Audiblox Theory

To fully understand what Audiblox is, it is necessary to know (1.) its point of departure and (2.) the learning principles on which it is based.

Its point of departure is that there is *nothing that any human being knows, or can do, that he has not learned.* This of course excludes natural body functions, such as breathing, as well as the reflexes, for example the involuntary closing of the eye when an object approaches it. But apart from that a human being knows nothing, or cannot do anything, that he has not learned. This implies that there is not necessarily anything wrong with a person who cannot do something. He does not necessarily suffer from a learning *dis*ability. He may simply not have learned it yet — and any person can learn almost anything, provided that he is taught according to *viable* learning principles.

There are three viable — and universal — learning principles on which Audiblox is based:

1. Learning is a Stratified Process

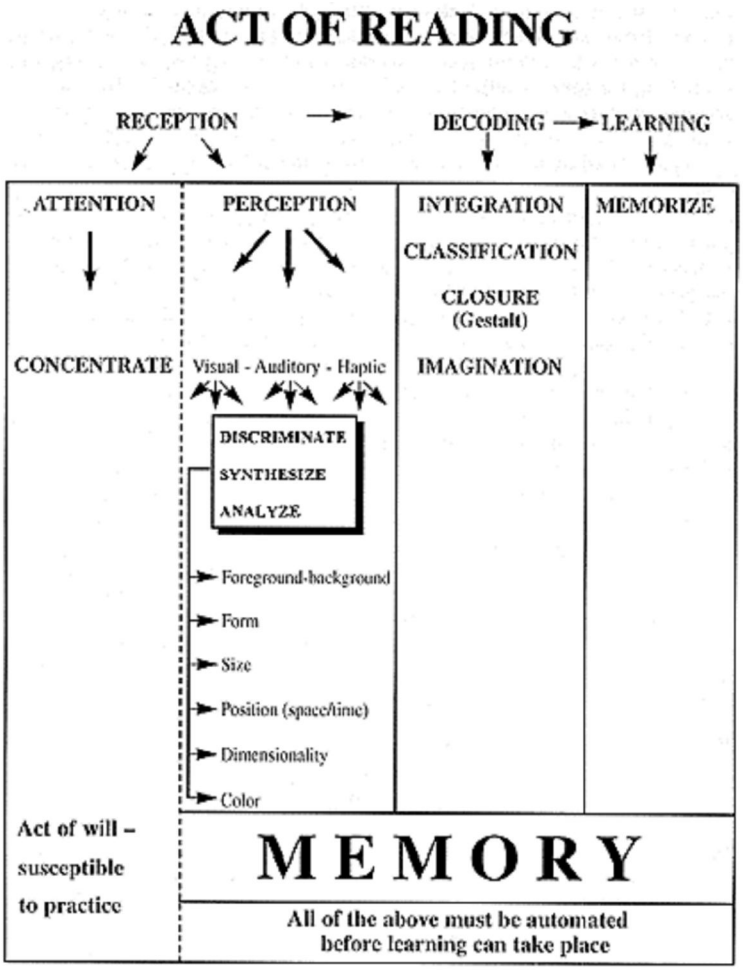
The first learning principle is that *human learning does not take place on a single level, but is a stratified process*. This characteristic is worldwide accepted as a didactic principle. The way in which the school system throughout the whole world is organized is an acknowledgement of this. One cannot send a child to university first. He must start in the first class and then progress year after year to the higher levels of education. Unless he has mastered a sufficient amount of the knowledge to form a firm enough base on which to build the knowledge of the following year, he will not make progress in the next class.

Another simple and practical example is the fact that one has to learn to count before it becomes possible to learn to add and subtract. Suppose one tried to teach a child, who had not yet learned to count, to add and subtract. This would be quite impossible, and no amount of effort would ever succeed in teaching the child to add and subtract. This shows that counting is a skill that must be mastered before it becomes possible to learn to do calculations.

This means that there is a sequence that is to be observed in teaching. Certain things have to be taught *first, before* it becomes possible to teach other things.

The main objective of the Audiblox program is to practice and automatize the skills that underlie reading, spelling, writing, mathematics and the learning of subject matter.

To illustrate the above-mentioned objective, reading will be used as an example. A schematic diagram of the act of reading is presented below, as well as a detailed explanation of the diagram:



The reading process can be divided into three steps: *Reception, decoding* and *learning*.

Reception

Reading must be regarded as an act of communication. There is a *communicator* (the author of the book that the reader is reading), there is a *message*, (transferred to the reader via symbols on paper), and there is a *recipient* of the message (the reader).

There are many factors involved in the reception of the message when a person is reading. The first of these is that the reader must *pay attention*. Paying attention is a body function, and therefore does not need to be taught. However, paying attention as such is a function that is quite useless for the act of learning, because it is only a fleeting occurrence. Attention usually shifts very quickly from one object or one thing to the next. The child must first be taught to *focus* his attention on something and to keep his attention focused

on this something for some length of time. When a person focuses his attention for any length of time, we refer to it as *concentration*. Paying attention therefore, is the body function that makes the skill of concentration possible, just as the functions of seeing and hearing make the skills of looking and listening possible.

Concentration rests on two legs. First, it is an *act of will* and cannot take place automatically. The will to focus attention on the written word must be sustained in order to carry out all the actions needed to fully comprehend it. Second, it is also a skill, and therefore has to be *taught*.

The next step in receiving the written word is that it must be perceived. In other words, *perception* must take place.

Before one can learn anything, one has to become aware of it through one of the senses. Usually one has to hear or see it. Subsequently one has to *interpret* whatever one has seen or heard. In essence then, perception means interpretation. Of course, lack of experience may cause a person to be liable to misinterpretation of what he has seen or heard. In other words, perception represents our apprehension of a present situation in terms of our *past experiences*, or, as stated by the philosopher Immanuel Kant (1724-1804): “We see things not as they are but as we are.”

The following situation will illustrate how perception correlates with previous experience:

Suppose a person parked his car and walks away from it while continuing to look back at it. As he goes further and further away from his car, it will appear to him as if his car is gradually getting smaller and smaller. In such a situation none of us, however, would gasp in horror and cry out, “My car is shrinking!” Although the sensory *perception* is that the car is shrinking rapidly, we do not *interpret* that the car is changing size. Through past experiences we have learned that objects do not grow or shrink as we walk toward or away from them. You have *learned* that their actual size remains constant, despite the illusion. Even when one is five blocks away from one's car and it seems no larger than one's fingernail, one would interpret it as that it is still one's car and that it hasn't actually changed size. This learned perception is known as size constancy.

Pygmies, however, who live deep in the rain forests of tropical Africa, are not often exposed to wide vistas and distant horizons, and therefore do not have sufficient opportunities to learn size constancy. One Pygmy, removed from his usual environment, was convinced he was seeing a swarm of insects when he was actually looking at a herd of buffalo at a great distance. When driven toward the animals he was frightened to see the insects “grow” into buffalo and was sure that some form of witchcraft had been at work.[1]

A person needs to *interpret* sensory phenomena, and this can only be done on the basis of past experience of the same, similar or related phenomena. Perceptual ability, therefore, heavily depends upon the amount of perceptual

practice and experience that the subject has already enjoyed. This implies that perception is a skill that can be improved tremendously through judicious practice and experience.

A further important point about perception is that the stratified nature of learning also applies here. Perception in itself consists of a large number of subskills, that can all be automatized. First, there are various ways of perceptualizing, namely visual, auditory and haptic. The latter includes touch perception and kinesthetic perception. Because we read with our eyes, visual perception plays the most important role in the reading act, and will therefore be discussed at some length.

When a person is reading, visual *discrimination* must take place. All printed letters are set against a certain background. The most important difference between the letters and the background is that they differ in color. Obviously, the first discrimination will thus be in terms of *color*. The second discrimination is in terms of *foreground-background*. The particular letter, or word, or sentence, that the reader is focused on is elevated to the level of foreground, whereas everything else within the field of vision of the reader (the rest of the page and the book, the desk on which the book is resting, the section of the floor and/or wall that is visible, etc.) is relegated to the background. Our Latin alphabet consists of 26 letters, each with its corresponding capital letters with a difference in size and sometimes in shape compared to the lower case counterpart. The letters all differ in *form* or *shape* and must be discriminated accordingly. Capital letters sometimes look exactly the same as their lower case counterparts, and must therefore be discriminated mainly with regard to *size*. One also does not only read letters, but thoughts, all compiled from a conglomeration of words. A word is made up of a number of letters arranged in a particular sequence. The reader must therefore be able to discriminate the letters in terms of their *positions*. If a sketch or picture is included in the text, there must be discrimination of *dimensionality* as well.

One of the most obvious — and one of the most common — telltale signs of dyslexia is reversals. People with this kind of problem often confuse letters like *b* and *d*, either when reading or when writing, or they sometimes read (or write) words like *no* for *on*, or *pot* for *top*. One invariably *also* finds that these people find it difficult to distinguish between left and right, or that they find it difficult to cross the midline. These difficulties are not signs of minimal neurological damage, as is often asserted, but simply signs that not enough had been done to teach these people to distinguish between left and right, or to cross the midline.

The human body consists of two halves, a left side and a right side. The human brain also has two halves, which are connected by the corpus callosum. Mindful of the wise words of Immanuel Kant that man does not see things as they are but as *he* is, it is inevitable that a person will interpret everything in terms of his own sidedness. A child or adult, who has not learned to interpret correctly in terms of his sidedness yet, who has not learned to distinguish properly between left and right, will inevitably experience problems when he finds himself in a situation where he is

expected to interpret sidedness. (See the *Act of Reading* diagram above — sidedness is a “position in space” interpretation.) One such a situation, where sidedness plays a particularly important role, is when a person is expected to distinguish between a *b* and a *d*. It is clear that the only difference between the two letters is the position of the straight line — it is either left or right.

It is important to note that people who are confused about left and right cannot use mnemonics or memory aids while reading, as is often advised by experts. Susan Hampshire, for example, advises that children should remember that “left” is the side on which they wear their watch. Girls, she says, sometimes enjoy having their right hand marked with a pretty ribbon.[2] Serfontein advises that one should put nail polish on the little finger of the student's left hand in order to teach him that reading and writing start on the left-hand side of the paper.[3] These tricks never work to improve reading ability. This is just like going to China with a Chinese dictionary and then hoping to be able to speak Chinese. One has to *learn* to speak Chinese. In the same way one has to *learn* to interpret sidedness. As all the other skills foundational to reading, the ability to distinguish between left and right must be drummed in so securely that the person can apply it during reading without having to think of it at all.

After having discriminated every letter in terms of color, foreground and background, form, size and position, letters must be combined into words. The reader must be able to perceive individual parts as a whole. In other words, he must be able to *synthesize*.

Although the ability to *analyze*, i.e. to perceive the whole in its individual parts, does play a role in reading, this ability is of special importance in spelling. To be a good speller, one must be able to *analyze*.

The above events sound very complex, and indeed must be recognized as being just that. In reality they take place all the time — at lightning speed — while a person is reading, but a good reader is unaware of these events because they have been automatized. It can be compared to driving a car. Try to remember your first driving lesson. How hard you had to concentrate on *what* to do *when* to prevent the car from wrapping itself around the nearest tree! Now, after many years of experience and of doing it over and over, your driving has become an automatism and you need not even think while you drive. In fact, your mind is probably on something else most of the time, like talking to the other people in the car, or listening to the radio, or looking at the beautiful scenery outside.

Speaking is another example of the importance of drilling some activities to such an extent that they become automatic. Any person, who speaks a language that he knows well, does not concentrate on vocabulary, or on sentence structure, or on grammar. His mind is focused on what he wants to say.

Decoding

However, when a person attempts to speak a language in which he has not become automatic yet, he will necessarily have to divide his attention between the content of his message and the language itself. He will therefore speak haltingly and with great difficulty. As explained in the *Journal of Learning Disabilities*, "if the skill on the primary task is automatized, it will not be disrupted by concurrent processing on the secondary task because automatic processing does not take up attentional resources. If, on the contrary, the skill is not automatized, it will be disrupted by concurrent processing of a second skill because two skills are then competing for limited attentional resources."[4] This also applies to the act of reading. The child, in whom the above-mentioned foundational skills of reading have not yet become automatic, will read haltingly and with great difficulty. The poor reader is forced to apply all his concentration to the reception of the message, and therefore has "no concentration left" to decode the message.

The decoding of the message is a very important aspect of the reading act. Without being able to decode the message, the receiver cannot understand it. This explains why some children "read" without understanding what they are reading.

Decoding implies that the reader is able to decipher the message, in other words, he is able to ascribe meaning to the written word. This becomes possible first by *integrating* the message that he is reading with his foreknowledge. Foreknowledge can be defined as the range of one's existing knowledge and past experiences. If one reads something that cannot directly be connected to or tied in with knowledge that one already possesses, one cannot decode or decipher the contents of the message. As Harris et al. state, "What a child gets from a book will often be determined by what the child brings to the book."[5]

It has been found that LD students often fail to integrate what they are reading with their foreknowledge.[6] The main reason for this has already been explained, i.e. that the poor reader is forced to apply all his concentration to the reception of the message, and therefore has "no concentration left" to decode the message.

A decoding skill that is closely related to that of integration is *classification*. When a person sees a chair, although he may never have seen a chair exactly like this one, he will nevertheless immediately recognize it as a chair, because he is familiar with the *class* of objects we call "chair." This implies that, whenever a name is ascribed to an object, it is thereby put into a specific class of objects, i.e. it is *classified.*

The Gestalt principle of *closure* means that the mind is able to derive meaning from objects or pictures that are not perceived in full. W- -re s-re th-t y-- w-ll b--ble to und-rsta-d th-s s-ntenc- (We are sure that you will be able to understand this sentence), although more than 25 percent of the letters have been omitted. The mind is quite able to bridge the gaps that were left in the

sentence. The idea of closure is, however, more than just seeing parts of a word and amplifying them. It also entails the amplification of the author's message. No author can put all his thoughts into words. This stresses the importance of foreknowledge. If it were possible for an author to put everything related to the subject he is dealing with on paper, the possession of foreknowledge would not have been necessary. That, however, is impossible, as an author can at most present a very limited cross-section of reality and the reader must be able to expand on this before comprehension becomes possible. Poetry is a good example of the importance of foreknowledge. Any person, who is unfamiliar with the Arthurian legend, will probably derive little meaning from a reading of *Morte d'Arthur* by Alfred Lord Tennyson.

Lastly, *imagination* plays a role in decoding. It is doubtful whether a person really understands something unless he is able to think about it in terms of pictures. When we read or hear a message, the words and thoughts comprising the message call up images in our mind's eye. If this does not occur, the message will not make any sense. If you read or hear a sentence in an unfamiliar language, it will not make any sense to you, simply because none of the words will call up any pictures in your mind's eye. This ability plays a very important role in the decoding of the message. Furthermore, by using one's imagination while reading, one's emotions can be addressed during the reading act.

Learning

Only after a person has decoded a message can learning take place. To learn, a person must be able to store something that he has perceived and decoded, so that he will be able to recall this information at a later stage. It is the ability to *recall to memory* or to remember that makes learning possible.

Memory is one of the foundational skills of learning that is of special importance in the so-called learning subjects at school or university, where information is presented to the learner, and it is expected that he be able to reproduce it as accurately as possible. However, memory is a skill that is also of great importance to the reading act. For example, recognizing the shapes of the different letters comprising a particular word is an act of memory. Every word also consists of letters in a particular sequence, and one has to remember what word is represented by the sequence of letters in question. Simply by changing the sequence of the letters in *name*, it can become *mean* or *amen*.

It is widely accepted that LD students have poor memories. Scruggs and Mastropieri state, “One of the most commonly described characteristics of learning-disabled students is their failure to remember important information.”[7] The problem is that memory is widely viewed as a “fafrotsky” (a word coined by Ivan T. Sanderson, and standing for "Things that…**FA**ll **FRO**m **T**he **SKY**"). For a long time it was firmly believed that IQ was biologically determined. In the same way, it is widely believed that biology decides whether a person has

a good memory or a bad, and those who believe that memory can be improved are ridiculed:

> For many centuries it was felt that mind-brain with its memory component was like a muscle — if you exercised it enough, it became bigger, healthier, and more efficient [cf. chapter three]. When I was young, most college-bound high school students were forced to study Latin. They were told that this study was good exercise for their brains and memories. With enough study of Latin, they would be able to learn practical disciplines more efficiently. Today, the analogy of memory and muscle causes chuckles of amusement at the innocence and simplicity of former educational and psychological theory. Today, most students of cognitive psychology believe that memory is physically determined. Individual differences allow for some small improvement, but generally a good memory remains good and a poor memory remains poor. Not much hope for the learning disabled here.
>
> However, some modern researchers feel that memory can improve dramatically with training. (They studiously avoid the muscle analogy or the word *exercise*. Who wants to be laughed at?)[8]

Perhaps that is why the role that memory training can play in preventing and overcoming learning disabilities is grossly underestimated.

In an article published in the *Learning Disabilities Quarterly* Scruggs and Mastropieri evaluated the results of mnemonic instruction in learning disabilities intervention, and concluded, “mnemonic instruction delivers the greatest learning increases seen in the history of learning disabilities intervention research.”[9]

Defined in broad terms, a *mnemonic* is a device, procedure, or operation that is used to improve memory. Defined in narrow terms — and what Scruggs and Mastropieri mean by the word — a mnemonic is a specific reconstruction of target content intended to tie new information more closely to the learner's existing knowledge base and, therefore, facilitate retrieval. Mnemonics have been used for thousands of years. Having limited access to writing materials, the Ancient Greeks developed complex mnemonic systems for remembering stories, poems, plays and lectures. Many of the Ancient Greek techniques were revived in the Middle Ages, where they were sometimes associated with mysticism and the occult.[10] However, with the invention of the printing press these ancient arts became lost as more and more people relied — sometimes exclusively — on note-taking and on the printed page.

There are a variety of mnemonic techniques, including keywords, pegwords, acronyms, loci methods, spelling mnemonics, phonetic mnemonics, number-sound mnemonics, and Japanese “Yodai” methods. An example of an *acronym* is to remember the word HOMES to recall the names of the Great Lakes: *H*uron, *O*ntario, *M*ichigan, *E*rie, and *S*uperior. The purpose of *number-sound mnemonics* is to recall strings of numbers, such as telephone numbers, addresses, locker combinations or historical dates. To use them, learners

must first learn the number-sound relationships: 0=s; 1=t; 2=n; 3=m; 4=r; 5=l; 6=sh, ch, or soft g, 7=k, hard c, or hard g; 8=f or v; and 9=p. To remember the date 1439, for example, the learner uses the associated consonant sounds, t, r, m and p, and will insert vowels to create a meaningful word or words. In this case, the word “tramp” can be used. *Spelling mnemonics* is intended to help us remember the spelling of words. In order to remember that the word “cemetery” is spelled with three e's, for example, one can picture a lady screaming 'E-E-E' as she walks past the cemetery.

In their research Scruggs and Mastropieri synthesized the results of twenty-four experimental investigations of mnemonic instruction in special education settings. They found that the overall effect size of these combined investigations was 1.62 standard deviation units. According to them this was the highest measure of treatment effectiveness reported at the time.[11] For comparison, Kavale and Forness reviewed previous quantitative syntheses of special education interventions, reporting overall effect sizes ranging from -0.12 to +0.58, for such interventions as reduced class size, special class placement, psycholinguistic training, perceptual-motor training, stimulant and psychotropic drugs, and diet interventions.[12]

Scruggs and Mastropieri demonstrate, first of all, that memory *can* be trained, and second, the importance of memory training in helping LD children. There are, however, at least two problems in improving memory by means of mnemonic instruction. *The first problem* is that it overlooks the sequential fashion of learning. Mnemonics instruction is, to a large extent, instruction in memory *techniques*, which should be taught only *after* the *skill* of memory has been learned. It can be compared to a child being taught soccer tactics, such as the “wall pass,” while he has not yet adequately mastered the skill of passing the ball. As stated in *Knowabout Soccer*, “No matter how good your passing technique, if the quality of your passing is poor, your technique will not be effective.”[13] *The second problem* is that by teaching the child to use memory crutches, the result is, as Scruggs and Mastropieri acknowledge, “On more complex applications, generalization attempts have been less successful.”[14] If the *skill* of memory is taught, however, the child can apply it in any situation.

Audiblox teaches the *skill* of memory, which makes it possible for a person to apply his memory in any situation, and also practices and automatizes the other foundational skills mentioned above.

2. A "Pyramid of Repetition" Has to be Constructed

The importance of repetition in the learning situation cannot be denied. There is not a single person on this earth who learned to speak a language, learned to swim, skate, play golf, or drive a car, without repetition. In the same way, neither the skills foundational to reading, nor reading itself, can be learned without repetition.

In recent years, neuroscientists have discovered that repetition is important in the "wiring" of a person's brain, i.e. the forming of connections or synapses

between the brain cells. Without these connections, the brain cells are as useless as batteries standing in a row next to a torch. Only when the batteries and torch are connected, can they make a shining light.

Mere repetition, however, is not the end of the story. A "pyramid of repetition" has to be constructed. This means that a learner must start by repeating a limited amount of material many times over and over. Gradually, less and less repetition will be necessary to master new skills and new knowledge. Without building this "pyramid of repetition" *first*, later learning will always be time consuming and prone to failure.

Audiblox practices and automatizes the foundational skills of reading, spelling, writing and mathematics by systematically creating a "pyramid of repetition."

3. Opportunities for Application

The third principle is that there must be opportunities for *application*. While a person is learning to master the skills that form the basis of reading, spelling, writing or mathematics, he should already be given opportunities to apply these skills.

An important point is that these three principles should be looked upon as a whole and should not be viewed in isolation.

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