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Sensory Trace of Stoke to Facilitate Learning Chinese Character Writing for Young Children (STS).

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Background

1. Child Early Learning Stage

As you can see from the table 1, the sensitive period of learning Language begins as early as from birth. Infants will be talked to very frequently and Phonics will be taught at age as young as 2 years so that your children will be able to read at very early age. The Chinese Character Writing Learning Foundation building on the Sensory Trace of Stoke (STS) is meant for Kids between age 2 to 6, this is important and the purpose is tap on the child early development on their senses during their sensitive periods, and their subconscious memory.

Age	0	1	2	3	4	5	6
Sensitive Periods	Movement						
	Language						
		Small object					
		Toilet train					
			Order				
			Music				
			Grace and Courtesy				
			Senses				
				Writing			
				Reading			
					Spatial Relationship		
					Mathematics		

Table 1: Table describing the Sensitive Period of kids development

This enable the kids to adopt the proper way to write the stoke of Chinese character. Children will often look at Chinese Character as a picture, memorise it, but not engraving in them as which stoke come first and the direction of the strokes. This will further elaborate in later section.

1.1. Sensory Play and Early Child Development

Sensory play includes any activity that stimulates your young child's senses: touch, smell, taste, sight and hearing. Sensory activities facilitate exploration and naturally encourage

children to use scientific processes while they play, create, investigate and explore. Spending time stimulating their senses helps children develop cognitively, linguistically, socially and emotionally, physically and creatively. [1]

1.1.1 The Multisensory Teaching Technique

The Multisensory teaching technique enables students to use their personal areas of strength to help them learn. They can range from simple to complex, depending on the needs of the student and the task at hand. [1]

Multisensory techniques are frequently used for children with learning differences. Studies from the National Institute of Child Health and Human development (United States of America) have shown that for children with difficulties in learning to read, a multisensory teaching method is the most effective teaching method.

Multisensory teaching techniques and strategies stimulate learning by engaging students on multiple levels. They encourage students to use some or all their senses to:

- Gather information about a task
- Link information to ideas they already know and understand
- Perceive the logic involved in solving problems
- Learn problem solving tasks
- Tap into nonverbal reasoning skills
- Understand relationships between concepts
- Store information and store it for later recall

Using a multisensory teaching technique means helping a child to learn through more than one sense. Most teaching techniques are done using either sight or hearing (visual or auditory). The child's sight is used in reading information, looking at text, pictures or reading information based from the board. The hearing sense is used to listen to what the teacher says. The child's vision may be affected by difficulties with tracking or visual processing. Sometimes the child's auditory processing may be weak. The solution for these difficulties is to involve the use of more of the child's senses, especially the use of touch (tactile) and movement (kinetic). This will help the child's brain to develop tactile and kinetic memories to hang on to, as well as the auditory and visual ones.

Students with learning difficulties typically have difficulties in one or more areas of reading, spelling, writing, math, listening comprehension and expressive language. Multisensory techniques enable students to use their personal areas of strength to help them learn. They can range from simple to complex, depending on the needs of the student and the task at hand. The development of the STS for learning Chinese character writing uses tactile technique.

1.1.2 Learning Style

Some researchers theorize that many students have an area of sensory learning strength, sometimes called a learning style. These researchers suggests that when students are taught using techniques consistent with their learning styles, they learn more easily, faster and can retain and apply concepts more readily to future learning. Most students, with a difficulty or not, enjoy the variety that multisensory techniques can offer.

On top of tactile, it can be use together with other multisensory technique, as follow. These other multisensory techniques could be used to compliment STS and to assist a student in his / her learning. The impact of the following learning will allow the children to recall from tactile experience of STS.

a) ***To stimulate visual reasoning and learning***

- Text and/or pictures on paper, posters, models, or flash cards
- Use of color for highlighting, organizing information or imagery, (texture is used for the STS).
- Graphic organizers, outlining passages
- Student created art, images, text, pictures and video

b) Auditory techniques

- Books on tape, peer assisted reading, paired reading and computerized text readers
- Video or film with accompanying audio
- Music, song, instruments, speaking, rhymes, chants and language games

c) Tactile teaching methods Multisensory techniques that involve using the sense of touch are called tactile methods. Tactile methods include strategies such as:

- Sand trays, raised line paper, textured objects, finger paints and puzzles to improve fine motor skills
- Modeling materials such as clay and sculpting materials
- Using small materials called manipulatives to represent number values to teach math skills

d) Kinesthetic methods Multisensory methods using body movements are called kinesthetic methods. These involve fine and gross motor movements.

- Games involving jumping rope, clapping or other movements paired with activities while counting and singing songs related to concepts.
- Any large movement activity for students involving dancing, bean bag tossing or other activities involving concepts, rhythmic recall and academic competition such as quizzes, flash card races and other learning games.

2 Children Intellectual Development

Intellectual Development, Learning and Teaching Styles Learning styles is a term that refers to different ways in which we learn, process, and retain information. All young children learn through meaningful hands-on experiences—through touching, doing, moving, seeing and hearing.

As you observe your child, you will begin to identify strengths and preferences that tell you something about your child's preferred learning style. You want to foster your child's strengths, but remember that it helps to challenge him to grow as well. Your child can excel

in a variety of areas. Therefore, offer a variety of experiences to help your child develop new strengths and interests that will broaden his or her understanding of the world.

Types of Learning Styles are the four main types of learning styles: Visual (learn through seeing) Auditory (learn through hearing) Tactile (learn through touch) Kinesthetic (learn through doing and moving).

a. Visual learners learn through seeing. Children who are visual processors tend to observe a parent's or teacher's body language and facial expressions for content and learn through demonstrations and descriptions. They tend to have well-developed imaginations and often think in pictures. Too much movement or action in a classroom may cause distraction for them. For older children who read, written instructions may help clarify verbal directions. Auditory learners learn through listening.

b. Children who are auditory processors learn through participating in discussions and talking things through. Verbal directions may help clarify instructions or written information. Too much noise may be distracting and children with this strength may learn best in a quiet environment. Tactile learners learn through touch.

c. Children who are more tactile prefer activities or projects that allow them to use their hands. Your child may prefer doodling or drawing to aid memory.

d. Kinaesthetic learners learn through moving and doing. Children who are more kinaesthetic learn through physicall sensations and may have trouble sitting still for long periods.

2.1 Sensory memory

During every moment of an organism's life, sensory information is being taken in by sensory receptors and processed by the system. The information people received which is stored in sensory memory is just long enough to be transferred to short-term memory.[5] Humans have five main senses: sight, hearing, taste, smell, touch. **Sensory memory** (SM) allows individuals to retain impressions of sensory information after the original stimulus has ceased.[6] A common demonstration of SM is a child's ability to write letters and make circles by twirling a sparkler at night. When the sparkler is spun fast enough, it appears to leave a trail which forms a continuous image. This "light trail" is the image that is represented in the visual sensory store known as iconic memory. The other two types of SM that have been most extensively studied are echoic memory, and haptic memory; however, it is reasonable to assume that each physiological sense has a corresponding memory store. Children for example have been shown to remember specific "sweet" tastes during incidental learning trials but the nature of this gustatory store is still unclear.[7]

2.1.1 Sensory receptors

In a sensory system, a **sensory receptor** is a sensory nerve ending that responds to a stimulus in the internal or external environment of an organism. In response to stimuli, the sensory receptor initiates sensory transduction by creating graded potentials or action potentials in the same cell or in an adjacent one.

The sensory receptors involved in taste and smell contain receptor molecules that bind to specific chemicals. Odor receptors in olfactory receptor neurons, for example, are activated by interacting with molecular structures on the odor molecule. Similarly, taste receptors (gustatory receptors) in taste buds interact with chemicals in food to produce an action potential.

Other receptors such as mechanoreceptors and photoreceptors respond to physical stimuli. For example, photoreceptor cells contain specialized proteins such as rhodopsin to transduce the physical energy in light into electrical signals. Some types of mechanoreceptors fire action potentials when their membranes are physically stretched.

The sensory receptor functions are the first component in a sensory system.

Sensory receptors respond to specific stimulus modalities. The stimulus modality to which a sensory receptor responds is determined by the sensory receptor's adequate stimulus.

The sensory receptor responds to its stimulus modality by initiating sensory transduction. This may be accomplished by a net shift in the initial states of a receptor.

2.1.2 Level of processing effect

The **levels-of-processing effect**, identified by Fergus I. M. Craik [8] and Robert S. Lockhart in 1972, describes memory recall of stimuli as a function of the depth of mental processing. Deeper levels of analysis produce more elaborate, longer lasting, and stronger memory traces than shallow levels of analysis. Depth of processing falls on a shallow to deep continuum. Shallow processing (e.g., processing based on phonemic and orthographic components) leads to a fragile memory trace that is susceptible to rapid decay. Conversely, deep processing (e.g., semantic processing) results in a more durable memory trace. **Tactile memory** representations are similar in nature to visual representations

2.1.3 Familiarity

A stimulus will have a higher recall value if it is highly compatible with preexisting semantic structures (Craik, 1972). According to semantic network theories, this is because such a stimulus will have many connections to other encoded memories, which are activated based on closeness in semantic network structure.[3] This activation increases cognitive analysis, increasing the strength of the memory representation. The familiarity modifier has been tested in implicit memory experiments, where subjects report false memories when presented with related stimuli. [11]

2.1.4 Specificity of processing

Specificity of processing describes the increased recall value of a stimulus when presented in the method with which it was inputted. For example, auditory stimuli (spoken words and sounds) have the highest recall value when spoken, and visual stimuli have the highest recall value when a subject is presented with images.[12] *Vaidya, CJ; Zhao M; Desmond JE; Gabrieli JDE (2002). [12].* In writing tasks, words are recalled most effectively with semantic cues (asking for words with a particular meaning) if they are encoded semantically (self-generated by the subject as being related to a particular meaning). Words are recalled most effectively with data-driven cues (word completion) if they are read, rather than generated by a subject. *Blaxton, TA (1989). "Investigating dissociations among memory measures: Support for a transfer-appropriate processing framework" (pdf).[13] [14]*

2.1.5 Touch

Tactile memory representations are similar in nature to visual representations, although there is not enough data to reliably compare the strength of the two kinds of stimuli. One study suggests that there is a difference in mental processing level due to innate differences between visual and tactile stimuli representations.[15] In this study, subjects were presented with an object in both visual and tactile form (a subject is shown a sphere but cannot touch it, and later is given a similar sphere to only hold and not view). Subjects had more trouble identifying size difference in visual fields than using tactile feedback. A suggestion for the lower level of size processing in visual fields is that it results from the high variance in viewed object size due to perspective and distance.

3 The Learning of Chinese Character

Research by The 4th International Symposium on Chinese Applied Linguistics, The University of Iowa, April 25-26, 2014 on "An Empirical Study on Teaching Radicals to Beginners with the Character Primer". Yong Children who have not fully developed in memory may have difficulty to memorize, comprehend and apply only, they are unlikely to retain the language in their long term memory. Instead, they should be taught the declarative knowledge of Chinese radicals and compound characters. This can be achieved by taping into the sensory memory of tactile. That is the memory of touch.

3.1 Stroke order

Stroke order refers to the order in which the strokes of a Chinese character are written. A stroke is a movement of a writing instrument on a writing surface. The stroke is important when relating to a dictionary and the ability to count the number of stroke within a Chinese character.

Its basic principle, Chinese characters are basically logograms constructed with strokes. Logographic systems, or logographies, are writing systems in which each symbol represents a concept rather than a sound, as in syllabary or phonographic systems. For children perspective, it is important to memorize how the stroke is written and the radical of the Chinese character.

Over the millennia a set of generally agreed rules have been developed by custom. Minor variations exist between countries, but the basic principles remain the same, namely that writing characters should be economical, with the fewest hand movements to write the most strokes possible. This promotes writing speed, accuracy, and readability. This idea is particularly important since as learners progress, characters often get more complex. Since stroke order also aids learning and memorization, students are often taught about it from a very early age in schools and encouraged to follow them. This is the same case when learning the radical of Chinese Character.

3.2 Chinese Character - Basic strokes

A basic stroke is a single calligraphic mark moving in one direction across a writing surface. The following table lists a selection of basic strokes divided into two stroke groups: simple and combining. "Simple strokes" (such as *Héng* "Horizontal" and *Diǎn* "Dot") can be written alone. "Combining strokes" (such as *Zhé* "Break" and *Gōu* "Hook") never occur alone, but must be paired with at least one other stroke forming a compound stroke. Thus, they are not in themselves individual strokes. Chinese character strokes are an attempt to identify and classify all single-stroke components that can be used to write Han radicals. There are some thirty distinct types of strokes recognized in Chinese characters, some of which are compound strokes made from basic strokes. The compound strokes comprise more than one movement of the writing instrument, and many of these have no agreed-upon name.

Table of basic strokes

Name (pinyin, trad./simp.)	CJK stroke	Translation of Chinese name	Additional description
Simple strokes			
Diǎn, 點/点		"Dot"	Tiny dash, speck
Héng, 橫		"Horizontal"	Rightward stroke
Shù, 豎/竖		"Vertical"	Downward stroke
Tí, 提		"Rise"	Flick up and rightwards
Nà, 捺		"Press down"	Falling rightwards (fattening at the bottom)
Piě, 撇		"Throw away"	Falling leftwards (with slight curve)
Combining strokes			
Zhé, 折	n/a	"Break"	Indicates change in stroke direction, usually 90° turn, going down or going right only.
Gōu, 鉤/钩		"Hook"	Appended to other strokes, suddenly going down or going left only.
Wān, 彎/弯		"Bend"	A tapering thinning curve, usually concave left (convex outward right).
Xié, 斜		"Slant"	Curved line, usually concave right (convex outward left).

Table 2: Table of basic stroke

Note, the basic stroke *Diǎn* "Dot" is rarely a real dot. Instead it usually takes the shape of a very small line pointing in one of several directions, and may be long enough to be confused with other strokes.

3.2.1 Compound strokes

Another classification showing 37 strokes: 8 basic strokes, and 29 complex strokes.

A compound stroke (also called a complex stroke) is produced when two or more basic strokes are combined in a single stroke written without lifting the writing instrument from the writing surface. The character 永 (pinyin: *yǒng*) "eternity" described in more detail below demonstrates one of these compound strokes. The centre line is a compound stroke that combines three stroke shapes in a single stroke.

3.2.2 Basics for making compound strokes [16]

In most cases, concatenating basic strokes together form a compound stroke. For example, *Shù* combined with *Gōu* produce (*Shù Gōu*). A stroke naming convention sums the names of the basic strokes, in the writing order.

An exception to this applies when a stroke makes a turn of 90° (and only of 90°). Horizontal  (*Héng*) and Vertical (Shù) strokes are identified only once when they appear as the first stroke of a compound; any single stroke with successive 90° turns down or to the right are indicated by a 折 (pinyin: *Zhé*) "Break". Nearly all complex strokes can be named using this simple scheme.

3.2.3 A naming convention

A naming convention is a classification scheme where a controlled vocabulary is used systematically to describe the characteristics of an item. The naming convention for a Chinese basic stroke is derived from the path mark left by the writing instrument. In this instance roman letters are concatenated to form a stroke name is a sequence of one or more roman letters indicating the component strokes used to create the Chinese basic stroke. The first letter of the Han radical's pinyin pronunciation represents each basic stroke.

In a basic stroke example, H represents the stroke  named 橫 (pinyin: *Héng*); in a compound example, HZT represents 橫折提 (pinyin: *Héng Zhé Tí*). This is the different basic Chinese stroke.

While no consensus exists, there are up to 12 distinct basic strokes that are identified by a unique Han radical.

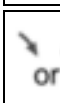
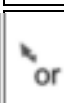
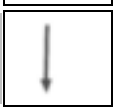
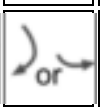
Letters commonly used in Chinese Basic stroke naming conventions												
Letter	**B**	**D**	**G**	**H**	**N**	**P**	**Q**	**S**	**T**	**W**	**X**	**Z**
Stroke direction												
Trad./simp.	扁	點/点	鉤/钩	橫	捺	撇	圈/圈	豎/竖	提	彎/弯	斜	折
Pinyin	*Biǎn*	*Diǎn*	*Gōu*	*Héng*	*Nà*	*Piě*	*Quān*	*Shù*	*Tí*	*Wān*	*Xié*	*Zhé*
Meaning	"Flat"	"Dot"	"Hook"	"Horizontal"	"Press down"	"Throw away"	"Circle"	"Vertical"	"Rise"	"Bend"	"Slant"	"Break"

Table 3: Letters commonly used in Chinese Basic Stroke naming convention

There are a many Chinese compound strokes, however there is no consensus for sequence letter naming of compound strokes using the basic strokes. The following table demonstrates the Chinese basic stroke naming convention.

3.3 Stroke order

Stroke order refers to the order in which the strokes of a Chinese character are written. A stroke is a movement of a writing instrument on a writing surface. Because most Chinese characters have many strokes, certain stroke orders guidelines are recommended to ensure speed, accuracy, and legibility in composition. Also, teachers enforce exactly one stroke order for each character, marking every deviation as a mistake, so everyone writes these characters the same way. The stroke order follows a few simple rules, though, which aids in memorizing these. To write Chinese characters, one must know how to write Chinese strokes, and thus, needs to identify the basic strokes that make up a character.

3.3.1 Eight Principles of Yong

The Eight Principles of *Yong* explain how to write eight common strokes in regular script which are found all in the one character, 永 (pinyin: *yǒng*, "forever", "permanence"). It was traditionally believed that the frequent practice of these principles as a beginning calligrapher could ensure beauty in one's writing.

Eight basic strokes



Eight principle strokes extracted from 永, "eternity" (five basic strokes: D, T, W, P, N and one compound stroke HZG). Enlarge this image to see the red arrows, showing the way of writing of each.

— the *Diǎn* 點/点, is a dot, filled from the top, to the bottom, traditionally made by "couching" the brush on the page.

— the *Héng* 橫, is horizontal, filled from left to right, the same way the Latin letters A, B,C,D are written.

 — the *Shù* 豎/竖, is vertical-falling. The brush begins by a dot on top, then falls downward.

 — the *Gōu* 鉤/钩, ending another stroke, is a sharp change of direction either down (after a Heng) or left (after a Shù).

 — the *Tí* 提, is a flick up and rightwards

 — the *Wān* 彎/弯, follows a concave path on the left or on the right

 — the *Piě* 撇, is a falling leftwards (with a slight curve)

 — the *Nà* 捺, is falling rightwards (with an emphasis at the end of the stroke)

 — the *Xié* 斜 is sometimes added to the 永's strokes. It's a concave *Shù* falling right, always ended by a *Gōu*, visible on this image).



All the basic stroke and the radical of Chinese character are to engrave into the writing plate, as shown in the figure 1 and figure 2 of the diagram filed.

4 Product Development Brief

The Brief will give an overview of the development, its benefits and its limitation. The Chinese stoke and the Chinese radical are engraved individually on the wooden plate. This also serve as the written plate for tracing of the engraved stoke and Chinese radical.

4.1 Overview of development

To produce a plate of Chinese basic stroke engraved in it. The stroke that was engraved will have a different texture and depth gradient. When children trace the stokes of the Chinese basic stroke, they will feel exactly the texture and the depth gradient stroke. This is to allow the children to know how exactly it is written. The texture will come with stroke direction gradient so when the tracing of it in the wrong direction, the children will know,

4.2 Benefits

Organizing strokes into a hierarchy aids a user's understanding [17] by bringing order to an obtuse system of writing that has organically evolved over the period of centuries. In addition, the process of recognizing and describing stroke patterns promotes consistency of stroke formation and usage. When organized by naming convention, classification allows a user to find a stroke quickly in a large stroke collection, makes it easier to detect duplication, and conveys meaning when comparing relationships between strokes. When organized by numbering scheme, categorization aids a user in understanding stroke differences, and makes it easier to make predictions, inferences and decisions about a stroke.

1. The hierarchy of stroke allows the children to remember how the stroke should flow
2. The children are able to certainly count the number of stroke of a Chinese character in a dictionary. This will be useful for them when checking Chinese non-electronic dictionary.
3. This will make writing of Chinese character easier for the children learning in the future.
4. To enhance the Learning of Chinese character and interpretation of the meaning of each Chinese character.

4.3 Limitations

The Chinese character strokes are described and differentiated using the criteria of visual qualities of a stroke. The children need to follow the flow of stroke. Because this can require subjective interpretation, Chinese character strokes cannot be placed into a single definitive classification scheme because stroke types lack a universal consensus on the description and number of basic and compound forms. Chinese character strokes cannot be placed into a single definitive categorization scheme due to visual ambiguity between strokes, and therefore cannot be segregated into mutually-exclusive groups. Other factors inhibiting organization based on visual criteria is the variation of writing styles, and the changes of appearance that a stroke undergoes within various characters.

The development will capture the engraving of the basic of Chinese character stroke and Chinese radicle.

5 The Description of Patent with claims

5.1 Title of the invention

The title of the invention is Sensory Trace of Stoke to Facilitate Learning Chinese Character Writing for Young Children.

5.2 Field

The present invention of STS (Sensory Trace of Stroke) relates to the early development of Chinese character writing for kids. Children will trace the engraved stoke of the writing plate. This will enable children between the age of 2 to 6 years old to build their foundation in the learning of writing Chinese Character.

5.3 Background Brief

Traditionally Chinese Character is taught using pen, pencil or calligraphy brush. This is only achieved when the learner is of certain age and able to hold on the pencil. The learning of writing Chinese character then evolved to recognizing the Chinese character word first.

The problem is that after recognizing the Chinese character word, the kids do not know the flow of each stroke of the Chinese character, so to them is like drawing a picture. This has led to difficulty in understanding of meaning behind each stoke of the Chinese character, and its culture. They will usually find it difficult to learn Chinese character, because their foundation of each basic stroke in Chinese character is weak. They are also affected in their development of Chinese related culture. The stroke is important when referring to dictionary and to count the number of stroke within a Chinese character.

This present invention will help young children in development of writing Chinese character, forming a foundation for the future of Chinese character writing. The present invention taps on the development of young children sensory memory and their intellectual development. Young children in this contact refer to children of age between 2 to 6 years old.

The present invention also make learning of Chinese writing easier, by allowing the children grasping of the basic or fundamental stoke of the Chinese character. The children will not look at the Chinese character as a picture but comprises of fundamental stoke of the Chinese character.

5.4 Detailed Description

Refer to section 1, section 2, and section 3, which to the children sensory development and their intellecture development.

5.5 Brief Description of the Drawing (Inventive specification)

The diagram of the invention is filed as Diagrams in the submitted documents

6 Filing Justification

6.1 NEW

The invention of Sensory Trace of Stoke (STS) is new as it is not found in the market. The highlight of the Chinese stroke may be available but it is mainly for visual learning. The new invention of the writing plate engraved with the Chinese character stroke for sensory tracing of Chinese character is unique with the essence of control depth gradient.

The practice requires about 15 minutes to 30 minutes. Children at age between age 2 to 6, are recommended to trace the Chinese character stoke from basic one to a more complicated one for at least twice a week. The complicated one is defined with more turns and stokes.

The methodology of tracing the tools with the index finger for at least 15 minutes to 30 minutes, twice a week on the writing plate will allow the children to have a deep impression of the stroke.

6.2 Benefits and Usefulness

As have describe in the background. The hierarchy of stroke allows the children to remember how the stroke should flow. This will benefits the children in learning Chinese Character writing.

The tracing of stoke benefit is that the method of learning is taping on the early childhood memory development of their sensory sense or tactile (their sense of touch).

The depth gradient of the stroke will add on to their impression of the Chinese character stroke.

6.3 Industrial Applicability

The development of Sensory Trace of Stoke (STS) can be used in preschool to teach Chinese character writing to young children. Many preschool for young learners struggle to make young children remember the direction of stroke and the different focus point on the stroke. The invention of STS basing on Kids sensory memory development will definitely be very useful for young children.

Claims

1. A learning tool for building Chinese character writing mainly for young children
    a. A flat plate engraved with Chinese basic character stroke (with the width of each stroke wide enough to allow kids to trace it with their fingers).
    b. The Chinese stroke on the plate is covered with different depth gradient of same texture (example fine sand).
    c. A depth of engrave is determined by how the Chinese character is written (refer section 3.2). The engrave depth are in depth gradient, from the start of the stroke to finishing the stroke.
2. A learning tool in claim 1 wherein the texture of the engraved Chinese character will be uniform or in the form of hair flowing in the direction of the stroke.
3. The depth gradient of the engraved Chinese character stroke has depth gradient similar to that when is written in Chinese calligraphy. The depth on each stroke of Chinese character is quite different.

A methodology of tracing the tools with the index finger for at least 15 minutes to 30 minutes on the writing plate (this invention).