wisconsin-Eau Claire in 1970" (p. 1). He also conceded that Dale's Cone of Experience should not have been conflated with the retention chart. He humbly asked for pardon for his scholarly lapse. Interestingly, Stice continued to maintain that the percentages, although not research-based, still held some intuitive appeal (p. 4).

Kåre Letrud

Critics of the retention chart have continued to come forward in more recent years. We will mention just one of them, because of the special perspective he has brought to the question. The gist of his research is that versions of the bogus retention data have been circulated since at least early in the 20th century in publications both in North America and Europe. So far, Kåre Letrud, of Lillehammer University College, has published only one major article on this question (Letrud, 2012), but unfortunately the text of that article was badly garbled in the editing process, making it difficult to interpret clearly. However, private e-mail communication with him in 2014 has established that he continues to extend his research and will be publishing some major findings about early versions of the retention data in the near future (Letrud, 2014).

Conclusion

In summary, we have shown that although the bogus retention chart has been accepted uncritically by many, a number of authors have striven since 1971 to debunk these fallacious data. Most of the debunking has taken place since 2002, after the mythical data had become associated with Dale's Cone and had metastasized across the breadth of the World Wide Web. The myth has not significantly penetrated serious educational technology literature, but it certainly has acquired a strong foothold in the ephemeral literature of teacher education, special education, engineering education, corporate training, and military and government training. Hence, further efforts at debunking are justified. □

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The Good, the Bad, and the Ugly: A Bibliographic Essay on the Corrupted Cone

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The authors are attempting to set the record straight regarding the sources frequently cited in the literature of the mythical retention chart and the corrupted Dale's Cone. They point out citations that do not actually connect with relevant works; provide correct citations of sources that are often cited erroneously; add references for overlooked works; and examine the stories and works of individuals involved in this controversy. Among the people discussed are: Edgar Dale and the team of Hoban, Hoban, and Zisman, who contributed the original concepts of the Cone of Experience; Frank Dwyer, Paul J. Phillips, and D. G. Treichler, who played roles in popularizing the mythical retention chart; Bruce R. Nyland and James E. Stice, who helped conflate the retention chart with Dale's Cone; as well as Ray Wiman and Wes Meierhenry and William Glasser, innocent bystanders who have been dragged in erroneously.

Objective

One of the problems in the discourse about the mythical retention chart and corrupted Dale's Cone is the prevalence of false or incorrect attributions of the chart or the cone. These fallacious references have been passed along, being cited by one writer after another, apparently without ever being checked against the supposed original sources.

Occasionally writers cite real works by their actual authors, but the works do not contain the information that is claimed. More often either the author's name or the publication information is incorrect. We hypoth-

esize that writers are more likely to succumb to the temptation to use a dubious source if they don't know the person, are not familiar with their role in the profession, or they believe the readers are also unfamiliar with them. A disembodied name is easier to misuse.

The main article in this special issue, "The Mythical Retention Chart and the Corruption of Dale's Cone of Experience" debunks the false claims that have been made about the various versions of the "cone of learning." This article focuses on putting some flesh on the bones of the people cited, rightly or wrongly, correctly or incorrectly, in the literature surrounding the mythical retention chart and corrupted Dale's Cone.

Having some accurate information about the person might help readers evaluate the credibility of a citation. At the very least, this listing will clarify the full names—correctly spelled—and affiliations of the various players.

We also provide correct citations for works that are relevant to this discussion, adding annotations about the contents of these works—which have sometimes been distorted by those citing these works, probably without examining them.

This bibliography is based on a careful examination of the texts of each of the works cited. The authors have held these books and journals in their hands! The entries are verified as correct, aside from possible quibbles about style.

Edgar Dale

By far, the name most frequently linked to the "cone of learning" is that of Edgar Dale—see *Exhibits 3, 4, 5, and 10*.^{*} And this linkage is actually partly justified, unlike many of the other names bandied about. Dale was a prolific scholar, and one of his intellectual products was the Cone of Experience, devised as an organizational schema for his 1946 textbook (*Figure 2*)[†] and slightly revised for the 1954 edition (*Figure 3*). Clearly, the many versions of the "cone of learning" are based on his original schema.

However, other than the conical outline with a number of horizontal divisions, there is little residue of Dale's original Cone of Experience in the "cone of learning" so widely disseminated over the past couple of decades (*Figures 10–16*).

* As explained in the *Introduction*, all of the 13 Exhibits referenced in the articles comprising this special issue are placed together in a separate, dedicated section of this issue rather than being dispersed across the issue.

† As explained in the *Introduction*, all of the 16 Figures referenced in the articles comprising this special issue are placed together in a separate, dedicated section of this issue rather than being dispersed across the issue.

Who Is Edgar Dale?

Edgar E. Dale (1900–1985) was a research professor at Ohio State University and a widely respected scholar in the field of education. He grew up in North Dakota, taking BA and MA degrees at the University of North Dakota. After serving as a teacher and principal, he completed a PhD at the University of Chicago in Education in 1928, becoming a research associate in the Bureau of Educational Research at Ohio State University in 1929, where he remained until his retirement in 1970. During World War II, Dale worked in the Bureau of Motion Pictures, Office of War Information and consulted on the development of training films in Hollywood. By that time he was already a widely published and renowned scholar in the educational applications of mass media and had served as president of the most prominent professional association in that field, the Department of Visual Instruction (DVI) in 1937–1938.

At midcentury, having written a celebrated textbook on audiovisual methods in teaching (Dale, 1946; subsequent editions in 1954, 1969), he was among the best known authorities in the field of audiovisual education. His “Cone of Experience,” introduced in the first edition of his textbook, was intended only as a framework for organizing the chapters of the book. At no point in time did Dale ever claim his Cone was a rigorous taxonomy, nor that the categories were based on research, nor did he ever associate ANY numbers with his categorization schema.

Dale was well known internationally for his studies of children’s vocabulary and the development of literacy programs. He was a US representative to UNESCO 1947–1951 and served on numerous boards in educational broadcasting and educational film. In 1935 he began a four-page publication known simply as *The News Letter*, which he continued to produce eight times a year until his retirement in 1970. *The News Letter* carried snippets of news related to education, mass media, literacy, and popular culture and usually a provocative essay by Dale (e.g., “Why Listen to Music?” “What Does It Mean, to Read?” and “Not by Arms Alone”). It was distributed gratis to a mailing list of followers that grew to over 25,000, and many leaders in educational media relied on it for its foresight and breadth of view. He received many awards and honors, including the first Educational Film Library Association award (1961), the Eastman Kodak Gold Medal (1968), and the Distinguished Service Award of the Association for Educational Communications and Technology (AECT) in 1972.

What Did Edgar Dale Write?

During his professional career Edgar Dale published dozens of influential articles, several books on films in education and children’s vocabulary development,

and three editions of his classic textbook on the use of audiovisual media in teaching:

- Dale, E. (1946). *Audio-visual methods in teaching*. New York: The Dryden Press. This is the first edition of Edgar Dale’s classic textbook on using audio-visual resources effectively in teaching. The “Cone of Experience” makes its first appearance here and it serves as the organizing principle for the chapters of the book.
- Dale, E. (1954). *Audio-visual methods in teaching* (revised edition). New York: A Holt-Dryden Book, Henry Holt and Company. This is the second edition of Edgar Dale’s classic textbook. By this time, television had become commonplace in homes, and the first public television station has gone on the air in 1953, necessitating the addition of a chapter on television and the inclusion of television in the Cone of Experience. By this time Dale had completed landmark research in readability, co-developing the standard instrument for measuring the readability of text in 1948.
- Dale, E. (1969). *Audiovisual methods in teaching* (3rd edition). New York: The Dryden Press; Holt, Rinehart, and Winston. Edgar Dale’s book, by the late 1960s, had significant competition as a college textbook, but the publisher put a third—and last—edition on the market. There are no significant changes to the Cone of Experience visual schema from the second edition. Dale retired as a faculty member at Ohio State University in 1970, living until 1985. At no time, in any edition, did Dale add any sort of percentages to the Cone of Experience.
- Dale, E. (1946/1996). The cone of experience. In D. P. Ely and T. Plomp (Eds.), *Classic writings on instructional technology* (pp. 169–182). Englewood, CO: Libraries Unlimited. The “Cone of Experience” chapter, excerpted from the first edition of Dale’s audio-visual textbook, is selected as one of the foundational writings for the field of instructional technology.

As is reiterated throughout this special issue, in none of his works did Dale ever mention or allude to any percentage figures regarding the retention of material presented in various media formats. On the contrary, as an expert in statistical analysis (particularly regarding children’s vocabulary development), he was always cautious about limiting any statistical claims with painstaking care.

Hoban, Hoban, and Zisman

The next authors—Charles Hoban junior and senior and Samuel Zisman—are not people whose names are mistakenly cited in the “cone of learning” literature; rather, they are absent from that literature, even though

they are arguably the intellectual fathers of the “cone” concept.

Who Is Charles F. Hoban?

Charles F. Hoban (1873–1948) was an early leader in the visual education movement and the father of and collaborator with Charles F. Hoban, Jr., on the influential textbook, *Visualizing the Curriculum* (Hoban, Hoban, & Zisman, 1937). The senior Hoban worked as a teacher and school superintendent in western Pennsylvania, attaining AB, MA, and PhD degrees from nearby Grove City College. By 1924 he was a staff member at the Pennsylvania Department of Public Instruction and by 1934 was director of the state museum and visual education program. Hoban served as president of the Department of Visual Instruction (DVI), predecessor of AECT, in 1931–1932. Because of his prominence as an advocate for the use of films in education, he was commissioned to lead a project to create a national film institute in the 1930s.

Who Is Charles F. Hoban, Jr.?

Charles F. Hoban, Jr. (1906–1977), the son of Charles F. Hoban, was a prominent scholar and author on visual education. He grew up in Harrisburg, PA and received his PhD from Ohio State University under Edgar Dale. In the late 1930s he was selected to lead a long-term project to promote the use of films in education. This work was interrupted by service during World War II as chief of film distribution and utilization for the Army Pictorial Service. Throughout the postwar period, on the faculty at the University of Pennsylvania, he was prominent as a scholar on communication theory and the systems approach to the development of mediated instruction, while he continued to promote the use of motion pictures in education.

Who Is Samuel B. Zisman?

Samuel Bernard Zisman (1908–1970) was a distinguished architect and planning consultant who spent most of his professional career in private practice in San Antonio, TX. He obtained a degree from MIT in 1930 and taught drawing in the Department of Architecture at MIT 1930–1935, later joining the faculty at Texas A&M University until the advent of World War II. During the war he was a Technical Sergeant in the Army Air Force, teaching camouflage techniques, and he later directed post-war rebuilding efforts in Bavaria. Back in the US in 1947, Zisman became director of city planning in Philadelphia. From his private practice in San Antonio, he consulted far and wide on urban planning throughout the US and in Europe, Africa, and Latin America.

What Did Hoban, Hoban, and Zisman Write?

Charles Hoban, Sr., was more of an administrator

and advocate than an author. Hoban, Jr., though, was a prolific writer, mainly on films and education. In the 1930s and 1940s he authored or co-authored five books related to integrating motion pictures into school and college curricula. With Edward B. van Ormer, he compiled *Instructional Film Research, 1919–1950*, an encyclopedic summary of military research on instructional uses of films from World War I through World War II (Hoban & van Ormer, 1950). He was called upon again in 1971 to revisit this subject with *The State of the Art of Instructional Films* (1971). Zisman wrote four books and many articles and reports, mainly on visual design, architecture, and urban planning. Hoban, Hoban, and Zisman together co-authored one book:

- Hoban, C. F., Hoban, C. F., Jr., & Zisman, S. B. (1937). *Visualizing the curriculum*. New York: The Cordon Company. One of the earliest, best, comprehensive textbooks on all types of visual media, with psychologically based recommendations for integration of materials into lessons and curricula, based on insights of a psychologist, an administrator of educational media, and a visual media producer.

This book was significant to the “cone of learning” discussion because it introduced a schematic diagram (similar to our *Figure 1*) which is uncaptioned but accompanied by this text:

The relative effectiveness of the various visual aids is in direct ratio to the pupil's stage of learning and development. This principle is illustrated in the following diagram. (p. 23)

That is, when learners have a lot of prior first-hand experience with a concept, they can understand more abstract presentations; when they lack that prior experience, they need more concrete learning activities. This concrete-to-abstract progression is later emulated by Dale as the organizing concept of his Cone of Experience.

Frank Dwyer

Another authentic scholar whose name occurs in the discussion of the mythical retention chart is Frank Dwyer. Although he has long been an outspoken critic of the fallacious data in the retention chart, one of his books probably accelerated the chart's dissemination.

Who Is Frank Dwyer?

Francis M. “Frank” Dwyer (b. 1937) has conducted hundreds of research studies in visual learning as a professor at Pennsylvania State University. Beginning as a high school science teacher with a BS in secondary education and an MS in instructional technology from Massachusetts State College-North Adams, he

went on to complete an EdD in Educational Administration at Pennsylvania State University in 1964, at which time he joined the faculty there, continuing until his retirement in 2007. In 1965 he began a unique long-term program of systematic research on the variables related to learning from visuals, the Program of Systematic Evaluation. This program yielded more than 300 research articles and 250 conference presentations in addition to providing invaluable collaborative opportunities for hundreds of graduate students. He developed and taught more than a dozen graduate courses on instructional design, research methods, and distance education. His many accolades include serving as president of the International Visual Literacy Association, 1978–1979 and of AECT, 1984–1985.

What Did Frank Dwyer Write?

During his 43 years as a professor at Penn State, Dwyer authored more than 300 research articles related to visual learning and instructional design, many arising out of his systematic program of experiments using standard materials. He has authored several books summarizing the findings of these studies; the first (Dwyer 1972) provided the outline of his systematic program and presented the findings of the first five years of research. His overall conclusion, contrary to easy generalizations about retention of visual material, is that:

...the effectiveness of visualized instruction is dependent upon the type of visual used, the method of cueing students to the essential learning cues, relevant student characteristics, the method selected for presenting the visualized instruction, and the type of educational objective to be achieved. (p. 94)

Two later books (Dwyer 1978, 1987) provided updates of findings as further research accumulated in his Program of Systematic Evaluation; in addition, he co-edited a major anthology on visual literacy (Moore & Dwyer, 1994). However, the book that has most bearing on the discussion of the mythical retention chart is his second:

- Dwyer, F. M. (1978). *Strategies for improving visual learning*. State College, PA: Learning Services. This is a scholarly survey of the state of knowledge about human learning from visuals as of 1978. It focuses on the author's systematic program of research at Pennsylvania State University using a standardized set of materials to study variables such as pacing, color, cueing, individual learner differences, and aptitude-treatment interaction, as well as issues in visual testing. Dwyer begins with a critique of naïve formulations about the value of visuals in facilitating

learning and he uses Treichler's retention chart as an example. He states that this chart "presents data distributed by the Socony-Vacuum Oil Company" (p. 8) and gives Treichler 1967 as a reference. Dwyer clearly intends to dismiss this naïve formulation, but still, Dwyer provides us with one of the few instances of the bogus data appearing in a scholarly book.

This book appears to be the source of both the "Socony-Vacuum" attribution and the version of the retention chart that became more or less standard in the years after 1978 (see *Figure 5*). It is highly unlikely that the many purveyors of the mythical retention chart of the 1990s and 2000s encountered this specific formulation via the original Treichler 1967 article. It is more likely that they found it in Dwyer's book, a book that had a deserved reputation for scientific credibility. The fact that Dwyer used it as a negative example either was misunderstood or ignored.

All of Dwyer's works consistently question the "realism" theory—the more realistic the experience, the more educationally effective it is—and seek to understand the factors that actually improve or impede student learning from visual presentations. In recent years Dwyer has been prominent in the chorus of educational technology authorities who have debunked the claims of the mythical retention chart and the corrupted cone (Dwyer, 2010), as is discussed at greater length in "Previous Attempts to Debunk the Mythical Retention Chart and Corrupted Dale's Cone."

Wiman and Meierhenry

As shown by *Exhibit 12*, the names "Wiman and Mierhenry [sic]" are often alluded to as possible sources for the mythical retention chart embedded in the "cone of learning." Like Dale and Dwyer, these are the names of actual scholars in educational media. However, neither of them ever wrote about retention rates or cones of learning.

Who Are Ray Wiman and Wes Meierhenry?

Raymond V. Wiman (1925–1991) had a long career on the faculty of Education at the University of Iowa, teaching and directing the graduate program in educational media. He received a BA from Arizona State University and an MA from San Francisco State College. After years of teaching at the elementary and secondary level, he attained the EdD degree at the University of Nebraska. His connection with the corrupted cone came as a result of his editing partnership with Wes Meierhenry (Wiman & Meierhenry, 1969).

Wesley C. Meierhenry (1915–1989) was a leading scholar in educational technology from the 1940s through the 1970s. He was a life-long Nebraskan, first a teacher, coach, and superintendent in public

schools, then a professor at the University of Nebraska after receiving his PhD there in 1946. He came to national fame as program administrator of the Nebraska Program of Educational Enrichment Through the Use of Motion Pictures, a four-year research project begun in 1946 to demonstrate how films could be integrated into the school curriculum. It involved hundreds of teachers in dozens of schools across Nebraska.

He worked in the extension division and the department of adult and continuing education as well as serving as assistant dean in the Teachers College at the University of Nebraska. He was unsurpassed as an analyst of new and emerging innovations in education—from film and correspondence study in the 1940s to educational television in the 1950s to programmed instruction in the 1960s to instructional theory in the 1970s. He served as president of the Department of Audio-Visual Instruction (DAVI), predecessor of AECT, in 1967–1968. An endowed chair at the University of Nebraska has been named in his honor.

What Did Ray Wiman and Wes Meierhenry Write?

Wiman was the author of a textbook and film series on audiovisual production (Wiman, 1972) and co-author of another on management of educational media service programs (Vlcek & Wiman, 1989); the latter was recognized as AECT's Publication of the Year. Meierhenry wrote dozens of influential articles, chapters, and monographs on innovations in educational technology in the 1940s through 1970s. Their one collaboration was as co-editors of *Educational Media: Theory into Practice* (1969), an anthology of commissioned chapters presenting new theoretical perspectives on the field that was then moving from audiovisual aids to a broader concern with the entire instructional system. (As part of their effort to promote application of instructional research, they specified that the book be printed with dark brown type on camel colored paper, based on recent research on readability.)

Neither Wiman nor Meierhenry ever wrote about retention formulas or about Dale's Cone of Experience, which by the time of their anthology was already "old news," having been in the literature since 1946. Their names are dragged into this discourse through an incorrect attribution of two different chapters that appeared in their anthology:

- Wiman, R. V., & Meierhenry, W. C. (Eds.). (1969). *Educational media: Theory into practice*. Columbus, OH: Charles E. Merrill Publishing. This interdisciplinary collection is meant to provide both theoretical and practical grounding to professional practice in the emerging field of instructional technology. Wiman and Meierhenry

provide the opening and closing chapters of the book, but neither chapter makes any reference to Dale's Cone, contrary to popular attribution.

Compare this citation with the erroneous attribution shown in *Exhibit 12*. Note the correct spelling of Wesley C. Meierhenry's name; virtually all perpetrators of this spurious citation spell it incorrectly. In addition, virtually all perpetrators also refer to "Wiman and Mierhenry" as authors, whereas they are editors of the book. In reality, two different contributors in the Wiman and Meierhenry anthology make passing reference to Dale's Cone—Randall Harrison and Donald K. Stewart:

- Harrison, R. (1969). Communication theory, in R. V. Wiman & W. C. Meierhenry (Eds.), *Educational media: Theory into practice*. Columbus, OH: Charles E. Merrill Publishing Company (pp. 59–92). On page 75 Harrison says "Edgar Dale's 'cone of experience' deals with the coding of information along an iconicity dimension." There is, properly, no mention of any percentage figures in connection with the cone.
- Stewart, D. K. (1969). A learning-systems concept as applied to courses in education and training, in R. V. Wiman & W. C. Meierhenry (Eds.), *Educational media: Theory into practice*. Columbus, OH: Charles E. Merrill Publishing Company (pp. 134–171). Stewart's chapter is about a systems approach to instructional design; in it, he advocates the design of learning environments that reproduce or simulate the conditions of on-the-job performance, and he ranks learning experiences into categories arranged pyramidally in his Figure 6–20 (p. 161). The accompanying narrative states "Figure 6–20 is, in a sense, a continuum ranging from abstract to concrete." Stewart's footnote to this sentence says "Based in part on Edgar Dale's 'Cone of Experience' as presented in his *Audio-visual methods in teaching*" (p. 160). This is one of two passing references to Dale's Cone in this book. It, of course, makes no mention of any percentages.

William Glasser

Some of those incorrectly identified as sources of the "cone of learning" have a connection so tenuous as to be virtually nonexistent. William Glasser (see *Exhibit 8*) falls into this category.

Who Is William Glasser?

Dr. William Glasser (1925–2013) was primarily a psychiatrist, advocating reality therapy, an alternative method of psychotherapy practiced by thousands internationally. He attended medical school at Case Western Reserve, took psychiatric training at the Veterans Administration Hospital in West Los Angeles

and UCLA (1954–1957), became board certified in 1961, and was in private practice from 1957 to 1986. He rejected Freudian theory and developed his own theory, based on choice theory and rooted in motivation.

What Did William Glasser Write?

Dr. Glasser's first popular book, *Reality Therapy* (1965), was a best-seller and became the foundation for a series of how-to books about resolving psychological problems by accepting responsibility for them. A 1969 sequel, *Schools Without Failure*, translates choice theory into a classroom model of team learning with emphasis on satisfaction and excitement. Glasser pursued the quest for educational reform with books in the 1990s on "quality schools" and "quality teachers." However, nowhere in these works did Glasser refer to or claim credit for any version of the mythical retention chart or the corrupted Dale's Cone. All attributions to him are simply bogus, despite the fact that the Website operated by his business expressed a willingness at one time to accept credit, as is shown in *Exhibit 8*.

Paul J. Phillips

Colonel Phillips, like the Hoban-Hoban-Zisman team, is not that visible in the literature of the mythical retention chart, but perhaps he ought to be. Some commentators believe he may be the person most responsible for formulating the canonical version of the retention chart (see *Figure 5*) and for popularizing its use among the American corporate training community.

Who Is Paul J. Phillips?

Paul John Phillips (1900–1950) spent the first part of his career as an instructor in automotive technology at Oklahoma A&M University, after receiving an MS degree in trade and industrial education at that institution. He then spent two summers—1939 and 1940—at the University of Texas Division of Extension, preparing manuals for oil field workers on internal combustion engines and pipeline compressors (Cyrus, 1963). He entered World War II (serving from 1940 to 1946) as a Reserve officer, and Captain (later Lieutenant Colonel). Phillips was assigned as director of the Training Methods Branch of the Army's Ordnance School at Aberdeen Proving Ground, in Maryland, based on his prior experience in vocational education. His duties were to "(1) train officer instructors in 'how to instruct,' (2) to inspect classes in the Ordnance School for the purpose of rating instructors, and (3) to prepare a 'Manual for Ordnance Instructors'" (United States Army, 1943, p. 85).

The history of the Ordnance School goes on to recount that Phillips's staff grew to include nine

instructors and a clerk-typist (p. 86). Phillips and his team developed a 30-hour course of "practical teaching procedures and techniques" and an accompanying manual. By March 1943 some 14,000 men had received training and some 850 inspections of instructors had been conducted (p. 89). There is no mention in this history of any organized program of research or of the addition of any specialized staff to carry out research, at least up to March 1943.

What Did Paul J. Phillips Write?

There are no publications by Col. Phillips to be found in the literature of education or training. After his discharge in October 1946, Col. Phillips returned to the University of Texas, where he continued with his previous work. Cyrus (1963) testifies that it was Phillips who provided the content of the retention chart incorporated in the Texas Extension Division's "passout sheet 'Some Training Principles,' TIM-151" before his untimely death in 1950. This handout had sketches added in 1955 and was apparently used for quite some time, possibly until the time of Cyrus's 1963 letter and beyond. Cyrus says the sheet is "used in 'Methods of Teaching' classes and other instructing situations." Given that Phillips had gained considerable stature as a "trainer of trainers" and that his organization continued to offer workshops for adult learners in the petroleum industry, it is entirely possible that his TIM-151 "passout sheet" got into the hands of many who turned around and used it in their own teaching. It is likely, therefore, that the modern American diffusion of the infamous retention chart gained momentum at the University of Texas in the post-war era.

The other question is the source of the data in the retention chart; is it based on gut feeling or on research-based findings? The history of the Ordnance School provides no evidence that Phillips was involved in systematic research, at least not between 1940 and 1943. Nor is there any claim in the historical record of the data coming from any research at an oil company or at the University of Texas.

On the other hand, Cyrus's letter (1963) reports "Upon his return to this office, January 1, 1947, I remember his describing the tremendous number of individuals trained during the war years and the control and *experiments in teaching done with controlled, selected, and managed groups* [emphasis added] in training at Ordnance School." It is conceivable that some sort of structured research was conducted between 1943 and 1946. However, we know that various formulations of the retention chart were in existence as folklore even before the World War II period, as is discussed at length in "The Mythical Retention Chart and the Corruption of Dale's Cone of Experience." Since the retention chart

does not refer specifically to any modern media, but only seeing and hearing, the formulation could have been ginned up at any point in history.

D. G. Treichler

There is one clearly established, published source of the canonical version of the mythical retention chart, shown in our *Figure 5*. It appeared in an article authored by D. G. Treichler in 1967.

Who Is D. G. Treichler?

DeForest Gordon "Treich" Treichler (1903–1970) served for many years as a training manager and advisor at Mobil Oil Corporation in New York City. He grew up in the Buffalo, NY area and joined Mobil in 1927 as a service station salesman. He had no formal education beyond the eighth grade, but obviously he was a man of great native ability, for he rose through the corporate ranks to organize Mobil's first full-scale audiovisual communication program in 1949 and to assist in the design of the company's model training center in 1956. Treichler was a stalwart in the corporate audiovisual community, frequently serving on planning committees and panel discussions, acting as an advocate for the use of audiovisual media in corporate communications.

What Did D. G. Treichler Write?

Treichler had only one known publication, composed at the end of his professional career, probably as a sort of valedictory:

- Treichler, D. G. (1967). Are you missing the boat in training aids? *Film and Audio-Visual Communication*, 1(14–16), pp. 29–30, 48. A broad ranging advocacy of the value of adopting modern visual media and using them based on current thinking from communication theory. Early in the article (p. 15) Treichler presents the infamous retention chart (it was his *Figure 5* and is substantially the same as our *Figure 5*); the accompanying narrative states:

Now what about retention? (See *Figure 5* for studies that indicate what people generally remember.) These figures, of course, are only approximate and subject to exceptions. However, they do indicate that the best way to persuade people to accept your ideas is through a well-illustrated visual aid presentation, especially one in which they participate." (p. 5)

Note that Treichler was not claiming originality for this chart, but he was claiming it was based on "studies"; by whom, he gives no indication. A bar graph later in the article, however, provides data about corporate audio-visual equipment use and is captioned "Socony-Mobil Oil Company, Inc." It is not surprising that some readers assumed that his reten-

tion chart was based on "studies" at that company (which they were not). On the title page, Treichler's affiliation is given as Mobil Oil Corporation, the successor to Socony-Mobil and Socony-Vacuum.

This is the earliest appearance we have found of the infamous retention data rendered into "chart" format in a published source, although the retention data clearly existed before 1967, since Treichler treats the information as so well-known that no attribution is needed. Clearly, Treichler did not create the retention data and did not claim to. As recounted in "The Mythical Retention Chart and the Corruption of Dale's Cone of Experience," various folkloric versions of the retention figures have been noted at least as far back as the early 1900s. And some version of the retention figures was being promulgated at the University of Texas extension division—Paul J. Phillips's work—since the late 1940s.

It must also be noted that at this point in time none of these authors were drawing any connection with Edgar Dale's Cone of Experience. These authors were not involved in, and were probably unaware of, the academic world of audiovisual education.

Treichler's article is the lead article in Volume 1, Number 1 of the new periodical, *Film and Audio-Visual Communication*, so it probably garnered special attention from corporate training readers, and might have lent credibility to the retention chart, aiding its acceptance among this audience. This article is the source used by Frank Dwyer to establish the "canonical" version of the retention chart. Even though Dwyer intended the chart as a negative example of the scientific knowledge base on learning and retention, Dwyer's mention gave the chart a degree of credibility.

Bruce R. Nyland

One of the more mysterious false attributions of the "cone of learning" is the one linking the corrupted cone with Edgar Dale and someone named Nyland (occasionally "Ryland"), as shown in *Exhibits 4* and *5*. The implication is that a person named Nyland, at some point in the life cycle of this myth, presented a visual showing some version of the mythical retention data overlaid on Dale's Cone of Experience. Both *Exhibit 4* and *Exhibit 5* mention the first name of Bruce to go with the last name of Nyland or Ryland. To the best of our investigative abilities, we have been able to identify one real-life person who is most likely to be the person referred to in these citations—Bruce R. Nyland.

Who Is Bruce R. Nyland?

Bruce R. Nyland (1938–1998) spent most of his career as a substance abuse counselor and educator to the civilian staff at Fort Eustis, Virginia. He studied

philosophy at Baldwin-Wallace College (AB) and Northwestern University (MA) and taught philosophy at the College of William and Mary in Williamsburg, Virginia from 1968 to 1971. He then served at Fort Eustis from 1972 until his death in 1998, directing the Fort Eustis alcohol and drug abuse prevention and control program. During those years he often spoke to professional and community groups about alcohol and substance abuse and smoking cessation. In 1994 he received an award for his advocacy work for the American Stop Smoking Intervention Study for Cancer Prevention (ASSIST).

What Did Bruce R. Nyland Write?

Up to now, no published works of Bruce R. Nyland have come to light. We speculate that at one or more of Nyland's professional presentations he handed out a visual diagram similar to our *Figure 14* or *15*. We further speculate that one or more of the recipients went on to share this diagram with others. This speculation is based on our identification of a version of the corrupted cone that was disseminated among substance abuse professionals in the late 1970s. It appeared in a self-instructional manual distributed by the National Institute on Drug Abuse:

- Bauman, A. R. (1979). *Training of trainers: Trainer's manual*, revised May 1977. Rockville, MD: US Department of Health, Education, and Welfare; National Institute on Drug Abuse of the Alcohol, Drug Abuse, and Mental Health Administration, Public Health Service. This self-instructional manual was designed as a rather comprehensive guide for novices in all the basic skills of being a trainer in an adult learning setting. Its ten modules cover the topics of learning theory, group process, needs assessment and specification of objectives, designing training activities, small-group presentations, individual presentations, evaluation, trainer interventions, and using training materials.

A corrupted cone, similar to our *Figure 14*, is featured on page I-39 in the module on Learning Theory. The page is entitled "Dale's Cone of Experience." A corrupted cone including the mythical retention percentages—not Dale's Cone—is used to illustrate "an important learning principle, supported by extensive research"... "that persons learn best when they are actively involved in the learning process." The author incorrectly cites "Wiman & Mierhenry" as the source.

Bruce Nyland may be one of many substance abuse counselors who used this self-instructional manual and adapted its contents to his own outreach efforts.

James E. Stice

Prof. Stice is an example of a well-meaning scholar

who innocently accepted the widely circulated corrupted cone as a legitimate scholarly product. He has been for many years a champion of instructional innovation in the field of engineering education. In a 1987 article primarily devoted to the possibilities of using Kolb's learning cycle to improve student learning, he alluded to "some data from the old Socony-Vacuum Oil Company" that aligned with some retention figures he had received privately from a colleague (Stice 1987, p. 293). The text includes a retention chart similar to our *Figure 5*, with Stice stating that he has no other information as to the source. Neither the "Socony-Vacuum's" nor the colleague's retention data were actually traced back to any research source. Unfortunately, Stice's support for the mythical retention data attracted a large following in engineering education.

Who Is James E. Stice?

James E. Stice (b. 1928) has been a faculty member at the University of Texas since 1968, teaching primarily in the area of chemical engineering. He received the BSChE degree from the University of Arkansas in 1949 and the PhD from the Illinois Institute of Technology in 1963. Although he retired from teaching in 1996, he has continued the work he started in 1973 at the Center for Teaching Effectiveness. He has received a dozen teaching awards and other honors for his contributions to teaching excellence and has authored and co-authored numerous articles and chapters on engineering education.

What Did James E. Stice Write?

As an accomplished researcher and teacher in the field of chemical engineering, Stice has accumulated a hefty dossier of publications. Most relevant to present purposes are his more recent works on engineering education, a dozen or so since the 1980s. The article that garnered the most attention:

- Stice, J. E. (1987). Using Kolb's learning cycle to improve student learning. *Journal of Engineering Education*, 77(5), 291-296. The article focuses on the learning-style inventory developed by David Kolb (1984). Kolb's four-stage learning cycle claims that concrete experiences form the basis for observations and reflection; these observations lead to concepts from which new implications for action can be deduced, serving as guides for action and for creating new concrete experiences, completing the cycle. Stice suggests how this notion can be used to radically improve engineering education.

As is discussed at greater length in "The Mythical Retention Chart and the Corruption of Dale's Cone of Experience" in this special issue, in private communications with the authors Stice reports that he received

the retention chart as a handout in a “train the trainer” workshop around 1970. In any event, this paper attracted a cascade of followers, firmly entrenching Stice—and the “Socony-Vacuum” retention chart—in the engineering education literature.

Eventually someone questioned the legitimacy of these claims and carried out a network analysis of citations to identify the source(s) of the fallacious retention chart (Holbert & Karady, 2008). Their analysis centered on Stice as the most frequently cited source, with a link back to Treichler (1967) as the only earlier published purveyor of the retention data. Holbert and Karady urged their colleagues to cease reference to this “unsupported statement.” In fact, Stice (2009) subsequently penned an earnest and wholehearted retraction.

Conclusions

Looking at the *dramatis personae* in this drama, we note that the people who are most often cited as authoritative sources of the corrupted cone either had nothing to do with it (William Glasser, Ray Wiman, Wes Meierhenry) or lacked credible backgrounds as possible creators of a research-based intellectual product in the field of educational technology (Nyland, Phillips, Treichler). A parallel conclusion is that authors who are most expert in the area encompassed by the corrupted cone are the most critical of its plausibility (e.g., Frank Dwyer).

The corrupted cone is a mythological will-o-the-wisp, a mirage arising out of marsh gas, most seductive to those without the professional background to assess the credibility of the various bogus claims that have been made. It lends a sense of scientific support to an oversimplified concept that obviously appeals to those seeking easy answers about selecting instructional media and methods.

Educators and trainers wish that the corrupted cone were valid. When disseminating it to others, they want to signify its scientific credibility so they attach a reference, usually lifted from a handout they received at a conference or saw on a Website.

In this way inaccurate or non-existent references have gained a foothold, not so much in the formal literature but in the ephemeral sphere, merely by being repeated by generation after generation of borrowers. We hope this small contribution helps stem that tide of misinformation. □

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Exhibits in Special Issue

The quotations in the Exhibits in this issue, beginning on page 39, represent a sample of the myriad attempts that have been made to offer some sort of scholarly credibility for the mythical retention data or the corrupted cone. They are not meant to be read independently, but are referenced in the articles in this issue. Our main intention is to list for the record some examples of spurious attributions that have been concocted by various authors. Further, we are showing these citations in context so the reader can appreciate more fully the struggles that other authors have endured in order to try to find wording—often vague and evasive—to prop up attributions which they know are not on solid ground. (The Exhibits are listed in alphabetical order by name of purported author, except for *Exhibit 13*, which is a letter, not a citation.)

All of the citations shown in this list of Exhibits are INCORRECT, in whole or in part. Some of them do refer to actual published works and may be technically accurate in terms of naming a real author, book, and publisher, but even these are incorrect in that the source does not actually say what the writer claims it says. For example, a reference to Dale's Cone plus the mythical percentages may cite "Dale, 1946," as in *Exhibit 3*. There is a book written by Edgar Dale in 1946, and while it does contain the original Cone of Experience, it definitely does not contain the mythical percentages.

Some refer to an actual work but get the author—and/or content—wrong. For example, one of the most frequently used spurious citations is "Wiman and Mierhenry" [sic], *Exhibit 12*. There is an anthology edited by Ray Wiman and Wes Meierhenry (note correct spelling), but it contains no chapters about Dale's Cone. However, two chapters (not written by Ray Wiman or Wes Meierhenry) do contain footnotes referring peripherally to the original Dale's Cone, but not to the mythical retention figures or the corrupted cone that incorporates those percentages. The frequent repetition of the incorrect spelling of Meierhenry's name is further indication that the abusers of this citation are copying from other users, not actually consulting the original source.

Most of the exhibits are earnest attempts to put academic window dressing on information borrowed from a non-academic source. The user saw the information in a handout at a conference and grasped at any handy name that seemed associated with the data; see *Exhibit 4*, for example.

In some cases authors are reduced to citing previous works of their own, works in which they first offered the mythical retention data, vaguely citing one of the other spurious sources, as in *Exhibits 6 and 9*.

Some of the references, such as *Exhibit 2* and *Exhibit 7*, are totally fallacious, and probably consciously so.

These inaccurate or non-existent attributions are shown as examples of the many attempts people have made to find scholarly cover for their use of the mythical retention data or corrupted Dale's Cone. The Editors implore readers to resist the temptation to ever consider repeating any of these bogus citations.

—The Issue Editors

Timeline of the Mythical Retention Chart and Corrupted Dale's Cone

Deepak Prem Subramony

Grand Valley State University

Michael Molenda

Indiana University

Anthony K. Betrus

State University of New York at Potsdam

Will Thalheimer

Work-Learning Research, Inc.

Using a table format, the authors trace the chronological development of the concepts of (a) the mythical retention chart, (b) Edgar Dale's "Cone of Experience," and (c) the combination of the retention data and the Cone into the corrupted cone.

Objective

In this special issue we are trying to trace the origins and evolution of three different concepts—the mythical retention chart, the real Dale's Cone of Experience, and the corrupted cone, the illegitimate overlay of the retention data on some version of Dale's Cone.

In order to follow these moving targets, we have prepared a rough chronological timeline. The timeline shows separate streams of development for the retention chart and the Cone of Experience up until 1970, when we have the first credible claim of seeing the two concepts combined into the corrupted cone.

The events shown in the timeline are chosen for illustrative purposes. These are events for which we have adequate documentation and dating. The actual trail of diffusion of these three problematic concepts is actually far broader and vaguer. We are merely attempting to show the skeletal outlines of the diffusion story as it developed in the United States. □

The Timeline

Years	Mythical Retention Chart	Dale's Cone of Experience
Before 1900?	Folkloric formulas about retention, More primitive than the later retention chart ¹	
Early 1900s	Folkloric formulas about retention, some similar to the later retention chart	
	1913 <i>Journal of Education</i> : "We remember 2/10 of what we hear, we remember 5/10 of what we see, we remember 7/10 of what we touch, we remember 9/10 of what we do." ²	
	1914 Calkins speech: "We remember 10% of what we hear, 15% of what we read, and 20% of what we see" ³	
1920s	1920 <i>Kansas City Times</i> : "It is an old maxim in education that we remember 5% of what we hear and 50% of what we see." ⁴	
	1922 <i>County Agents</i> : "We remember about ten or fifteen percent of what we read and about eighty-seven percent of what we see and do" (p. 1)	
	and "the average person retains only about ten percent of what he reads and about eighty-five percent of what he sees." (p. 8) ⁵	

The Timeline (cont.'d)

Years	Mythical Retention Chart	Dale's Cone of Experience
1930s		1937 Hoban, Hoban, & Zisman publish <i>Visualizing the curriculum</i> : includes visual schema that is a precursor to Dale's Cone of Experience. ⁶
1940s	Late 1942-late 1946 Col. P. J. Phillips offers instructor training at Ordnance School. ⁷	1946 Edgar Dale's AV textbook published, contains original "Cone of Experience." ⁸
	1947 Phillips returns to Univ. of Texas, develops handout TM-151, which reportedly contains retention data. ⁹	
1950s		1954 Edgar Dale's AV textbook 2nd edition published, contains "Cone of Experience" in its final form. ¹⁰
	1955 U. Texas handout TM-151 revised, (reportedly showing retention chart in full form). ¹¹	
	1957 Curl (in 1971) reports seeing retention chart in a college class. ¹²	
	1957 <i>Bureau of Naval Personnel</i> : "...we remember approximately 10 percent of what we hear, 20 percent of what we read, 50 percent of what we see, and 90 percent of what we do." ¹³	

The Timeline (cont.'d)

Years	Mythical Retention Chart	Dale's Cone of Experience
1960s	<p>1961 <i>USDA Radiological Training Manual</i>, "We remember... 10% of what we hear, 50% of what we see, and 80% of what we do."¹⁴</p> <p>1964 <i>UW Bureau of Audio-Visual Aids</i>, "We retain 10% of what we read, 20 of what we hear, 30 of what we see, 50 of what we see and hear, 70 of what we say as we talk, and 90 of what we say as we do a thing."¹⁵</p>	<p>1969 Wiman & Meierhenry's <i>Educational Media</i> published; contains two peripheral references to Dale's Cone (none to retention chart).¹⁷</p>
1970s	<p>1970s Stice (in 2014) reports having seen the corrupted cone at a "Train the Trainer" workshop at Univ. of Wisconsin-Eau Claire.¹⁸</p> <p>1977 <i>Training of Trainers</i>, by Ann R. Bauman; so far, the earliest clearly documented, published combination of retention chart and Dale's Cone—the corrupted cone.¹⁹</p> <p>1977 <i>Family Cluster Programs</i> by R. Ted Nutting, another version of the corrupted cone appearing in a published book.²⁰</p> <p>1979 <i>Instructor Training Course</i>, US Dept. of Labor "The Cone of Experience illustrates...we retain only about 10% of what we hear, but up to 90% of a simulated experience."²¹</p>	

The Timeline (cont.'d)

Years	Mythical Retention Chart	Dale's Cone of Experience
	<p>1971 Curl's column; first known published refutation of the myth of the retention chart.²²</p> <p>1978 Dwyer's <i>Strategies for improving visual learning</i> published; includes critique of retention data, with Treichler's version as example.²³</p>	
1980s		<p>1980s Corrupted cone being slowly disseminated through slides and handouts at classes, training workshops, and conference presentations.</p> <p>1986 <i>US Department of Labor</i>: "You have also learned that, as a learning animal, we retain: 10% of what we read, 20% of what we hear, 30% of what see, 50% of what we both see and hear, 80% of what we say, 90% of what we say as we do a thing and experience it." (Display 20)²⁴</p>
1990s		<p>mid-1990s World Wide Web begins to expand rapidly; diffusion of corrupted cone gains momentum.</p>
2000s		<p>2002 and following Debunking of the corrupted cone begins (Januszewski & Betrus, 2002)²⁵ (Thalheimer, 2003)²⁶ (Subramony, 2003)²⁷ (Molenda, 2004)²⁸ (Holbert & Karady, 2008)²⁹</p>

The Timeline (cont.'d)

Years	Mythical Retention Chart	Dale's Cone of Experience
2010s	Diffusion of the corrupted cone continues unabated: Google search shows these results in 2014: <ul style="list-style-type: none"> • 11,000 "Dale's Cone" • 14,500 "Cone of Learning" • 15,100 "Dale's Cone of Learning" • 70,000 "Dale's Cone of Experience" • 176,000 "Cone of Experience" <p style="text-align: center;">–plus–</p> 145 hits for "Cone of Experience" for videos on YouTube	

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Figures for Special Issue

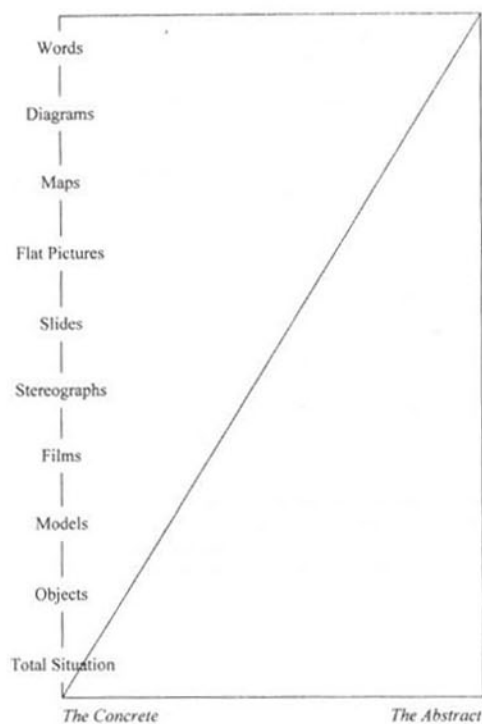


Figure 1. Hoban, Hoban, & Zisman's media/abstractness diagram, 1937

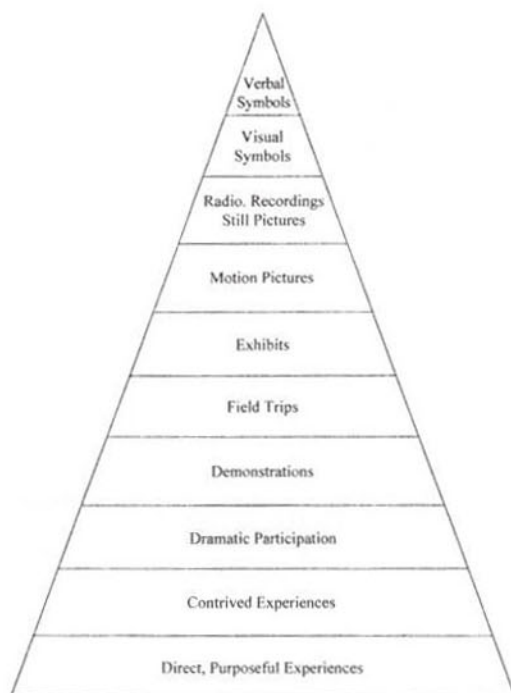


Figure 2. Dale's Cone of Experience, 1946 edition

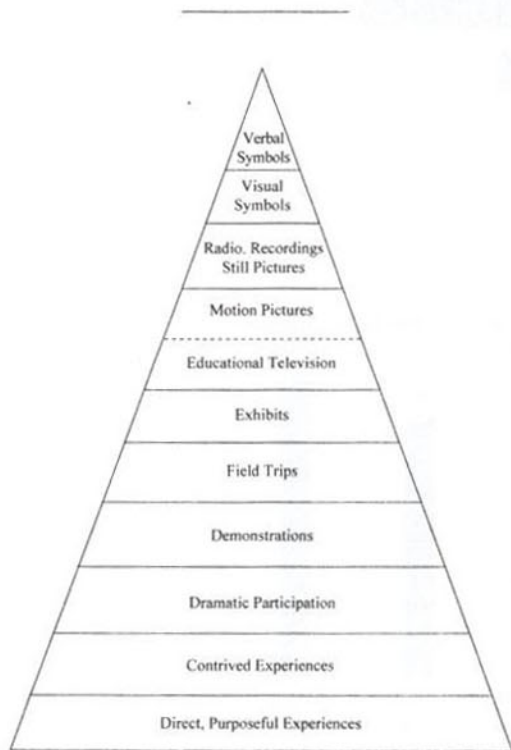


Figure 3. Dale's Cone of Experience, 1954 and 1969 editions (Television added)

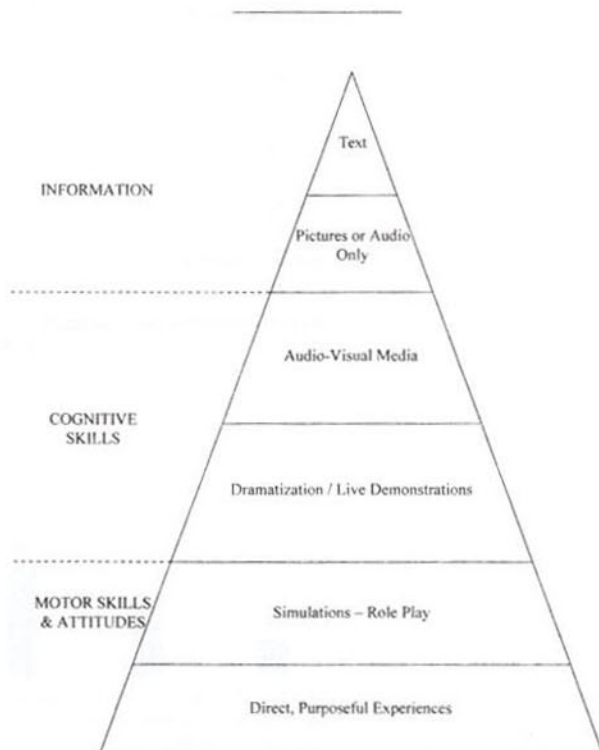


Figure 4. Dale's Cone modified (categories condensed) plus Learning Objectives

People generally remember	
10% of what they	READ
20% of what they	HEAR
30% of what they	SEE
50% of what they	HEAR & SEE
70% of what they	SAY
90% of what they	SAY AS THEY DO A THING

Figure 5. Retention data in chart format à la Treichler, 1967

We learn:	
10%	of what we read
20%	of what we hear
30%	of what we see
50%	of what we see and hear
70%	of what we discuss with others
80%	of what we experience personally
95%	of what we teach to someone else

Figure 6. Retention chart modified with altered numbers, expanded categories, and shift of claim from retention to learning

Learners retain approximately:	
90%	of what they learn when they teach someone else/use immediately
75%	of what they learn when they practice what they learned
50%	of what they learn when engaged in a group discussion
30%	of what they learn when they see a demonstration
20%	of what they learn from audio-visuals
10%	of what they learn from reading
5%	of what they learn from lecture

Source: NTL Institute for Applied Behavioral Science

Figure 7. Retention chart modified with altered numbers, expanded categories, and shift of claim to learning and retention, plus spurious source

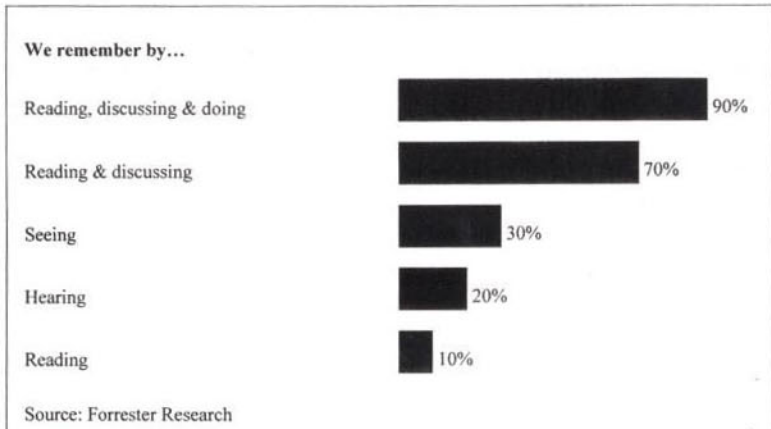
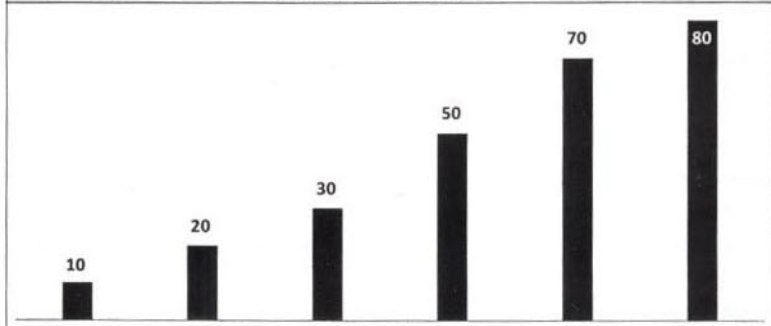


Figure 8. Retention chart modified with altered numbers and converted to horizontal bar graph, plus spurious source



Chi, M. T. H., Bassok, M., Lewis, M. W., Reimann, P., & Glaser, R. (1989). Self-explanations; How students study and use examples in learning to solve problems. *Cognitive Science*, 13, 145-182

Figure 9. Retention chart modified with altered numbers and converted to vertical bar graph, plus spurious journal citation

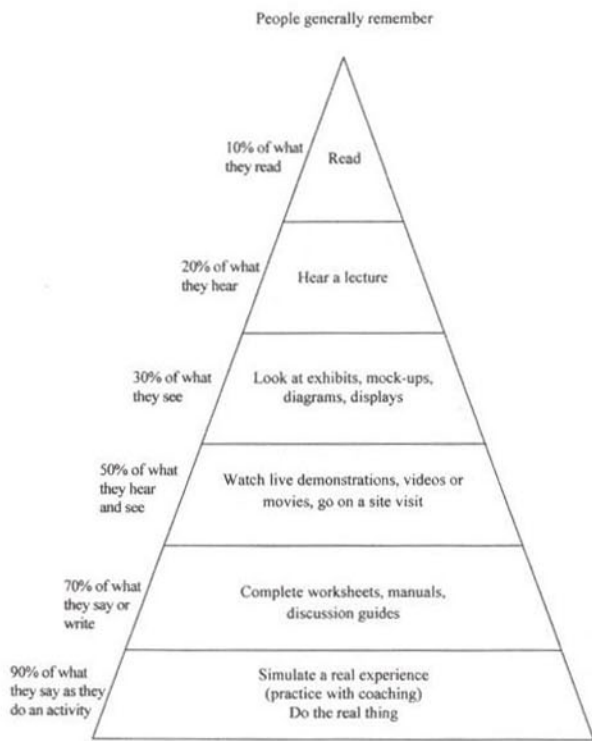


Figure 10. Dale's Cone condensed and truncated, with retention data aligned

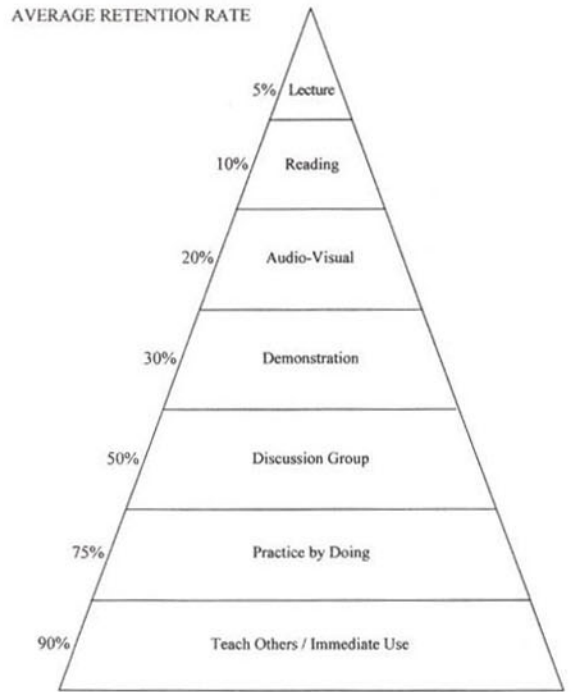


Figure 11. Dale's Cone modified, with retention data aligned

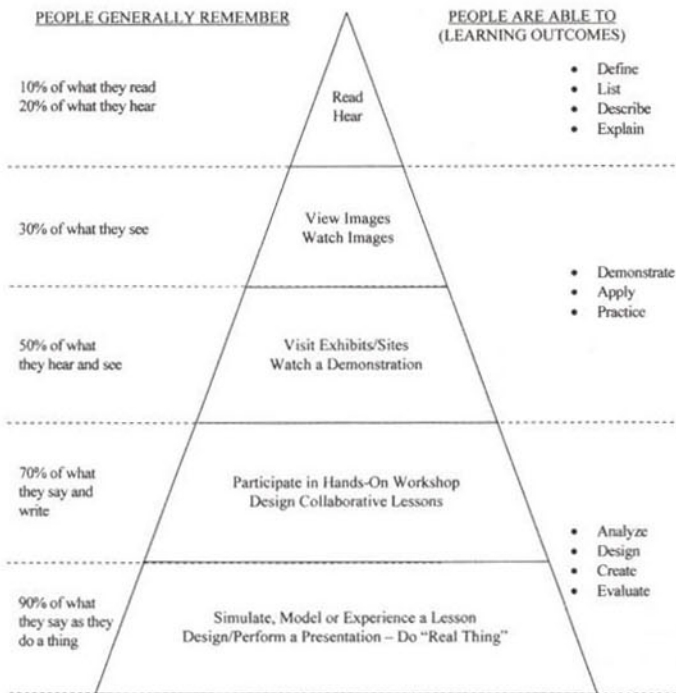


Figure 12. Dale's Cone modified, with retention data aligned, plus "Learning Outcomes"

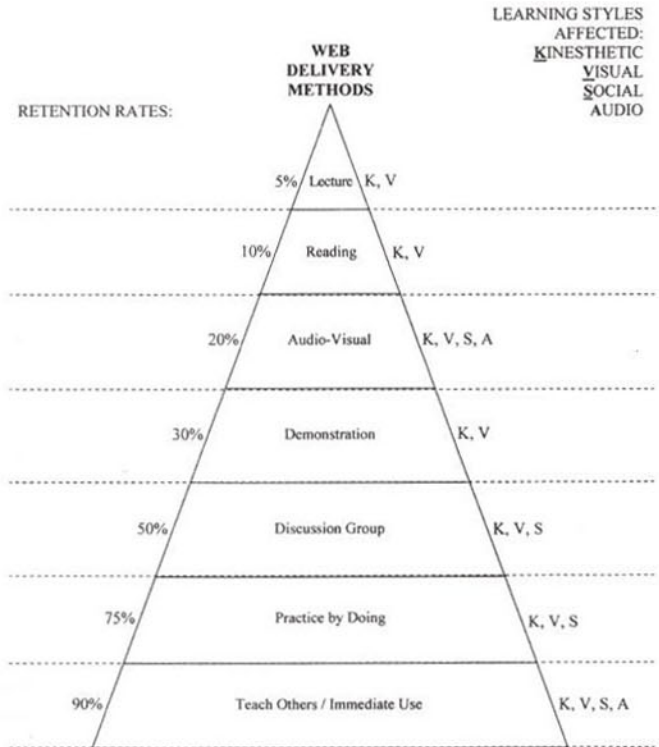


Figure 13. Dale's Cone modified, with retention data modified and aligned, plus "Learning Styles"



Figure 14. Dale's Cone modified (question marks added), with retention data aligned, plus "Nature of Involvement"

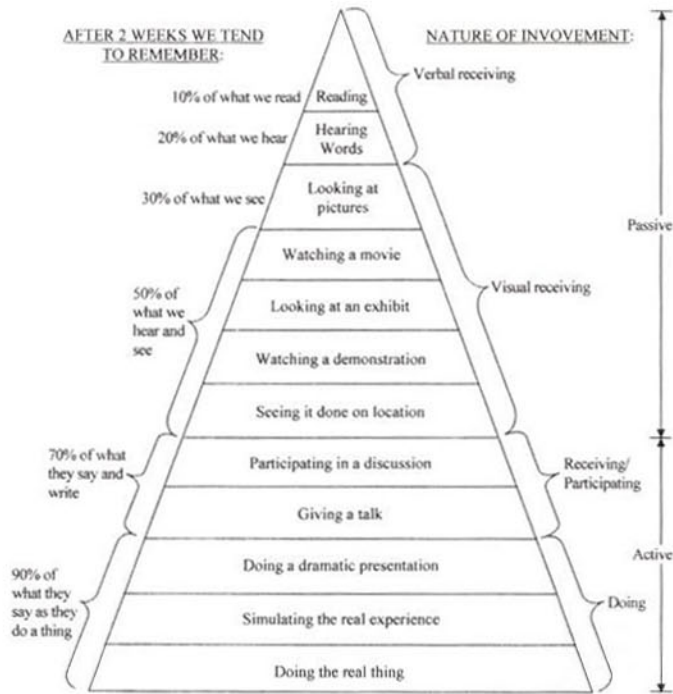


Figure 15. Dale's Cone heavily modified, with retention data aligned, plus "Nature of Involvement" and "Active/Passive"

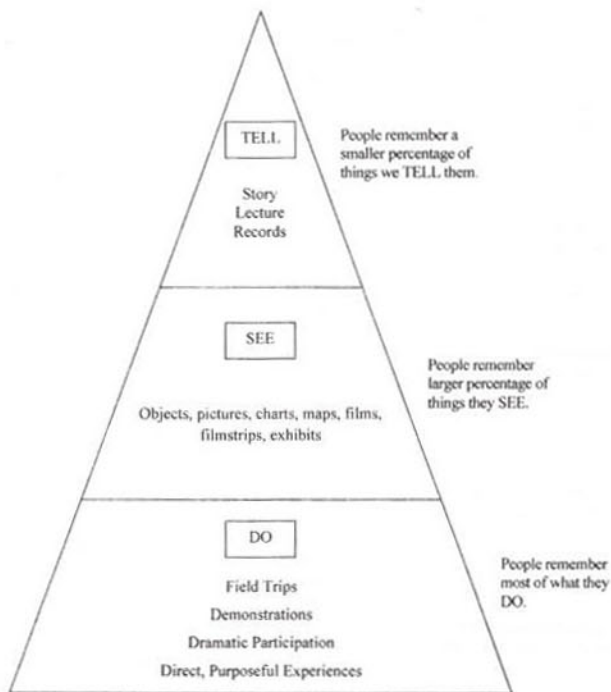


Figure 16. Dale's Cone and retention data condensed into three categories

Exhibits for Special Issue

Example #1:

Developing Professional Skills from the Higher Education Academy at the UK Centre for Materials Education website. Available online at: <http://www.materials.ac.uk/guides/developing.asp>. Retrieved November 25, 2013.

Research commissioned by the **British Audio Visual Society** in 1988 suggests that we remember 10% of what we read, 20% of what we hear, 30% of what we see, 50% of what we see and hear, 80% of what we say and 90% of what we say and do at the same time.

UK Centre's website's References:

No reference is provided on the website.

Example #2:

Pollock, G. (1996). The essential elements of multimedia: Content is not the only answer. In C. McBeath and R. Atkinson (Eds), *The Learning Superhighway: New world? New worries?* Proceedings of the Third International Interactive Multimedia Symposium, 323-327. Perth, Western Australia, 21-25 January. Available online at: <http://cleo.murdoch.edu.au/gen/aset/confs/iims/96/lp/pollock.html>. Retrieved November 25, 2013.

Interactivity refers to the actions by the user and the resulting responses and feedback from the computer. In a learning context, the claim is the higher the level of interactivity the more successful will be the learning experience. These claims date back to an old Chinese proverb which states:

If you tell me, I will listen
If you show me, I will see
If you let me experience, I will learn

More current research, such as that conducted by the **British Audio-Visual Society**, has come up with various figures about how much information learners retain such as:

10% of what is read
20% of what is heard
30% of what is seen
50% of what is seen and heard
80% of what is spoken
90% of what is spoken and performed

Although the figures may differ from study to study, the conclusion remains the same - learning and retention increase as the learner is more involved.

Pollock's References:

No reference is provided by the author.

Exhibit 1. British Audio-Visual Society, 1988

Example:

Thalheimer, W. (2006). "People remember 10%, 20%...Oh Really?" *Will at Work Learning* blog, available online at: http://www.willatworklearning.com/2006/05/people_remember.html. Retrieved November 26, 2013.

My investigation of this issue began when I came across the following graph:

[See our Figure 9]

The Graph is a Fraud!

After reading the cited article several times and not seeing the graph---nor the numbers on the graph---I got suspicious and got in touch with the first author of the cited study, Dr. Michelene Chi of the University of Pittsburgh (who is, by the way, one of the world's leading authorities on expertise). She said this about the graph: "*I don't recognize this graph at all. So the citation is definitely wrong: since it's not my graph.*"

What makes this particularly disturbing is that this graph has popped up all over our industry, and many instructional-design decisions have been based on the information contained in the graph.

Thalheimer's References:

Chi, M.T.H., Bassok, M., Lewis, M.W., Reimann, P., & Glaser, R. (1989). Self-Explanations: How Students Study and Use Examples in Learning to Solve Problems. *Cognitive Science*, 13,145-182.

Exhibit 2. Chi, Bassok, Lewis, Reimann, & Glaser, 1989

Example #1:

Marshall, J.M. (2002). *Learning with technology: Evidence that technology can, and does, support learning*. White paper prepared for Cable in the Classroom.

Researchers posit that explanations presented in words and pictures, as opposed to words or pictures, make for increased comprehension (Mayer, 2001) for the learner. Dale's "**Cone of Experience**" (1946, 1996) provides evidence of these phenomena. Dale's research suggested that increasing the modalities by which content was presented could increase retention rates. Wiman and Mierhenry (1969) extended Dale's concept to conclude that people will generally remember

- 10 percent of what they read
- 20 percent of what they hear
- 30 percent of what they see
- 50 percent of what they hear and see

Marshall's References:

Dale, E. (1946). *Audiovisual methods in teaching*. New York: Dryden Press.

Dale, E. (1996). The cone of experience. In D.P. Ely and T. Plomp (Eds.), *Classic writings on instructional technology* (pp. 169-182). Englewood, CO: Libraries Unlimited.

Mayer, R.E. (2001). *Multimedia learning*. Cambridge, England: Cambridge University Press.

Wiman, R.V., and Mierhenry, W.C. (1969). *Editors, educational media: Theory into Practice*. Columbus, OH: Charles Merrill Publishing.

Exhibit 3. Dale, 1946, 1969, and 1996

Example #2:

Stice, James E. "Using Kolb's learning cycle to improve student learning," *Journal of Engineering Education*, vol. 77, no. 5, Feb. 1987, pp. 291-296

As previously discussed, each of the four different learning styles has its strengths and weaknesses. Not obvious on the face, however, is that learning (or at least retention) is enhanced as more of the learning stages are used. According to Dixon,³ 20 percent is retained if only AC is used; if both RO and AC are used, retention is increased to 50 percent; if one used CE+RO+AC, it rises to 70 percent; 90 percent is retained if all four learning stages are employed.

This sounds a little surprising, but the results are similar to some data from the old Socony-Vacuum Oil Company. (The source indicates the data are from the 1930s or 1940s, but I have no other information.)

The data:

Learning method	Retention by Learner
What they read	10%
What they hear	26
What they see	30
What they see and hear	50
What they say	70
What they say as they do something	90

If reading and hearing are concrete experience (CE) and seeing is reflective observation (RO), then the Socony-Vacuum numbers are nearly identical to Dixon's retention percentages for Kolb's model. Further credence is lent by similar figures reported for **Edgar Dale's**⁴ "cone of learning."

Stice's References:

3. Dixon, Nancy, private discussions, Austin, Texas

4. Dale, Edgar, *Audio-Visual Methods in Teaching*, (3rd edit.), Holt, Rinehart and Winston, 1969, p. 107.

Exhibit 3. Dale, 1946, 1969, and 1996 (cont.'d)

Example #1:

Holbert, K.E. and Karady, G.G. (2008). Removing an unsupported statement in engineering education literature. *Proceedings of the 2008 American Society for Engineering Education Pacific Southwest Annual Conference*, Flagstaff, AZ, March 27-28, 2008. Copyright © 2008, American Society for Engineering Education.

More recently, Prof. Stice stated in an email that he received that Socony-Vacuum Oil Co. data "as a one-page handout at a workshop I attended in the 1970s at the University of Wisconsin-Eau Claire [4]." Prof. Stice also notes that at the same workshop he obtained "a handout called 'the Cone of Learning,' as adapted by a **Bruce Nyland** after work done by Dr. **Edgar Dale**."

Holbert & Karady's References:

[4] J.E. Stice, "Socony-Vacuum study," email communication, May 12, 2007.

Example #2:

Gustafson, C.B. (Gus), Increased stimulation with audiovisual aids in training, *JEMS, a Journal of Emergency Medical Services*, June 1985, p. 61.

There is no discussion in the text, but the article includes an illustration, similar to our Figure 14, captioned "Cone of Learning" and giving this source: "developed and revised by **Bruce Nyland** from material by **Edgar Dale**."

Gustafson's References:

Neither Nyland nor Dale is listed in the article's References.

Exhibit 4. Dale and Nyland

Example:

Website of The William Glasser Institute (founder of reality therapy and choice theory). Available online at <http://www.wglasser.com/articles.htm>. Retrieved March 6, 2003.

Since we get requests about this quote quite often, and Dr. Glasser is not the originator, we thought you might be interested to know that Edgar Dale's "Cone of Experience" can be found in *Education Media* by Wiman and Mierhenry, Charles Merrill Publishers, 1969; *Experience and Learning* – Developed and revised by **Bruce Ryland** from material by **Edgar Dale**.

*"We learn 10% of what we read
20% of what we hear
30% of what we see
50% of what we see and hear
70% of what we say or write
90% of what we teach"*

William Glasser Institute's References:

The website does not give any further citations for any of the sources mentioned.

Exhibit 5. Dale and Ryland

Example:

Ekwall, E.E. & Shanker, J.L. (1988). *Diagnosis and remediation of the disabled reader*, 3rd ed. Boston: Allyn and Bacon.

The Socony Vacuum Oil Company (**Ekwall and Oswald**) did an interesting study on how humans learn in terms of retention. It has some important implications for diagnosis and remediation:

Students' Power of Retention

1. 10 percent of what they read
2. 20 percent of what they hear
3. 30 percent of what they see
4. 50 percent of what they see and hear
5. 70 percent of what they say as they talk
6. 90 percent of what they say as they do a thing (p. 370)

Ekwall & Shanker's References:

Ekwall, E.E., & Oswald, L.D. (1971). *Rx reading program—teacher's manual*. Glenview, IL: Psychotechnics, Inc.

Exhibit 6. Ekwall and Oswald, 1971

Example:

Thalheimer, W. (2006). "Another Guru Sharing the Same Old Myth." *Will at Work Learning* blog, available online at: http://www.willatworklearning.com/2006/12/another_guru_sh.html. Retrieved November 26, 2013.

And here's another example of a well-respected industry analyst lazily sharing the biggest myth in the learning field. This time it's from a Senior Industry Analyst with Forrester Research (October 19th, 2006).

[See our Figure 8]

Read my initial post describing how this myth got started, and how it harms our field and our learners. The source of the offending PowerPoint slide claims the data as their own ("Source: Forrester Research"). Yeah, I guess if you find false information on the web, then change it around a little bit to help you make your point, that you ought to cite yourself. Is it plagiarism if you steal a lie?

Thalheimer's References:

Thalheimer did not include any references. The original source, Forrester Research, falsely claimed ownership of the chart; they gave no citation of any other source. The claim has since been deleted from their website.

Exhibit 7. Forrester Research, 2006

Example #1:

Cowart, D. *Education for All*. Available online at: <http://principalcowart.blogspot.com/2009/02/how-we-learn-william-glasser.html>. Retrieved November 25, 2013.

How We Learn- William Glasser

10% of what we READ
20% of what we HEAR
30% of what we SEE
50% of what we SEE and HEAR
70% of what is DISCUSSED with OTHERS
80% of what is EXPERIENCED PERSONALLY
95% of what we TEACH TO SOMEONE ELSE
~William Glasser

Remember the lectures in college when the teacher just spoke and you were expected to listen and take notes? Well according to **Glasser** you might remember 20% of what the professor said. If you had a professor that showed notes, images, tables or graphs, you might remember 50% of what was said. This kind of teaching is so ineffective. Yet it is the style still used by most colleges, many high schools and middle schools and even in some elementary schools. Students need to experience things personally and have an opportunity to interact with others. Ultimately, we would want students to teach someone else something. Unfortunately that is not what always happens, even with the best intentions. But all students can work together when given the correct cooperative framework. When given this framework and a meaningful project or task, students will retain up to 80%.

Cowart's References:

The website does not give any citation.

Exhibit 8. Glasser

Example #2:

Schwed, A. & Melichar-Utter, J. *Brain-Friendly Study Strategies, Grades 2-8: How Teachers Can Help Students Learn*. Thousand Oaks, CA: Corwin Press.

Teachers need to integrate visual, auditory, and kinesthetic methods in order to reach learners who learn through different modalities. In the late 1960s, **William Glasser** popularized this point with the following concept:

WE LEARN

10% of what we read

20% of what we hear

30% of what we see

50% of what we both see and hear

70% of what is discussed with others

80% of what we experience personally

95% of what we TEACH to someone else (p. 19)

Schwed's References:

No reference is provided for the Glasser claim.

Exhibit 8. Glasser (cont.'d)

Example:

EDC's Center for Children and Technology, Corporation for Public Broadcasting. *Television goes to school: The impact of video on student learning in formal education*. Washington, DC: Corporation for Public Broadcasting, 2004.

We've all heard the proverb: "Seeing is believing." Research has shown that seeing is remembering, too. **Marshall** (2001) cites the conclusions of Wiman and Mierhenry (1969) who found that "...people will generally remember:

- 10% of what they read
- 20% of what they hear
- 30% of what they see
- 50% of what they see and hear."

EDC's References:

Marshall, J.M. (2002). *Learning with technology: Evidence that technology can, and does, support learning*. White paper prepared for Cable in the Classroom.

No full citation is given for "Wiman and Mierhenry."

Exhibit 9. Marshall, 2001

Example #1:

Wood, E.J. Problem-Based Learning: Exploiting Knowledge of How People Learn to Promote Effective Learning. *Bioscience Education E-Journal*, Vol. 3, May 2004. Available online at: <http://journals.heacademy.ac.uk/doi/pdf/10.3108/beej.2004.03000006>. Retrieved January 15, 2014.

The general consensus about the effectiveness of various teaching methods is summarised in the “learning pyramid” (Fig. 1) which has appeared in various forms, and this version of the diagram simply deals with how effectively students are thought to retain information (page 5)

Wood’s Figure 1 (page 4) is similar to our Figure 10.

Wood’s References:

Wood’s Figure 1 has this caption: “The Learning Pyramid. The learning pyramid originates from the **National Training Laboratories** (NTL) for Applied Behavioral Science, 300 N. Lee Street, Suite 300, Alexandria, VA 22314, USA. The percentages represent the average “retention rate” of information following teaching or activities by the method indicated. In fact this diagram was originally developed and used by NTL in the early 1960s at NTL’s Bethel, Maine, campus, but the organisation no longer has or can find the original research that supports the numbers given. In 1954 a similar pyramid with slightly different numbers had appeared in a book, *Audio-Visual Methods in Teaching*, published by the Edgar Dale Dryden Press, New York. Bligh (1998) gives some evidence for the effectiveness of different teaching methods.”

Example #2:

Academic Spaces That Improve Learning Outcomes on website of Tradeline. Available online at <http://www.tradelineinc.com/reports/2011-4/academic-spaces-improve-learning-outcomes>. Retrieved January 15, 2014.

Studies by the **National Training Laboratories** (NTL) of Arlington, Va., demonstrate how learning environments affect retention. The old-fashioned lecture format produces a 5 percent retention rate, while giving students an opportunity to practice by doing results in a 75 percent retention rate...

Tradeline’s References:

“This report is based on a presentation given by Colleen O’Connor Grochowski, Mary Jo Olenick, and Robert Pulito at Tradeline’s Academic Medical and Health Science Centers 2010 conference.”

Example #3:

Thalheimer, W. (2006). *NTL continues its delusions*. Will at Work Learning website. Available online at www.wilklatworklearning.com/myths_and_worse/index.html. Retrieved January 17, 2007.

Thalheimer reports on his personal correspondence with the NTL Institute, which included the following claim, which appears to be a “form” response sent to all who inquired:

Thanks for your inquiry of NTL Institute. We are happy to respond to your inquiry about The Learning Pyramid. Yes, it was developed and used by **NTL Institute** at our Bethel, Maine campus in the early sixties when we were still part of the National Education Association's

Exhibit 10. National Training Laboratories or NTL Institute

Adult Education Division. Yes, we believe it to be accurate - but no, we no any longer have - nor can we find - the original research that supports the numbers. We get many inquiries every month about this - and many, many people have searched for the original research and have come up empty handed. We know that in 1954 a similar pyramid with slightly different numbers appeared on p. 43 of a book called *Audio-Visual Methods in Teaching*, published by the Edgar Dale Dryden Press in New York. Yet the Learning Pyramid as such seems to have been modified and always has been attributed to NTL Institute.

To summarize the numbers (which sometimes get cited differently) learners retain approximately:

- >>90% of what they learn when they teach someone else/use immediately.
- >>75% of what they learn when they practice what they learned.
- >>50% of what they learn when engaged in a group discussion.
- >>30% of what they learn when they see a demonstration.
- >>20% of what they learn from audio-visual.
- >>10% of what they learn when they've learned from reading.
- >>5% of what they learn when they've learned from lecture.

Feel free to use the Learning Pyramid (below) as you wish without charge - and cite at the bottom - "NTL Institute for Applied Behavioral Science, 300 N. Lee Street, Suite 300, Alexandria, VA 22314. 1-800-777-5227."

["Learning Pyramid," similar to our Figure 10, is included in letter.]

References:

Thalheimer provided no further reference information. NTL provided only the inaccurate Dale citation.

Exhibit 10. National Training Laboratories or NTL Institute (cont.'d)

Example #1:

Stice, James E. "Using Kolb's learning cycle to improve student learning," *Journal of Engineering Education*, vol. 77, no. 5, Feb. 1987, pp. 291-296

As previously discussed, each of the four different learning styles has its strengths and weaknesses. Not obvious on the face, however, is that learning (or at least retention) is enhanced as more of the learning stages are used. According to Dixon,³ 20 percent is retained if only AC is used; if both RO and AC are used, retention is increased to 50 percent; if one used CE+RO+AC, it rises to 70 percent; 90 percent is retained if all four learning stages are employed.

This sounds a little surprising, but the results are similar to some data from the old **Socony-Vacuum Oil Company**. (The source indicates the data are from the 1930s or 1940s, but I have no other information.) The data:

<i>Learning method</i>	<i>Retention by Learner</i>
What they read	10%
What they hear	26
What they see	30
What they see and hear	50
What they say	70
What they say as they do something	90

Exhibit 11. Socony-Vacuum Oil Co. or Standard Oil of NY

If reading and hearing are concrete experience (CE) and seeing is reflective observation (RO), then the **Socony-Vacuum** numbers are nearly identical to Dixon's retention percentages for Kolb's model. Further credence is lent by similar figures report for Edgar Dale's⁴ "cone of learning."

Stice's References:

3. Dixon, Nancy, private discussions, Austin, Texas
4. Dale, Edgar, *Audio-Visual Methods in Teaching*, (3rd edit.), Holt, Rinehart and Winston, 1969, p. 107.

Example #2:

Golich, V.L., Boyer, M, Franko, P., & Lamy, S. (2000). *The ABCs of Case Teaching. Pew Case Studies in International Affairs*. Washington, DC: Institute for the Study of Diplomacy, Georgetown University.

The point is made by a study carried out by the **Socony-Vacuum Oil Company** that concludes that student retain 10% of what they read; 26% of what they hear; 30% of what they see; 50% of what they see and hear; 70% of what they say; and 90% of what they say and do.

Golich's References:

No source for this claim is given in the article's References.

Example #3:

Ekwall, E.E. & Shanker, J.L. (1988). *Diagnosis and remediation of the disabled reader*, 3rd ed. Boston: Allyn and Bacon.

The **Socony Vacuum Oil Company** (Ekwall and Oswald) did an interesting study on how humans learn in terms of retention. It has some important implications for diagnosis and remediation:

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6. 90 percent of what they say as they do a thing (p. 370)

Ekwall & Shanker's References:

Ekwall, E.E., & Oswald, L.D. (1971). *Rx reading program—teacher's manual*. Glenview, IL: Psychotechnics, Inc.

Example #4:

Dwyer, F. M. (1978). *Strategies for improving visual learning*. State College, PA: Learning Services.

Figure I-4 presents data distributed by the **Socony-Vacuum Oil Company** which illustrates the importance attributed to the visual medium in the learning process.

Dwyer's Reference:

Treichler, 1967, p. 15 (which does not actually attribute the retention data to "Socony-Vacuum Oil Co.")

Example #1:

Marshall, J.M. (2002). *Learning with technology: Evidence that technology can, and does, support learning*. White paper prepared for Cable in the Classroom. Washington, DC: Cable in the Classroom.

Researchers posit that explanations presented in words and pictures, as opposed to words or pictures, make for increased comprehension (Mayer, 2001) for the learner. Dale's "Cone of Experience" (1946, 1996) provides evidence of these phenomena. Dale's research suggested that increasing the modalities by which content was presented could increase retention rates. **Wiman and Mierhenry** (1969) extended Dale's concept to conclude that people will generally remember

- 10 percent of what they read
- 20 percent of what they hear
- 30 percent of what they see
- 50 percent of what they hear and see

Marshall's References:

Dale, E. (1946). *Audiovisual methods in teaching*. New York: Dryden Press.

Dale, E. (1996). The cone of experience. In D.P. Ely and T. Plomp (Eds.), *Classic writings on instructional technology* (pp. 169–182). Englewood, CO: Libraries Unlimited.

Mayer, R.E. (2001). *Multimedia learning*. Cambridge, England: Cambridge University Press.

Wiman, R.V., and Mierhenry, W.C. (1969). *Editors, educational media: Theory into Practice*. Columbus, OH: Charles Merrill Publishing.

Example #2:

Website of The William Glasser Institute (founder of reality therapy and choice theory), 1925-2013. Available online at: <http://www.wglasser.com/articles.htm>. Retrieved March 6, 2003.

Since we get requests about this quote quite often, and Dr. Glasser is not the originator, we thought you might be interested to know that Edgar Dale's "Cone of Experience" can be found in Education Media by **Wiman and Mierhenry**, Charles Merrill Publishers, 1969; Experience and Learning – Developed and revised by Bruce Ryland from material by Edgar Dale.

*"We learn 10% of what we read
20% of what we hear
30% of what we see
50% of what we see and hear
70% of what we say or write
90% of what we teach"*

William Glasser Institute's References:

The website does not give a full citation for any of the sources mentioned.

Exhibit 12. Wiman and Mierhenry [sic], 1969

THE UNIVERSITY OF TEXAS
DIVISION OF EXTENSION
AUSTIN 12

INDUSTRIAL EDUCATION DEPARTMENT
PHONE GR. 6-3271

Pers-C14-dmj
Ser. C14/1681
November 22, 1963
November 27, 1963

Mr. Michael B. Callahan
Head, Training Aids Branch
Department of the Navy
Bureau of Naval Personnel
Washington 25, DC

Dear Mr. Callahan:

The information in this letter will let you know where we got the percentages included on our sheet "Some Training Principles," TIM-151 (11-55). Originally this sheet was mimeographed; but with the revision in November, 1955, the sketches were added and the percentages are the same as appeared on our original sheet with the same TIM number. This content is on a passout sheet used in "Methods of Teaching" classes and other instructing situations.

In the summer, 1939, Paul John Phillips worked in this office and prepared an Educational Extension Training manual for oil field workers entitled Internal Combustion Engines. In the summer, 1940, Mr. Phillips again worked in this office and prepared a manual for Petroleum Industry Extension Training entitled Pipe Line Compressors. Mr. Phillips had a M.S. degree in Trade and Industrial Education and he was a regular instructor of Automotive Technology in Oklahoma A. and M. College. He was on short-time employment when he came to Texas in 1939 and 1940.

He did not return to Oklahoma A. and M. in September, 1940; rather, he accepted a position at the Aberdeen Maryland Army Proving Ground. Mr. Phillips was a reserve officer and as a reserve officer, he went to the Proving Ground to put in a year of service for his government. After this year was up tension was high and Mr. Phillips remained at the Proving Ground.

Records are not exactly clear but would indicate that Mr. Phillips was an instructor of Visual Aids from 1940 to 1946 at the Ordnance School, Aberdeen Proving Ground, Maryland. Upon his return to this office, January 1, 1947, I remember his describing the tremendous number of individuals trained during the war years and the control and experiments in teaching done with controlled, selected, and managed groups in training at Ordnance School.

The percentages and organization of our passout sheet "Some Training Principles," TIM-151 are those set down by Mr. Phillips shortly after he returned to this office. Unfortunately, Mr. Phillips died with some sort of spleen ailment March 3, 1950, and for that reason we have been unable to check with him when we have received letters similar to yours requesting verification.

This explanation will let you know where we originally got these percentages. Our classes are not organized in such a manner that we can experiment and check with controlled groups, but our experiences in teaching gives us no reason to question the apparent reasonableness of these percentages.

Sincerely yours,

Charles Cyrus
Training Specialist