

Lamination Study

Vocabulary Cards in the Montessori Primary Classroom

Julia Volkman, AMI 3 to 6+ (Founder, Maitri Learning), with advice and guidance from Annette Haines, Ed D. (Director of Training, Montessori Training Center of St. Louis; AMI Pedagogical Committee), Tarin Weiss, Ed D. (School of Education, University of Massachusetts at Amherst), and Pamela Allen, M Ed./Doctoral Student (Education Program Specialist, Office of Non-Public Education, US Department of Education).

Abstract

This was an observational, international, multi-center, single-blind study of vocabulary card lamination formats in eleven Montessori primary (ages 3 to 6+) classrooms with total enrollment of 284 students. The study ran from December, 2005 through March 15, 2006. The study evaluated identical vocabulary cards laminated in distinct ways: Set A with a flexible, 1.5 mil laminate and square corners; Set B with a rigid, 5 mil laminate with rounded corners. The assumption that vocabulary cards featuring color photographs will call to and interest the child is clearly supported by the findings of this study; the cards were regularly and repeatedly used in all classrooms. The overall frequency with which children chose Set A versus Set B cards was nearly equivalent, although the children were slightly more likely to choose Set B for the initial presentation. Of the children who stated a preference, 83% preferred Set B cards. Ninety percent of responding teachers preferred Set B cards. No teachers preferred Set A cards. Seven of the 11 classrooms (64%) studied reported damage to Set A cards. No classrooms reported damage to Set B cards.

Introduction

This study came about as a result of a question asked by Dr. Annette Haines (Director of Training, Montessori Training Center of St. Louis; AMI Pedagogical Committee) about the cards Maitri Learning makes, “Why rounded corners?” Why indeed? In my own classroom, I had found that square corners pricked the children’s fingers. This would sometimes lead them to avoid certain materials.

When I founded Maitri Learning and designed cards to be made and sold in quantity, I tested a myriad of laminate and paper combinations to arrive at one that was aesthetically textured, easy to use, comfortable in the hand, and durable. The resulting combination was heavyweight (80# text) paper laminated with a rigid 5 mil laminate. The corners on these cards were sharp. They not only poked fingers, but they bent easily and detracted from the durability of the cards. So, I rounded the corners. Then, I enlisted the assistance of several of my colleagues to determine if my lamination method was optimal for them and their students. Their results supported my findings.

This all seems highly logical from an adult’s perspective and Maitri Learning cards that have been in use for over three years now are still in excellent condition. Yet, my assumptions were based on informal experience, not scientific data.

Dr. Montessori herself was constantly studying the materials she developed and how the children responded to them. In this study, Dr. Haines has inspired me to take up Dr. Montessori’s love of scientific research and her insatiable quest to offer children the best materials we can. I hope that this study will lead other Montessorians to formally study

their questions. As more data becomes available, more and more people will begin to recognize the wisdom, intelligence, and beauty the Montessori approach offers the world.

Also, while I have inadequate expertise in the area of educational research studies, I have received guidance, advice, and direction from others who have what I lack. Conducting this study would not have been possible without the support of Annette Haines, Tarin Weiss, and Pamela Allen. I am deeply grateful to them.

Theoretical Framework

Montessori and Choice

The work of Dr. Maria Montessori demonstrated that children learn best when given the opportunity to work with didactic materials that appeal to them. The children must be free to choose their work, to work without interruption, and to repeat their work. Before being able to make a valid choice, the Montessori teacher must demonstrate to the child how the didactic materials are meant to be used. Thus, the teacher creates a link between the child and the materials. Once this link is forged, the child is drawn (led by their own inner developmental guide) to lay his/her hands upon the materials (the child's work) repeatedly. It is through this self-directed (not required) repetition that mastery is effortlessly achieved by the young child (under age 6). Thus, mastery is one goal of repetition, but there are other values of repetition. "Repeating the ordered routines [as demonstrated to the child during the teacher's presentation] may be even more important to a sense of mastery than achieving the immediate goal of each routine... children seem to get something from merely engaging in the routine" (Stoll Lillard, 2005, 302). Thus, we must ensure that the materials we offer the child are of the best possible quality and design so as to encourage repetition.

If we wish a child to choose a work from the many options presented to him/her in the Montessori environment, we must insure that each work appeal to the child. This does not mean that the work should include drawings of popular cartoon characters for this offers only a superficial and transient attraction. The materials must call to the child at a deeper level. They must call to the child because they meet the child's need and quest for learning about the world they lay their hands upon and interact with every day. "The environment must be rich in motives which lend interest to activity and invite the child to conduct his own experiences" (Montessori, 1988, p. 84). Thus, the work must be truly relevant to the child's development to call to him deeply and repeatedly.

Sensory Perceptions

Children of this age have an acute sense of touch. They are extraordinarily sensitive to sensations received through the skin, particularly the skin on the fingertips. For this reason, Dr. Montessori designed specific pedagogical apparatus to educate the sense of touch. As the children are instructed in the use of these materials, their awareness of their fingertip's sensitivity grows: "They enjoy keenly touching any soft pleasant surface..." (Montessori, 1964, p. 186).

Many of the materials used to educate the senses involve isolating that sense. For example, blindfolds are used to isolate a tactile sense such as sorting cotton from wool from silk fabrics. A key reason for this isolation is because, as Dr. Montessori noted, "the

eye can interfere with what the hand knows” (in Stoll Lillard, 2005, p. 322). While the opposite is not exactly true (that the hand may interfere with what the eye knows), the hand can redirect the focus of the eye. Thus, since the vocabulary cards are designed for visual work, *it is important that the tactile sense not be so strongly roused as to overshadow the visual sense*. If the square corners on those cards are sharp, the resulting tactile sensations could easily distract the child from the cards themselves.

We must ensure that our card materials are of the proper tactile design so as to lead the child to be called to use them repeatedly. “In order that an instrument [pedagogical apparatus] shall attain such a pedagogical end [to cause the child to educate him/herself], it is necessary that it shall not *wear* but shall *divert* the child” (Montessori, 1964, p. 168). We must not introduce new obstacles, such as sharp corners, that would tire the child and, thus, inhibit him/her from using the apparatus. “Pedagogy teaches that the environment must offer less resistance; so avoidable obstacles which the environment contains are diminished more and more, or perhaps removed entirely” (Montessori, 1967/1995, p. 92). The materials must teach without presenting even the smallest of obstacles.

Vocabulary Cards

Vocabulary cards are designed to help the child with his/her drive to learn the names of everything s/he encounters. They are a standard part of the Montessori primary (ages 3 to 6+) curriculum included under the title “Enrichment of Vocabulary.” Vocabulary cards are used to teach specific vocabulary (via the three-period lesson) and, later, in sorting exercises (eg, sorting images of wildflowers from tools) and matching exercises (ie, matching identical photos) (Montessori, 1988, p. 153). Mario Montessori gives a clear description of these cards and some of their uses in his article, *The Botanical Cards*.

Montessori teachers are expected to equip their classrooms with vocabulary cards that they make themselves and/or purchase. In order to increase their durability, vocabulary cards are usually laminated (by the teacher or the manufacturer) before being used by the child.

Environmental Feedback

In addition to a question about why the corners of Maitri Learning’s cards were rounded, Dr. Haines also wondered if the rigid laminate provided enough environmental feedback to the child. That is to say, if a child seriously misused the cards, would the cards be damaged? This damage would provide direct environmental feedback to the children about their handling (or mishandling) of the materials. This is a highly desirable characteristic in pedagogical materials as the children can see for themselves the results of mishandling and thus temper themselves in handling objects carefully. This is a valuable lesson on many levels including the development of common sense and logic as well as the refinement of fine motor skills. Along this vein, many of the materials in Montessori classrooms are specifically designed to provide environmental feedback.

For example, classrooms provide children with glass rather than plastic cups and pitchers. Each year, some of these glasses and pitchers will break while being used or misused by the children. Similarly, other didactic materials made of painted wood may chip as a result of mishandling. Teachers expect this and are trained to remove damaged materials

from the shelves and put them aside until they can be repaired or replaced. Sometimes the materials need only be removed for a day (as in the case of a broken pitcher for which a replacement exists) other times it is a month or longer before they are returned to the shelves (depending on the teacher's time/ability to repair the damage and the availability of replacement parts/paints).

While the possibility of environmental feedback is desirable in the design of the didactic materials, the design must be sturdy enough that this is indeed a possibility rather than a probability. Teachers do not purchase juice glasses that are likely to shatter if they simply fall over on a table top. Likewise, the paints used on wooden materials should not chip as a result of normal use. Thus, there is a balance that must be found that makes the pedagogical materials practical for long-term regular use while also allowing for the possibility of environmental feedback if misused.

Teacher Preference

While it is the child's needs that drive much of what happens in the Montessori environment, the teacher's perspective on this topic is also critical for many reasons. First, as primary scientific observer, the teacher must have the opportunity to record his/her own findings and adjust his/her behavior accordingly. Second, the teachers are in control of the lamination procedure (either by laminating themselves or by purchasing certain types of laminated cards). Third, it is the teacher who must create the link between the child and the materials. If a teacher dislikes a material and conveys this dislike (consciously or unconsciously) in his/her presentations, the children will be disinclined to use the material. As such, one of the indirect objectives of this study was to uncover any teacher bias towards lamination that differs from the child's preference.

Economic Considerations

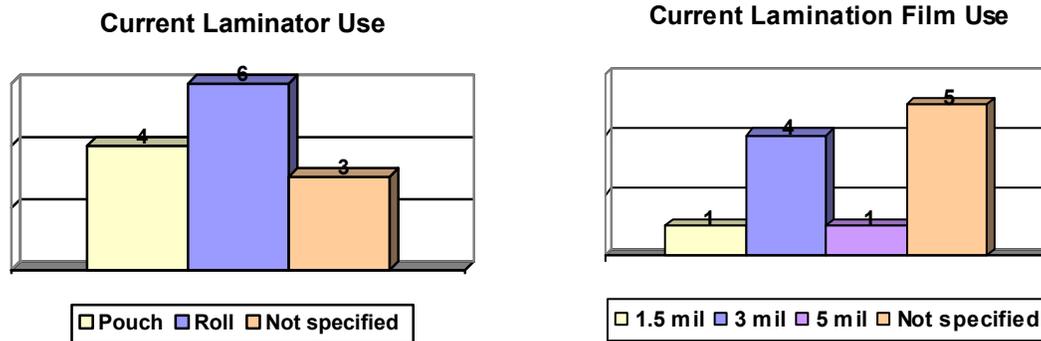
Because vocabulary cards are often laminated by teachers, the question of how they should be laminated has significant implications on school resources. The need to laminate requires a budget to purchase laminate and teacher time to laminate and hand cut each card. Also, if rounded corners are preferred, there will be the additional expense of a corner rounding machine and/or the additional time it takes teachers to manually round the corners (eg, with scissors).

Further, the life of laminated vocabulary cards can vary significantly depending on the type of laminate chosen and the laminating method (with or without extra laminate that extends past the edge of the cards). Thus, there are long-term costs to be considered.

Montessori schools commonly own laminating equipment that uses roll and/or pouch laminating film. Schools often purchase the film for teacher use but it is not uncommon for teachers to purchase their own film (whether due to a preference for a different film than the school provides or due to the school's budgetary constraints). In general, thinner, more flexible laminating film is more economical than thicker, more rigid laminating film and roll laminating film is more economical than pouch laminating film. However, the standard film for pouch laminators is more rigid and offers a higher level of ultraviolet (UV) protection (to prevent fading) than the standard film for roll laminators. These qualities of pouch laminating film can be found in specialty roll laminating films which are more expensive and must be specially ordered.

The teachers participating in this study regularly use roll laminators, pouch laminators, or both with varying thickness of laminating film. Many teachers did not specify the type of laminating film used which may indicate a need for education on the differences among available films. Their specific usage data are summarized in Figure 1.

Figure 1: Current Laminator Use by Teachers participating in this study



Study Objectives

This study was designed to evaluate which format of laminated vocabulary cards:

- appeals more to the child in a primary (ages 3 to 6+) Montessori classroom
- appeals more to the teacher of a primary Montessori classroom

The lamination formats in question are:

- cards laminated with a flexible 1.5 mil laminate with square corners
- cards laminated with a rigid 5 mil laminate with rounded corners

The questions driving this study are as follows:

- Does the child prefer vocabulary cards that are rigid or flexible?
- Do the cards provide the right level of environmental feedback to the child (eg, to physically demonstrate to the child the need to treat the cards with care)?
- Do the square corners on thin laminate cards interfere with the child's ability and/or desire to use the cards (eg, do the corners prick his/her sensitive fingers)?
- Do teachers observe a difference in the usability, aesthetics, or durability of the different sets of cards?

Limitations, Risks, and Assumptions

This study did not assess rounded corners on thin laminate cards. Likewise, it did not assess square corners on rigid laminate cards. For the young child, having four identical baskets of cards (ie, thin laminate with round corners, thin laminate with square corners, rigid laminate with round corners, rigid laminate with square corners) might have proven overwhelming; the child may not have been able to make a valid choice. It is assumed that the square corners on rigid cards would be too sharp and could poke the child's sensitive fingers.

This study also does not evaluate unlaminated vocabulary cards. Unlaminated cards are preferred by some for many reasons. For one, they offer a different texture than the

plastic which is so prevalent in children's items today. Also, laminated cards may produce a glare/reflection that could obstruct the child's view of the image pictured. Further, unlaminated cards offer a high level of environmental feedback to the child. A study of unlaminated cards to evaluate their frequency of damage, the feasibility of replacement, and their total financial and environmental cost is warranted.

Another key assumption of this study is that the vocabulary cards will call to the child and, thus, that the child will have a desire to use them. Further, it is assumed that the child will exhibit a preference for one lamination format over the other.

The design of the cards themselves was not specifically studied and is assumed pedagogically valid.

Methodology

This was an observational, international, multi-center, single-blind study of vocabulary cards in the Montessori primary (ages 3 to 6+) classroom.

Setting

The cards were evaluated by regularly enrolled students in Montessori primary classrooms (ages 3 to 6+) led by AMI trained teacher(s) and by the trained teachers. A total of 11 classrooms in seven geographically diverse locations participated in the study. Three classrooms were part of the Chesterfield Montessori School (Chesterfield, MO), three were part of the Casa Montessori Child Development Center (Austin, TX), and one each were part of the Bilingual Montessori School of Paris (Paris, France), the Capitol Hill Cluster School (Washington, DC), the Ecole Montessori Internationale (Montreal, Canada), Mad River Montessori School (Arcata, CA), and the Pioneer Valley Montessori School (Springfield, MA). A total of 284 children were enrolled in these classrooms.

Materials

Each classroom was provided with a Protocol/Teacher Instructions, a Frequency of Use Form, a Children's Comments Form, a Teacher Questionnaire, and two sets of vocabulary cards identical in every way except the type of laminate and corners. (Note: All forms are reproduced for reference in the Appendix.) Set A was laminated with a 1.5 mil laminate and had square corners. Set B was laminated with a rigid, 5 mil laminate and had rounded corners. Each card was 3¾" x 4¼". Cards were printed on heavy weight (80# text) paper and laminated using a pouch laminator and pouch laminating film. Cards were cut at the paper's edge; no extra laminate was left beyond the paper's edge.

Study materials were sent to participating classrooms in December of 2005 or January of 2006. Teachers were asked to return completed materials by March 15, 2006.

Each set of cards included isolated photographs (objects only on white backgrounds) of images in individual packets as follows:

- *Around the House*: 12 photos of objects children see in the home environment including couch, desk, hook, phone, chair, lamp, rug, table, bed, toilet, dresser, and bookcase

- *Around Town*: 12 photos of objects children see in the outdoor environment including traffic light, fire hydrant, pay phone, barricade, bench, street light, crosswalk, telephone pole, gas pump, mail box, and parking meter
- *In the Kitchen*: 12 photos of objects children see in a kitchen environment including salt and pepper shakers, pot, cabinet, pan, refrigerator, pot holders, jar, sink, microwave, sponge, stove, and measuring cup
- *Tools*: 12 photos of tools commonly found in the home including hammer, goggles, screwdriver, c-clamp, hacksaw, carpenter's square, level, mallet, measuring tape, wrench, putty knife, and pliers

Teacher Presentations

Teachers were given specific directions on how to present the cards to the children. Each teacher chose one packet of cards (eg, Around Town) and placed both Set A and Set B cards in identical baskets next to each other on a shelf in the language area of their classroom. Children were introduced to the cards and given a presentation that offered them the option of choosing either basket to do their work. For example, the teacher may have picked up an identical card from each basket and said, "These are such beautiful cards." The child was given the opportunity to touch and hold each card. Then, the teacher might have said, "Would you like to use these cards [and touch Set A] or these cards [and touch Set B]?" The lesson then proceeded with the basket the child preferred.

When the lesson was completed and the child returned the basket to the shelf, the teacher restated that the child was now free to use either basket. For example, she may have said, "The next time you want to work with these cards, you can use this basket [and placed her hand on Set A] or this basket [and placed her hand on Set B]. You can choose."

Teachers were given a copy of the relevant section of the chief investigator's Language Album for specific details on the vocabulary card presentation/lesson. (*Note*: Albums are a detailed description of how each Montessori material is presented to the child—a detailed lesson plan for every didactic material. Albums are created by all teachers who attend an AMI diploma program.)

The teachers left the Set A and Set B packets on the shelf for two weeks (10 school days). After the two weeks, s/he was instructed to rotate the materials by introducing a separate pair of Set A and Set B packets.

Data Sources

Montessori teachers are trained in scientific observation as part of their diploma program. The teachers were the primary data collectors of this study. The data sources are:

- Frequency chart of children choosing Set A cards during presentations vs. independent work
- Frequency chart of children choosing Set B cards during presentations vs. independent work
- Written records of children's comments regarding the laminating format
- Written teacher observations of the usability of Set A and Set B cards
- Graphic illustrations of teacher ratings of Set A and Set B cards

All information was recorded by the teachers on three prepared forms (supplied to participating teachers along with teacher instructions and stamped return envelopes) which are reproduced in Appendix A.

Frequency of Use: Teachers noted how often each basket was chosen both for presentations and for independent work thereafter. This information was recorded on the Frequency of Use Form.

Children's Comments: Teachers made a written record of statements the children made about the different card formats. This information was recorded on the Children's Comments Form.

Teacher Questionnaire. Teachers completed the Teacher Questionnaire to record his/her own impressions on the value of each format including how the children were able to handle each card (eg, are they easy or difficult to separate, layout, stack, etc.) and how the children treated the cards (eg, roughly or gently). Also, the teacher noted the state of the cards (their durability) at the end of the study period.

Data Analysis

The frequency of use information has been tallied and reported in tabular and graph format. In addition to the frequency of use data, teachers made a written record of Children's Comments. Specific Children's Comments are also included in the Discussion to give depth to the numerical findings.

The data collected on the Teacher Questionnaires was compiled and reported in graphic format. Teacher Comments were also recorded and, as with the Children's Comments, are presented in the Discussion to give depth to the questionnaire findings.

Results

All packets of cards were frequently used (taken off the shelf and manipulated by children) in all classrooms with a total of 678 recorded work sessions during the 8 weeks of the study. On average, each classroom saw the cards used 1.54 times per day or 7.7 times per week.

Frequency of Use

All eleven participating teachers returned the completed *Frequency of Use* form. Children chose Set A for presentations 156 times (47.4% of presentations) and Set B 173 times (52.6% of presentations) for a total of 329 presentations. After receiving these presentations, children chose to work with Set A 175 times (50.1% of independent work) and Set B 174 times (49.9% of independent work) for a grand total of 349 independent work sessions. In sum, the children chose Set B slightly more often for presentations than Set A but there was almost no difference in how often they chose either set for independent work.

Each pair of packets was available for the children to use for approximately 2 weeks (there were some slight variations in this time due to school vacation schedules). The Tools packet was used most often (a total of 179 times in presentations and independent work) with Around the House (175), In the Kitchen (173), and Around Town (151)

following in order of use. Specific frequency of use results for each packet are displayed in Tables 1 through 3 and Figure 2. (Note: In one case, the child exhibited no preference during the initial presentation and the teacher chose Set B for the lesson. This choice was not recorded in the results charts.)

Table 1: Total Number of Times Packets were chosen for the Initial Presentation (all classrooms)

Packet	Set A	Set B
	1.5 mil, square corners	5 mil, round corners
Around the House	42	46
Around Town	40	34
In the Kitchen	38	43
Tools	36	50
Total	156	173
Percent	47.4%	52.6%

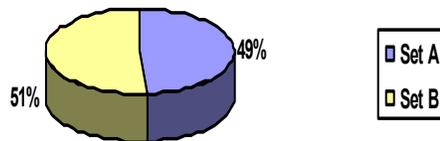
Table 2: Total Number of Times Packets were chosen for Independent Work (all classrooms)

Packet	Set A	Set B
	1.5 mil, square corners	5 mil, round corners
Around the House	38	49
Around Town	41	36
In the Kitchen	49	43
Tools	47	46
Total	175	174
Percent	50.1%	49.9%

Table 3: Total Number of Times Packets were chosen for Presentation and Independent Work (all classrooms)

Packet	Set A	Set B
	1.5 mil, square corners	5 mil, round corners
Around the House	80	95
Around Town	81	70
In the Kitchen	87	86
Tools	83	96
Total	331	347
Percent	48.8%	51.2%

Figure 2: Frequency of Use for Presentations and Independent work (all packets/all classrooms)



Comments made by teachers regarding the nature of the children's choices are summarized in Table 4.

Table 4: Teacher Comments regarding Frequency of Use

- *“I noticed that sometimes when a child chose a set of cards for independent work, s/he wasn’t able to choose between laminates because I was giving a presentation to another child with the other set of cards. I still recorded the laminate choice...but I wondered which one would have been chosen if both sets had been on the shelf.”*
- *“The marks indicating independent work with Set A are usually only when they want to do matching with Set A. It is rare they choose Set A alone. However, Set B is chosen alone very often.”*
- *“Children did not seem to prefer one or the other in their independent work. They chose what was available on the shelf or sometimes they took both the sets and matched them.”*
- *“To most of the younger children...it did not matter whether the cards were thin laminated with square corners or thick laminated with round corners. Sometimes I even observed them doing both set of cards and sometimes they had them out together and matched them.”*
- *“When working independently the children did not seem to have a preference of thin or thick because they both “look” the same on the shelf.”*
- *“For the independent work, most had no preference for thick or thin. Some children matched them, taking both trays at [one] time.”*

Children’s Comments

Ten of the 11 participating teachers returned the Children’s Comments form; two of those returned a blank form with no children’s comments listed. Comments were recorded from 21 children. All of these comments are listed in Table 5.

Table 5: Children’s Comments

Set A Comments	Set B Comments
<p><i>“I like these ones.”</i></p> <p><i>[Likes cards that are] “square” and “lighter”.</i></p> <p><i>“I like these better because they would be easier if you were cutting them out” [with scissors].</i></p> <p><i>“I like the round corners but I like the bendy cards better.”</i></p> <p><i>“These are the same pictures but different edges. One is round and one is square.”</i></p> <p><i>[Preferred because they are “lighter.”]</i></p>	<p><i>[Preferred] “because they are nicer.”</i></p> <p><i>[Preferred] “because they are thicker.”</i></p> <p><i>[Preferred because] “they are nicer to hold.”</i></p> <p><i>[Preferred because they are] “softer.”</i></p> <p><i>“I like this one better because this one can’t get bent.”</i></p> <p><i>“I don’t like pointy corners.”</i></p> <p><i>[Likes rounded edges.]</i></p> <p><i>[Preferred because they wont’ bend.]</i></p> <p><i>“This set [Set B] is plastic and this set [Set A] is not. I like plastic better.”</i></p> <p><i>“Doesn’t prickle.”</i></p> <p><i>[Preferred because of their] “roundness.”</i></p> <p><i>“I like the curved corners best...they’re not so pokey.”</i></p> <p><i>“Do these because we like circles on the end.”</i></p> <p><i>“We like these ones because they are round. The other ones are prickly on the fingers. The round ones are better.”</i></p> <p><i>[Preferred because the child likes] “the way they feel.”</i></p>

In sum, three of the comments above indicate a clear preference for Set A cards while 15 indicate a clear preference for Set B cards. Eight of the comments specifically state a preference for rounded corners. One comment indicates a preference for the thinner laminate because it is more flexible. Two comments indicate a preference for the thicker laminate because it is not flexible.

Teacher’s Ratings and Comments

Ten of the eleven participating teachers completed and returned the Teacher Questionnaire form. Teacher’s showed an overwhelming preference for Set B cards. Between 80% and 100% of responding teachers rated Set B cards Excellent in the measured areas: ease of use, aesthetic appeal of photos, aesthetic appeal of laminate, aesthetic appeal of corners, and texture/feel. Only 10% to 20% of responding teachers rated Set B as Average in any of these areas. Further, 100% of responding teachers rated Set B cards as having excellent durability. No teachers gave Set B a Poor rating in any category. Set A ratings were much lower in comparison. Most ratings fell in the Average range with 40% of responding teachers indicating that the durability of Set A cards was Poor. These ratings are summarized in Figures 3 and 4.

Figure 3: Teacher Ratings of Set A

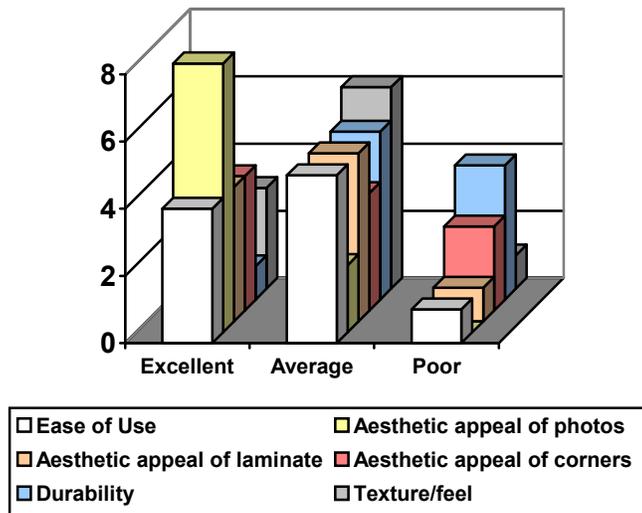
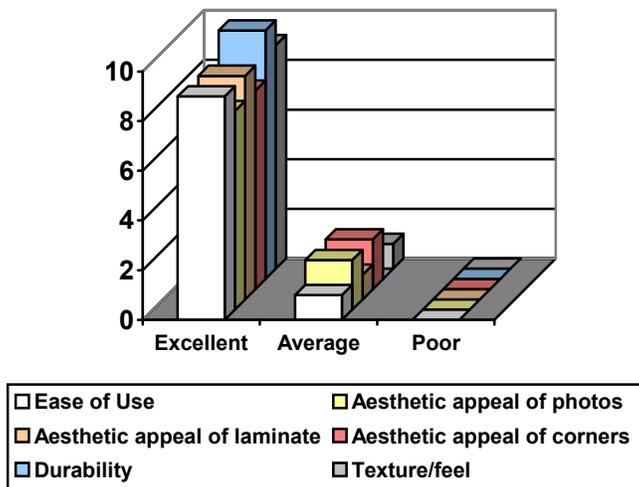
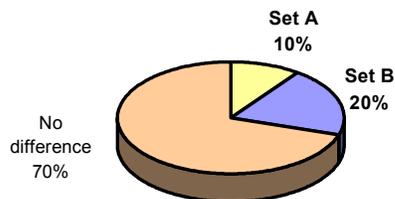


Figure 4: Teacher Ratings of Set B



The teacher’s were also asked if either Set A or Set B cards was easier for the children to handle. Most teachers (70%) found no difference in the children’s ability to separate the cards, lay them out, or stack them. These findings are illustrated in Figure 5.

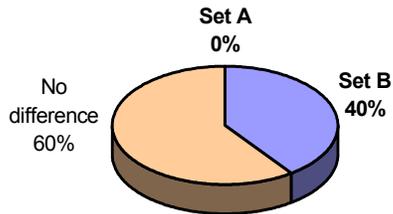
Figure 5: Teacher Response to the question “Which set was easier for the children to handle (eg, separate the cards, layout, stack)?”



The issue of environmental feedback was addressed in a question asking the teachers whether the children handled either Set with greater care. Most teachers (60% of

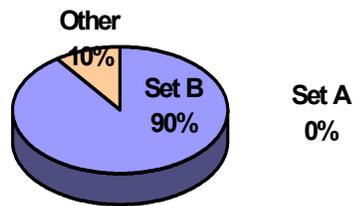
respondents) felt there was no difference in how they were handled while 40% felt that Set B was handled with greater care. No teachers felt Set A was handled with greater care. These findings are illustrated in Figure 6.

Figure 6: Teacher Response to the question “Did the children treat the cards differently? Did they handle one set of cards more gently (with more care)?”



When asked for their overall preference between Set A and Set B cards, 90% of responding teachers said they preferred Set B. No teachers preferred Set A. One teacher preferred a 1.5 mil laminate with rounded corners (not studied). These findings are illustrated in Figure 7.

Figure 7: Teacher Response to the question “Which set did you prefer?”



Teachers were also encouraged to make general comments about their students' experience with the cards. These are summarized in Table 6.

Table 6: General Teacher Comments (one per responding teacher)

<ul style="list-style-type: none">• “[The children made] many comments about the ‘softness/flexibility’ of thin laminate but every child who preferred thick laminate liked the rounded corners....I heard many comments about the “pokey” corners on the square corner cards!”• “Children preferred set B cards because they were easier to manipulate whilst the Set A cards were very difficult to pick up from the table as they were too thin. Set A had square corners that could hurt children...”• “There is a definite preference for Set B. Children seem to choose Set A only if B is unavailable....”• “I personally liked the thick laminated cards but it did not matter to me whether they had round or square corners.”• “The thick cards are more durable and will last longer. They will resist damage, they feel better in your hand. The thin cards feel flimsy.”• “With the thin laminate, the children were tempted to hold a card in their hands and bow it. It was attractive to them because of the springy quality of the laminated card, from flat to bowed to flat again....the thick laminate cards had a tendency to stick/cling to each other...The square and round corners didn’t seem to be an issue in terms of poking fingers or ease of picking up from a table. I tend to prefer the thick laminate/round corners cards because of their perceived durability.”• “I much preferred the round-edged, thick cards—easier to handle, sturdier, no sharp corners.”• “The children didn’t seem to prefer one or the other kind of cards for their independent work. When asked for their preference...some children preferred thick and some thin but they were consistent in picking the same kind.”• “When invited to the lesson and asked, ‘Which one would you like to use?’, then the difference is pointed out so the child feels the need to pick one but I don’t think they are picking one out of preference of one over the other.”• “They [the cards] invoked more oral conversation and the children were fascinated by the interesting words.”

Seven of the ten teachers who completed the Teacher Questionnaire (70% of reporting teachers; 64% of all teachers) noted that at least one Set A card had been damaged by the children during the study. No teachers noted any damage to Set B cards. The damage to Set A cards was in the form of a card’s being creased, bent, or folded.

Several teachers also noted how the children responded to the damage. These comments are listed in Table 7.

Table 7: Comments regarding Damaged Cards

<ul style="list-style-type: none">• “The children did not like it when a card got bent—it was a distraction for them and they felt bad.”• After damaging a card (it was folded), the child “tried to straighten the fold and did not like to choose that set again.”• After damaging a card (creased), “The boy was a bit worried and didn’t want to take the thin set afterwards.”• “Some of the children noticed that the cards were bent and tried to flatten it.”
--

Discussion

The assumption that vocabulary cards featuring color photographs will call to and interest the child is clearly supported by the findings of this study. The cards were regularly and repeatedly used in all classrooms. Further, several teachers commented on the value of vocabulary cards in their classrooms. These comments are summarized in Table 8.

Table 8: Comments regarding the value of vocabulary cards

<ul style="list-style-type: none">• “They [the cards] invoked oral conversation....”• “They [the children] enjoyed talking about them [the objects featured in the cards].”• “This material has an excellent conversational appeal.”• “The younger children enjoyed saying the names of the things.”

Flexible versus Rigid Laminate

Overall, there was no significant difference in the rate of choice of Set A or Set B packets. The children did show a slight preference for Set B packets during the initial presentation (53% chose Set B while 47% chose Set A). The regular use of both Set A and Set B cards suggests that these differences in lamination are not perceived as important to the child. However, there were two primary factors which confounded these results. First, the study did not distinguish between the choice of both packets together for matching work from the choice of a single packet for vocabulary work. Second, the study did not measure when a packet was chosen because it was the only packet available on the shelf (ie, the other packet was already in use). A valuable follow-up study might ask the teachers to record the unexpected uses of the cards (ie, for matching work and for independent work when the other set was already in use) separately from choices made when both sets were available on the shelf.

Since the frequency of use data does not clearly indicate a preference for one lamination method over the other, we look to the children’s comments. Of the eighteen children who stated a preference, 83% (15 children) preferred Set B cards while 17% (3 children) preferred Set A cards. This preference may have been due to the more rigid laminate or to the rounded corners.

Next, we must consider the question of damage. This study found a high rate of damage to Set A cards and no damage to Set B cards. Montessori teachers know that a creased

vocabulary card can not be repaired; the crease will not be removed even if the card is re-laminated. As it is no longer “perfect,” the children will forever be distracted by the damage and have difficulty looking past it to the image presented on the card. Thus, it needs to be removed and replaced. This, of course, adds an additional burden to the teacher’s time and budget.

Taken together, the children’s stated preference for Set B combined with the damage factor (and the children’s reluctance to use again materials they have damaged) speaks against the thin laminate and in favor of the thicker laminate.

Environmental Feedback

As to the question of adequate environmental feedback, the fact that damage occurred during just 8 weeks of use in 70% of responding classrooms is concerning. It may indicate a flaw in the design/manufacture of the Set A cards themselves rather than in a valuable level of environmental feedback. One teacher stated this possible design flaw in her comments: *“I had the impression that with the Set A, children couldn’t pick up the cards from the table and that was why they had to crease them to lift them at all, they were too thin.”*

Based on the results of this study, the thin laminate used in Set A cards created the probability rather than the possibility of environmental feedback. The results indicate that vocabulary cards laminated with a 1.5 mil laminate are at high risk of damage in a short period of time. Economically, the cost of replacing damaged cards may offset the savings in purchasing this less expensive form of laminate.

But, do Set B cards provide enough environmental feedback? If they do not, one might expect the children to handle them more roughly (since there would be little physical consequence for rough or careless use). This did not appear to be the case as 60% of teachers felt there was no difference in how the children handled the cards and 40% felt they handled Set B with greater care. Still, it may be interesting to study this question in a new study where half of the classrooms examine cards laminated with a 3 mil laminate while the other half examine otherwise identical cards laminated with a 5 mil laminate.

Square versus Rounded Corners

Both children and teachers noted that the corners of Set A cards were “pokey,” “pricky,” or hurt the child’s fingers. There were no concerns stated by either children or teachers about the rounded corners. These comments demonstrate that the square corners produced a tactile distraction to the child while the rounded corners did not. Thus, the rounded corners provide greater isolation of the visual stimulus than cards with square corners.

Based on the limited results available from this study, it seems that rounding the corners on laminated cards does not interfere with the children’s desire or ability to use them while leaving the corners square may.

Teacher Preference

The teachers overwhelmingly preferred Set B cards. Teachers were not concerned with the level of environmental feedback provided by either set of cards (excluding damage).

They also perceived no significant difference in the children's ability to handle (eg, layout, stack) either set of cards. The issue of preference focused on the perceived superiority of Set B cards with respect to their durability and rounded corners.

Implications

A key finding of this study is that vocabulary cards are a work that the children want to use repeatedly. This data supports the importance of vocabulary cards in the Montessori language curriculum and should encourage all teachers to offer the children a variety of vocabulary cards that are regularly rotated through their language area.

Similarly, the study found that children were drawn to match the cards together even though they had not been given a specific lesson to do so. If we trust the child's inner guide to find the work that they need, assuming it is available for them to choose, we are reminded that identical matching is also an important work for the child. It too should be included in the language area of all classrooms.

Another important discovery of this study is that the children were much more flexible about the lamination format of the cards than were teachers. The children may have preferred one set over the other but this did not prevent them from using both sets to do identical matching work. At the same time, many children commented on the "pokey" corners of the square cards. As our aim is to isolate the visual stimuli the cards are designed to provide (just as we wear a blindfold to isolate the tactile sense), we should round the corners on laminated cards in order to remove this tactile distraction and by so doing further isolate the concept being presented.

Finally, the rate of damage that occurred to the cards laminated with the 1.5 mil laminate indicates that this form of lamination is undesirable. If a high level of environmental feedback is desired, unlaminated cards may be the most economical and environmentally responsible means of attaining it. If the cards will be laminated, they should be laminated with a thicker laminate.

Conclusion

Based on the results of this study, it is recommended that when laminated vocabulary cards are preferred, they be laminated with a thicker laminate as the 1.5 mil laminate was too easily damaged and proved difficult for the children to lift off the table. Rounding the corners will not detract from the appeal or usability of the cards, will overcome the resistance some children stated to squared corners, and will remove the tactile distraction of "pokey" corners.

Investigator

Julia Volkman is the chief investigator of this study. She holds an AMI diploma (3 to 6+) earned from the Montreal Montessori Training Centre (a bilingual course) and a Bachelor's degree in English from Boston College. She also completed graduate coursework in English and Psychology at Harvard University Extension School. Ms. Volkman taught in Montessori classrooms for four years. Before discovering Montessori, she worked for over 10 years as a medical writer and corporate educational consultant. In 2003, Ms. Volkman founded Maitri Learning, a company which creates color photo cards

specifically for use in Montessori classrooms. Her goal in undertaking this study was to inform the manufacturing procedures she follows in creating Maitri Learning's products.

Maitri Learning currently uses the Set B lamination and corner rounding model for its language cards. However, the 5 mil laminate itself is much more expensive than a thinner laminate would be. Further, production costs are significantly increased by the rounding of the corners. Thus, if the study had supported Set A cards, Maitri Learning could have significantly lowered its manufacturing costs. Support of Set B, on the other hand, confirms the validity of its current manufacturing procedures. (As such, results in favor of either Set of cards have positive implications for Maitri Learning and thus remove the motive for investigator bias.)

Works Cited

Montessori, Maria. The Absorbent Mind. Oxford, England: Clio Press; 1988.

Montessori, Maria. The Montessori Method. New York, NY: Schocken Books; 1964.

Montessori, Mario M. "The Botanical Cards" reprinted in *The NAMTA Journal*. 1998; 23(2), 10-24.

Stoll Lillard, A. Montessori: The Science Behind the Genius. Oxford, England: Oxford University Press; 2005.

Appendix A: Study Materials

Lamination Study Vocabulary Cards in the Montessori Primary Classroom

Teacher Instructions (Study Protocol)

This information describes the procedures to follow when participating in the Lamination Study. Follow the instructions carefully and record your findings as described on the attached forms. If you have any questions regarding how to implement this study, please contact Julia Volkman via email at juliav@maitrilearning.com or phone at 413-529-2868.

Materials

Included with this packet are the following study materials:

- Set A (thin laminate with square corners) of each of the following Vocabulary Card Packets: Around the House, Around Town, In the Kitchen, Tools
- Set B (thick laminate with rounded corners) of each of the following Vocabulary Card Packets: Around the House, Around Town, In the Kitchen, Tools
- Frequency of Use Form
- Children's Comments Form
- Teacher Questionnaire
- Enrichment of Vocabulary portion of Language Album (for your reference)
- Stamped return envelope (**all forms should be returned to Julia Volkman, 131 Tob Hill Road, Westhampton, MA 01027 by March 15, 2006**; the vocabulary cards are yours to keep)

Set A and Set B Packets with the same title (eg, Tools) are identical in every way except for the laminate and corners.

Preparation

Choose one packet of cards (eg, Around Town). Remove both Set A and Set B cards from their plastic bag. Place each set of cards in an identical basket next to each other on a shelf where you would normally place vocabulary cards (eg, in the language area of your classroom). The teacher control sheet is for your reference only. Do not place this on the shelf.

Each packet pair (eg, Set A and Set B of Tools) should remain on the shelf for two weeks (10 school days). After two weeks, please exchange one pair of packets (eg, Set A and Set B of Around Town) for another (eg, Set A and B of Around the House) so that all four packet pairs can be studied. If you do not get to study all four packet pairs, please complete the attached forms based on the packet pairs you did study.

Presentation

Invite the child to do the work with you.

Introduce the work to him/her and offer him/her the choice of Set A or Set B cards. For example, you might pick up an identical card from each basket and say, "*These are such beautiful cards.*" Give the child an opportunity to touch and hold each card. Then, you might say, "*Would you like to use these cards [and touch Set A] or these cards [and touch Set B]?*"

If the child exhibits no preference, you may choose the basket but be sure to repeat the lesson with the child at a later time using the other set.

Proceed as you would normally present a vocabulary card lesson (eg, the three-period lesson with 3 or 4 cards) using the basket the child prefers. A copy of the presentation of vocabulary cards from the chief investigator's Language Album is attached for your reference.

When the lesson is complete and the child returns the basket to the shelf, restate that the child is now free to use either basket. For example, you might say, "*The next time you want to work with these cards, you can use this basket [and place your hand on Set A] or this basket [and place your hand on Set B]. You can choose.*"

Recording the Results

Use the attached three forms to record how often each basket is chosen, what the children say about the cards, and your own impressions of the cards. Return all completed forms in the envelope provided no later than March 15, 2006.

You are also encouraged to take photos and/or videos of the materials and the children using the materials throughout the course of the study. Please submit these along with your written findings upon completion of the study.

Lamination Study Frequency of Use Form

Number of Students Enrolled in Classroom: _____ **Location (State/Province):** _____

Use this form to keep a running tally (hash marks are fine) of how many times each card packet is chosen for the initial presentation/lesson and for independent work.

Packet Title	# Times Chosen			
	Set A (thin laminate, square corners)		Set B (thick laminate, round corners)	
	<i>Presentations*</i>	<i>Independent Work</i>	<i>Presentations*</i>	<i>Independent Work</i>
<i>Around the House</i>	<i>Presentations*</i>	<i>Independent Work</i>	<i>Presentations*</i>	<i>Independent Work</i>
<i>Around Town</i>	<i>Presentations*</i>	<i>Independent Work</i>	<i>Presentations*</i>	<i>Independent Work</i>
<i>In the Kitchen</i>	<i>Presentations*</i>	<i>Independent Work</i>	<i>Presentations*</i>	<i>Independent Work</i>
<i>Tools</i>	<i>Presentations*</i>	<i>Independent Work</i>	<i>Presentations*</i>	<i>Independent Work</i>

*If the child does not state a preference during the initial presentation, please note with an asterisk.

Lamination Study Children's Comments Form

Use this form to record statements you hear the children make when they are using the cards. Please attach additional paper if necessary.

Child's Age	Child's comment(s) (use quotes if verbatim, no quotes if paraphrase; specify which set of cards they are discussing)

Lamination Study Teacher Questionnaire

Please respond to the following questions after studying at least one packet in both formats A (thin laminate/square corners) and B (thick laminate/round corners).

1. Which packet(s) did you study? (circle all that apply)

Around the House *Around Town* *In the Kitchen* *Tools*

2. Please rate each set (place a check mark in the appropriate boxes):

	Set A (thin laminate/square corners)			Set B (thick laminate/round corners)		
	Excellent	Average	Poor	Excellent	Average	Poor
Ease of use						
Aesthetic appeal of photos						
Aesthetic appeal of laminate						
Aesthetic appeal of corners						
Durability						
Texture/feel						

3. Which set was easier for the children to handle (eg, separate the cards, layout, stack)?

Set A (thin/square corners) Set B (thick/round corners) No difference

4. Did the children treat the cards differently? Did they handle one set of cards more gently (with more care)?

Gentler/more careful with Set A (thin) Gentler/more careful with Set B (thick) No difference

5. Did the children damage any of the cards? _____ If yes, please answer the following questions:

A. Which set was damaged? Set A (thin) Set B (thick)

B. How was the card(s) damaged (eg, cut, folded, creased, immersed)? _____

C. How did the child respond to the damage? Did s/he try to repair it? Did s/he treat the cards differently afterwards?

6. Which set do you prefer?

Set A (thin/square corners) Set B (thick/round corners) No preference

7. When you laminate language cards, what type of laminate/laminator do you usually use? (circle all that apply)

pouch laminator roll laminator 1.5 ml laminate 3 ml laminate 5 ml laminate

