

What Belongs in a Montessori Primary Classroom? Results from a Survey of AMI and AMS Teacher Trainers

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Lillard and Else-Quest (2006) studied a group of children, some of whom attended a Milwaukee public Montessori school, and others who attended other types of kindergarten programs, and found that the Montessori children outperformed the other children on various measures. This study brought up another research question. The materials in the Milwaukee public Montessori school were largely limited to classic Montessori materials, even though many Montessori schools offer a variety of materials not described by Dr. Montessori. I was intrigued to investigate the impact of offering these alternative/supplementary materials, and so I went on to study children in what I termed Classic versus Supplemented Montessori Primary classrooms (Lillard, submitted).

The “classic” materials used to distinguish classrooms were selected mainly with reference to Montessori’s books. However, teachers have sometimes responded that they are not sure about what the classic materials are. To examine whether there is an agreed-upon set of materials, and to clarify what materials elicit divergent views, American teacher educators/trainers were asked to fill out a questionnaire listing 140 materials or activities that the author had seen in Montessori Primary classrooms*. Montessori materials catalogs and the AMS School Accreditation Handbook’s list were also used in constructing the list. Three Montessori Primary teachers, educated at different centers, looked over the list to ensure that no important materials were omitted and that names used for the materials clearly designated specific materials to teacher educators. For each material or activity, people were asked to state if it was Necessary, Desirable, Acceptable, or Better Not Used in a Montessori Primary classroom, and to make any remarks they might have about it. Two additional questions at the end of the survey were aimed at 1) whether Practical Life activities need always be real activities in the culture; and 2) whether duplicate (meaning more than one copy of) materials beyond Moveable Alphabets, Stamps Games, and Equation Cards are ever okay.

*AMI uses the term “teacher trainer” and AMS “teacher educator.” Many schools use the term “Early Childhood” or “Preschool” in place of “Primary.” The teaching credential as issued by AMS specifies the term “Early Childhood.”

Montessori Primary teacher educators were asked to complete the survey based on the rationale that they are the best living “voice” for what the materials should be. There are two major types of Montessori teacher education in the United States: AMI-USA (the American branch of the Association Montessori Internationale, founded by Dr. Montessori to carry on her work) and AMS (American Montessori Society, founded by Nancy Rambusch to represent Montessori in America). A problem for a study involving these two groups is representation: Primary teacher education is offered at about 100 AMS centers, whereas it is only offered at 10 AMI teacher training centers in the United States. Ten is a very small sample size, but one also does not want highly skewed representation for a study.

Some skew, however, is in keeping with the actual skew in the population. Thus, questionnaires were sent to all AMI Primary training centers, and to a subset of 20 AMS Primary teacher education centers geographically proximate to the existing AMI centers. Seven months later 29 forms had been returned: 17 from teacher educators at AMS centers, 11 from people presently or recently educating teachers at AMI centers, and 1 from an AMI affiliate in training. This last survey was used in the full pool but not in the AMI pool since the individual was not yet a certified AMI trainer (but could have taught at other types of centers). Although many AMS teacher educators are AMI-trained themselves, in this sample all respondents happened to be educated at the same type of center (AMI or AMS) at which they were preparing teachers, with the exception of 3 AMS teacher educators with NCME and/or IAPM (International Association of Progressive Montessori) training.

The results of the survey are presented here. For materials that elicited considerably divergent views, I try to shed light on the material by examining Montessori's writing and lectures. The source most often used in these discussions is the two-volume *The Creative Development in the Child*, which consists of Montessori's lectures to the teacher education course in Madras, India, in 1939, translated into English by Mario Montessori. These lectures were given 32 years after the opening of the first Montessori classroom in San Lorenzo, hence the system and Montessori's philosophy were well developed; Mario Montessori's translation also renders these lectures particularly authentic. Other books are also used where they seemed helpful. In addition, research in developmental psychology is discussed for issues on which it seemed relevant.

This paper aims to promote deep discussion about materials by reviewing participants' responses and Montessori's writings and, where relevant, current research.

As a preview, there are many materials about which there is high agreement among teacher educators: either they belong in a classroom, or they don't (workbooks were the one item teacher educators agreed did not belong). When there are disagreements, they appear to stem from one of two issues: the material is not developmentally appropriate but might be useful at another time—in these cases it either aims too low for most 3-year-olds or aims too high for a child in the first plane of development; or second, the material has no clear or at least no agreed-upon educational purpose at any age.

Results

Materials discussions below are arranged by topic or area. Within each, first I list materials that all teacher educators agree are important to a Montessori Primary classroom, before discussing materials that elicited divergent opinions across or even within organizations. Not every teacher educator responded regarding every material, in some cases because they could not identify the material. Sometimes comments made it clear that they had an opinion but they did not mark a category. For example, if a comment was "For Elementary only" I assumed the teacher educator meant it should not be in a Primary classroom. Percentages were calculated concerning the group that did respond or for whom a response could be clearly inferred from a comment.



Materials are discussed according to their basic groupings (Sensorial, Practical Life, and so on). For the materials in the initial table under each area below—materials agreed to be necessary—at least 85%, and in most cases 97%, of all respondents said the material was necessary to a Primary Montessori classroom. The reason no material elicited 100% agreement was that one teacher educator designated all the manufactured Montessori materials as desirable but not necessary; this teacher educator wrote, "One can be a Montessori teacher with anything at hand. I would hate to limit true Montessori to those who can afford all the materials." It is not clear that Montessori would agree, given the depth of her discussions about each material and statements like:

The importance of the material lies in the fact that through the activity, the mind of the child is called to that key which is presented by the material which should always [be] present[ed] in the usual prescribed fashion so that the special quality for which the material has been designed stands out. (Montessori, 1989b, p. 196)

Thus, according to Montessori, if one lacked the special materials, one would lack the “keys” to the world that the Primary materials present. Montessori seemed to think the specific materials she developed along with exercises of Practical Life (which differ by culture) were important to her system of education. That said, there are surely many classrooms around the world that lack many or even most of the Montessori materials, but still offer free choice, independent activity, and much else that is of great value for children’s development.

Under each table, I also note materials that at least 80% of respondents agreed were necessary or desirable, noting organizational differences where they were marked, and then I go on to discuss materials that elicited divergent opinions within or across trainings. For simplicity in the presentation of data, both AMI and AMS teacher educators are referred to as “trainers”.

Sensorial Materials

Seventeen Sensorial materials were agreed to be necessary to a Montessori Primary Classroom, and another 6 elicited very strong endorsement.

Sensorial: 85% or higher agreement as Necessary

Wooden Cylinders (4 Sets)	Pink Tower	Brown Stair
Red Rods	Knobless Cylinders	Color Tablets
Geometry Cabinet	Sound Boxes/ Cylinders	Rough & Smooth Boards
Smelling Bottles	Fabric Box	Mystery Bag
Geometric Solids	Sorting Exercises	Constructive Triangles
Binomial Cube	Trinomial Cube	

More modest but still strong agreement was expressed for **Musical Bells, Thermic Bottles, Thermic Tablets, Baric Exercises,** and the **Circles, Squares, and Triangles Tray**. These materials were all reported as necessary for AMI trainers, and either necessary or desirable for at least 80% of AMS teacher educators. **The Smelling Exercise** was 88% positive (necessary or desirable) overall although less so for AMI trainers, several of whom were unfamiliar with it. It has been described as a collection of aromatic items (selected by the teacher or found on a walk) that children identify while wearing a blindfold (Seldin & Epstein, 2003).

There were also many Sensorial materials that elicited different views depending on training affiliation. The **Inscribed/Concentric Figures**, a series of geometric shapes that can be inlaid, allowing the child to explore gradations of size and how one object can fit into another, were considered necessary/desirable by over 80% of AMS teacher educators, but elicited some divergence in AMI:

AMI Trainers: Necessary Desirable Acceptable Better Not

Inscribed/Concentric Figures	75%	—	13%	13%
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No trainers made remarks about this material. It is described as an Elementary material in *The Advanced Montessori Method—II* (p. 290), but as a material derived from geometric inset materials and which underlies creation of decorative design, but in the Primary lectures in *The Creative Development in the Child I* (p. 130), Montessori mentions exploring concentricity as well, with insets.

The post-Bells music materials elicited somewhat different views across training as well. AMI trainers more strongly endorsed the Bells (above) but also strongly endorsed the **Musical Boards and Notes**, whereas AMS trainers expressed more divergent views of the importance of the Musical Boards and Notes.

AMS Trainers: Necessary Desirable Acceptable Better Not

	Necessary	Desirable	Acceptable	Better Not
Musical Boards and Notes	17%	53%	29%	—

The Musical Boards and Notes are described in Montessori's books as being presented after and along with the Musical Bells to introduce the symbol system that leads to musical notation (Montessori, 1916/1965, 1967).

The **Tone Bars** are a material that AMI trainers said should not be in a Primary classroom but 60% of AMS trainers said was desirable and 40% claimed was acceptable. Many AMI trainers commented that the Tone Bars are an Elementary material.

Montessori discussed the Tone Bars as being a material with which one composes music after having learned musical notation from the Musical Boards. *The Advanced Montessori Method—II* specified that the first two materials are used in the Primary classroom, and then moved on to discussing materials for teaching the full scales including the Tone Bars, but did not specify in which classroom this material goes. Consideration of the Planes of Development and how each of these materials addresses the needs in those planes might help to shed light on this issue. In the first plane, ages 0 to 6, the child is "receptive, absorbing impressions with ease" (Montessori, 1948/1967, p. 5). The Musical Bells suit this time, as they are about "training the ear to perceive differences between musical sounds" (Montessori, 1916/1965). The child moves on to learn the musical notes and corresponding names ("do, re, mi") and then the symbol system as used on musical staves, learning to write basic songs. In this way learning musical notation parallels learning phonetic and numerical symbols in the Primary classroom. "All these exercises are based on sensory experience as the point of departure" (Montessori, 1916/1965, p. 332). By contrast, in the second plane, 6 to 12, the child is analytical, "wants to understand for himself" (Montessori, 1948/1967, p. 5), and acquires culture in an organized and systematic way. The Tone Bars are designed to convey the musical scales, allowing the child to discover the scales through experimentation and to develop understanding of melody. They are a much more complex and abstract material than the Bells.

AMS Trainers: Necessary Desirable Acceptable Better Not

	Necessary	Desirable	Acceptable	Better Not
Tone Bars	—	60%	40%	—
Pressure Cylinders	25%	69%	6%	—

In addition to the Tone Bars, AMI trainers contrasted with AMS trainers in viewing the **Pressure Cylinders** as not suitable for a Primary classroom. These cylinders convey the feeling of varying degrees of pressure. In the Nienhuis catalog, they are attributed to George Russell and were apparently developed in the 1980s. Montessori developed sensorial materials to abstract the qualities of color, temperature, texture, smell, tone, and so on, but did not develop a material for abstracting the quality of pressure. Whether that quality is important enough that it deserves a place on the Sensorial shelf is an issue for discussion.

In sum, there is wide agreement among trainers about most Sensorial materials. The Music materials that follow the Bells elicit some divergences across organizations, as do the Pressure Cylinders. Most trainers also endorse the Inscribed/Concentric Circles, but a minority of AMI trainers do not.

Language Materials

There were 10 language materials that were considered necessary, and 4 that received high agreement as necessary or desirable.

Writing on Lined and Unlined Paper, The Farm, and the Grammar Symbols were considered necessary by AMI trainers, and either necessary or desirable by at least 80% of AMS trainers.

Language: 85% or higher agreement as Necessary

Vocabulary Cards	Sandpaper Letters	Moveable Alphabet
Metal Insets	Chalkboards for Writing	Phonetic/Phonogram Objects
Phonetic Cards	Phonogram Booklets and Cards	Puzzle Word Cards
Realistic Books		

Three language materials elicited divergent opinions from both AMI and AMS. The criteria for this was that 80% or fewer of the respondents chose either necessary/ desirable or acceptable/better not (combining) categories. By dividing the categories in this way we can tap into points of real divergence, as the first two categories are clearly supportive, and the last two lukewarm or negative.

Divergent

Language Materials Necessary Desirable Acceptable Better Not

Language Materials	Necessary	Desirable	Acceptable	Better Not
Grammar Boxes-AMI	20%	—	—	80%
Grammar Boxes-AMS	18%	24%	29%	29%
Punctuation Exercises-AMI	63%		13%	25%
Punctuation Exercises-AMS	13%	31%	38%	20%
Tape Recorder-AMI	—	22%	33%	44%
Tape Recorder-AMS	19%	31%	44%	6%

For the **Grammar Boxes**, most AMI trainers thought the material negative in Primary classrooms, with some noting that it is an Elementary material, but 20% thought it necessary for Primary. Among AMS trainers, 42% saw it as necessary or desirable, and close to 30% saw it as acceptable and the same percentage as better not. This material seems to sit at the junction of the two planes of development in Montessori's books. She described, in *The Creative Development in the Child II*, the lectures that appear to constitute a Primary training course, but also in *The Advanced Montessori Method—II* (formerly entitled *The Montessori Elementary Material*). In the latter volume she notes that it is an activity of most interest to children from ages 5.5 to 7.5—the end of the first plane and the beginning of the second. Thus, whether Grammar Boxes belong in a Primary classroom might depend on how far the children in that classroom progress with their writing and reading, and whether the classroom has many children on the verge of the second plane of development.

The **Punctuation Exercises** also elicited divergent opinions, with 63% of AMI trainers considering them necessary, and 24% considering them negative; AMS trainers' responses were spread across the four categories but 43% considered them necessary or desirable and 38% simply acceptable. Montessori describes a series of more advanced Punctuation Exercises in *The Advanced Montessori Method—II*. In keeping with this, one trainer explained that the basics of what certain marks mean for readers (a comma indicates a pause, for example) would be explained to a Primary advanced reader, but that more formal exploration of punctuation is for Elementary level children. Another trainer noted that a short introduction to punctuation would come after presenting verbs to children.

Tape Recorders are a fixture in many Montessori classrooms, typically with books on tape so that the child can listen while looking at a book. Fifty percent of AMS trainers thought Tape Recorders were necessary or desirable, and another 44% thought them acceptable. AMI trainers were less positive, with 44% against them and 33% finding them just acceptable.

The only language material that AMS trainers strongly supported (over 85%) but which elicited divergent views among AMI trainers is the **Sand Tray**, a wooden tray filled with sand in which a child can practice writing letters. One trainer noted that the Sand Tray was “remedial work,” but others did not comment.

AMI Trainers: Necessary Desirable Acceptable Better Not

	Necessary	Desirable	Acceptable	Better Not
Sand Tray	18%	27%	36%	18%

To the best of my knowledge the Sand Tray is not mentioned in Montessori’s books. *The Montessori Method* as well as her later work (e.g., Montessori, 1989c) discussed only Metal Insets and the Sandpaper Letters as direct preparation for writing.

There were two language materials that AMI trainers eschewed but about which AMS trainers differed: **Whiteboards with Markers** and **Fantasy Books**.

AMS Trainers: Necessary Desirable Acceptable Better Not

	Necessary	Desirable	Acceptable	Better Not
Whiteboards with Markers	21%	50%	21%	7%
Fantasy Books	44%	—	25%	31%

Using **Whiteboards with Markers** to practice writing elicited a 70-30 split among AMS trainers, with the majority having a positive view. One trainer explained that one should have the material if possible because it is “certainly part of our culture these days.”

Fantasy Books also elicited divergent opinions. Montessori clearly took a negative view of introducing fantasy to children under 6 years of age; fairy tales, she specified, should be introduced in Elementary, and she found that normalized younger children had no interest in them (Montessori, 1989a, pp. 44-6). In other places she suggests that adults presenting fantasy to children confuse the developing mind, which is trying to sort out reality (Montessori, 1997, pp. 40-5), and she noted that “. . . often silly, funny stories or cartoons, in children’s books, do not appeal to the child” (Montessori, 1989c, p. 224). She went on to describe the beautiful, realistic, factual books she recommended teachers make (because publishers at the time did not).

There were three Language materials that AMI trainers agreed were necessary or desirable, but about which AMS trainers diverged.

AMS Trainers: Necessary Desirable Acceptable Better Not

	Necessary	Desirable	Acceptable	Better Not
Reading Analysis	18%	24%	29%	29%
Word Study	18%	41%	29%	12%
Detective Adjective Game	12%	53%	24%	12%

Reading Analysis, introducing children to the foundations of grammar, is described in *Creative Development in the Child II*, p. 281, followed by a presentation of the Grammar Boxes. Word Study begins with oral games (detecting sounds in words, described in *Creative Development in the Child II*, p. 15) and extends to studying related nouns, compound words, contractions, and the like towards the end of Primary. The **Detective Adjective Game** was also among the presentations at the course in Madras (*II*, p. 218), with the teacher giving the child labels for different types of triangles (little, red, isosceles) for the child to choose. These are clearly more advanced reading materials, and so would only be needed in a class where children were more advanced in their reading. The same issues discussed with regard to the Grammar Boxes thus seem pertinent here, although all of these materials come before the Grammar Boxes in the sequence and so more clearly fall in Primary.

One language material that did not elicit much endorsement from either training was **Writing Workbooks/ Worksheets**. All the AMI trainers considered them negative and 65% of the AMS trainers did, with most of the remaining AMS trainers viewing them as just acceptable.

In sum, there was agreement that 14 Language materials belonged in the classroom, and an additional set of materials appear to belong, when readers in the classroom are more advanced. There was one language material, the Sand Tray, that was considered a remedial add-on by some but necessary by others. Tape Recorders and Fantasy Books are two materials and about which there was disagreement across trainings.

Math Materials

Fifteen Math materials were agreed to be necessary to a Montessori Primary classroom, and another 3 elicited high agreement.

Mathematics: 85% or higher agreement as Necessary

Number Rods & Cards	Sandpaper Numbers	Spindle Boxes
Cards & Counters	Golden Beads (1 & 2)	Decimal Numeral Cards
Teen Boards & Beads	Ten Boards & Beads	Unit Division Board
Strip Boards	Linear Chains with Squaring Labels	Linear Chains with Cubing Labels
Snake Game	Multiplication Board	Multiplication with Beads

The **Stamp Game**, **Small Bead Frame**, and **Fraction Insets** were deemed necessary by over 85% of AMI trainers, and either necessary or desirable by at least 80% of AMS trainers.

There was only one Math material eliciting divergent views across the board.

Necessary Desirable Acceptable Better Not

Equation Booklets–AMI	50%	—	—	50%
Equation Booklets–AMS	53%	18%	24%	6%

Equation Booklets are square paper booklets used with materials like strip boards and finger charts to assist memorization of basic math facts. One trainer commented that this material was acceptable if a child was ready for it. Among AMI trainers, only 8 answered this question; 2 others indicated they did not know what the material was. Of those who answered, half found the booklets necessary and half thought them negative.

There were 5 Math materials that AMI trainers considered necessary but about which AMS trainers were divergent.

The **Dot Game** is about “carrying” in addition, described in *Creative Development in the Child II* (pp. 94-5) as a material presented after, but used in parallel with, the Stamp Game. Today it is offered either as a pencil-and-paper exercise with a preprinted form or with a whiteboard and water-based marker; Montessori describes it as involving a ground glass over a paper form. Whereas the Small Bead Frame is used for addition and subtraction, the **Large Bead Frame** supports multiplication. **Racks and Tubes** are used in Long Division. **Story Problems** (self-explanatory) are not something I have seen described in Montessori’s books. These are all more advanced Montessori Math materials, and while AMI trainers considered them necessary, AMS trainers had divergent responses. As

with some of the Language materials, the necessity of these Math materials in the classroom might hinge on how advanced the students in the classroom are. At schools where 5-year-olds tend to leave for public school, they might not be necessary.

AMI Trainers: Necessary Desirable Acceptable Better Not

	Necessary	Desirable	Acceptable	Better Not
Dot Game	47%	12%	18%	24%
Finger Charts & Equations	56%	25%	13%	6%
Large Bead Frame	25%	19%	31%	25%
Story Problems	35%	24%	41%	
Racks & Tubes	—	14%	29%	57%

One Math material considered negative among AMI trainers, but necessary/desirable for 94% of AMS trainers, was **The Hundred Board**. This material was developed in Holland to assist counting from 1 to 100; it is not described in Montessori's books. Other Montessori materials for counting include actual objects which one counts (like **the Golden Beads** and the **Long Bead Chains**); the step to abstraction in Montessori's sequence is the **Stamp Game**, which uses color coding for units, tens, hundreds, and thousands, and is used for mathematical operations rather than simply counting.

Like writing workbooks and worksheets, trainers were universally negative about **Math Workbooks and Worksheets**.

In sum, there was wide agreement about a core set of Math materials, but there were some materials that elicited divergent views across trainings. Specifically, there were 5 materials deemed necessary only by AMI trainers, and The Hundred Board was deemed necessary only by AMS trainers.

Geography and Science Materials

Four Geography materials were considered necessary by all trainers.

Sandpaper Globe	Land & Water Forms
Painted Globe	Puzzle Maps

Four additional materials—two Geography and two Science—elicited strong agreement. **Geography Cards and Folders/Boxes** and the **Botany Cabinet** were seen as necessary by more than 85% of AMI trainers, and necessary or at least desirable by more than 80% of AMS trainers. **Botany and Animal Cards** were agreed to be necessary or desirable by 80% of all trainers. More than 80% of all trainers considered the set of **Flags** necessary or desirable, but a substantial minority of AMI trainers (18%) thought them just acceptable.

One Geography material that AMS trainers considered necessary/desirable but about which AMI trainers were divergent was **Animals of the Continents**. This was described as placing plastic models of animals in their appropriate places on a map of the continents. A different iteration might be descriptions of animals placed in Geography Folders describing different countries, and this might be the reason for the divergence among the AMI respondents. I know of no discussions of this material in Montessori's writings.

AMI Trainers: Necessary Desirable Acceptable Better Not

	Necessary	Desirable	Acceptable	Better Not
Animals of the Continents	—	44%	44%	11%

Three other Science materials were considered necessary or desirable by AMS trainers but negative among AMI ones.

AMS Trainers: Necessary Desirable Acceptable Better Not

	Necessary	Desirable	Acceptable	Better Not
Sink and Float	94%	6%	—	—
Magnets	94%	6%	—	—
Botany & Animal Puzzles	63%	31%	6%	—

Sink and Float involves a basin of water and a set of objects that the child drops in to determine their flotation. This activity is not described in Montessori's books.

Magnets are interesting. In Elementary a child might begin to explore the underlying mechanisms of magnetism, and using them in Primary could set a child up for this much as the Binomial Cube is first used as a Sensorial activity. Montessori, however, did not introduce Science activities in this way, so it seems to be another interesting material for discussion.

The **Botany and Animal Puzzles** are offered in the Nienhuis catalog, but they are not described by Montessori. They show the different features of different animal groups and types of plants.

In sum, the area of Science and Geography had a small set of agreed-upon materials, as well as a few materials that elicited different opinions. This is not an area that is much discussed in Montessori's books for Primary, but it is much discussed in her books with regard to Elementary.

Practical Life Activities

Seventeen Practical Life activities were agreed to be necessary.

Walking on the Line	Silence	Grace & Courtesy
Dusting	Table Washing	Sweeping
Folding Clothes	Pouring Liquid	Pouring Solid
Polishing	Scissors Exercises	Dressing Frames
Arranging Flowers	Dish Washing	Food Preparation
Care of Plants	Washing Hands	

Table Setting and **Cloth Washing** also elicited quite strong agreement as necessary or desirable.

Six Practical Life activities evoked disagreement within AMI, but were agreed upon by most AMS trainers to be necessary or desirable.

AMI Trainers: Necessary Desirable Acceptable Better Not

	Necessary	Desirable	Acceptable	Better Not
Braiding	18%	27%	55%	—
Weaving	27%	27%	46%	—
Tools (hammer, screwdriver)	18%	18%	64%	—
Spooning Beans	46%	—	55%	—
Using a Sponge	22%	22%	33%	22%
Opening/Closing Jars and Bottles	55%	—	46%	—

Roughly half of AMI trainers thought **Braiding** and **Weaving** are desirable/necessary classroom activities, while the rest deemed them merely acceptable. The use of **Tools** also elicited disagreement, perhaps because it is unclear how one might use a hammer, screwdriver, and so on in the Primary classroom for a real activity. No AMI trainer saw any of these three activities as negative.

Spooning Beans also elicited some disagreement among AMI trainers, but again with no negative views. Montessori discussed *pouring* dry materials (Montessori, 1989b, p. 57), and all trainers agreed on this as a necessary activity. When trainers put notes by this item, they specified that it might be a preliminary activity. Preliminary activities isolate skills that are needed for other activities, and the trainers who endorsed two other Practical Life activities—**Using a Sponge** and **Opening/Closing Jars and Bottles**—tended to emphasize this as well: these activities might be there if there were children in the class who seemed to need them, but then they should be removed and replaced by more challenging activities as soon as possible. The child's interest, Montessori said, "may be destroyed in two ways—in finding things too difficult, or too easy" (Montessori, 1989c, p. 9). Thus choosing Practical Life activities with practical uses, and moving preliminary exercises out of the classroom once they were mastered by the children, would both seem to be important in the selection of activities of Practical Life.

Another six Practical Life Activities were thought to be negative by AMI trainers, but generally necessary/ desirable among AMS trainers.

AMS Trainers: Necessary Desirable Acceptable Better Not

	Necessary	Desirable	Acceptable	Better Not
Dropper Activity	88%	6%	6%	—
Tonging Activity	88%	6%	6%	—
Shell Scrubbing	63%	31%	6%	—
Grating Soap	21%	43%	36%	—
Locks/Lock Box	75%	25%	—	—
Peace Table/ Peace Stick	53%	29%	12%	6%

Dropper and **Tonging Activities** involve moving liquids with a dropper or solids with tongs from one container to another. Tonging is often done with cotton balls in Primary classrooms. **Shell Scrubbing** and **Grating Soap** are self-explanatory. Trainers sometimes asked in their comments on these activities, "For what purpose?"

A basket of **Locks** or a **Lock Box** was seen as merely acceptable by 82% of AMI trainers but as necessary by 18%, whereas it was viewed as necessary or desirable by all AMS trainers.

Having a **Peace Table** or **Peace Stick** was highly endorsed by AMS trainers but viewed as negative (67%) or just acceptable (22%) by AMI trainers. Montessori did not mention the use of these in her books, which describe children who are normalized and seem naturally to find ways to work peacefully with each other.

Near the end of the survey, teacher trainers were asked, "For Practical Life, does it matter if the activity is something one would normally do in real life? For example, is hammering golf tees into Styrofoam for practice at hammering at least an acceptable activity?" Overall trainers were about evenly split on this question, with 12 saying yes and 15 saying no. There was a strong difference across trainings, with 11 AMS trainers affirming the golf tee activity and 5 having a negative view of it (one did not answer the question), and 9 of the 10 AMI trainers answering against it. Across both trainings, when the activity was endorsed, it was often noted that it was okay as a preliminary activity and that real hammering of a real nail into wood should replace the golf tee activity as soon as possible. Those who answered negatively, across both trainings, specified that practical life activities should be ones that are real and meaningful in the culture, and should have a real purpose.

Art Materials

Just two Art materials elicited near-universal agreement among teacher-trainers: **Paints** and the **Easel**. **Pastels** and **Chalk** for drawing elicited fairly strong agreement as necessary or desirable for both groups of trainers, but 27% of AMI trainers thought them only acceptable. From there, the opinions were diverse both between and within trainings. Montessori's own views regarding art appear to have evolved considerably over her lifetime.

Only one art material elicited divergent opinions within both trainings: **Crayons**.

	Necessary	Desirable	Acceptable	Better Not
Crayons for Drawing-AMI	36%	18%	27%	18%
Crayons for Drawing-AMS	56%	6%	31%	6%

Fifty-four percent of AMI trainers and 62% of AMS trainers saw **Crayons** as desirable or necessary; 18% of AMI trainers thought them negative as compared to 6% of AMS trainers. One trainer who said they were desirable specified that their use should be limited, rotating them with other art materials, and that they should be presented formally. Two trainers specified that Crayons are a transition material for new children in the classroom; one said the goal was to work towards higher-quality materials like Oil Pastels. Another trainer held that Crayons were acceptable only for special occasions and activities.

Playdough and **Markers for Drawing** were viewed negatively by AMI trainers and divergently but mainly positively by AMS trainers. Some trainers noted that Playdough is too soft and Clay is preferable.

AMS Trainers:	Necessary	Desirable	Acceptable	Better Not
Playdough	41%	23%	18%	18%
Markers for Drawing	47%	6%	29%	18%

Three activities endorsed by AMS trainers elicited disagreement from AMI trainers.

AMI Trainers: Necessary Desirable Acceptable Better Not

	Necessary	Desirable	Acceptable	Better Not
Colored Pencils for Drawing	27%	27%	36%	9%
Crafts Projects	27%	—	36%	36%
Clay	36%	27%	27%	9%

The divergence regarding **Colored Pencils** might stem from whether they are being used for drawings from Insets or free drawing. Montessori clearly endorsed the former, not the latter (see below).

Crafts Projects were another point of disagreement, with the majority of AMI trainers finding them acceptable/better not but a few considering them necessary. I know of no discussions in Montessori's books on this topic, and suspect they were not considered part of school while she was alive. One trainer who did not make a category judgment commented that Crafts Projects should be used like any Montessori material: they should be well organized and thought out, and presented in a lesson. Another said they were acceptable only for special occasions. Another objected to the "project" aspect, suggesting crafts are fine.

Clay also elicited different opinions. In *The Montessori Method* the use of Clay for "Free Plastic Work" is discussed (Montessori, 1912/1965, pp. 241-2) as analogous to free drawing with pencils. She noted that children often make small models of objects in their homes, and thus could provide teachers insight about the child; but she removed this from the later edition of the book, suggesting she had decided by then that it was not a good material to include.

Toys and Games

Montessori's books note that she initially had toys in the classroom but removed them because children were more interested in work (Montessori, 1966, p. 122). Two Toy/Game Activities were thought to be negative among AMI trainers, but elicited divergent views among AMS trainers.

AMS Trainers: Necessary Desirable Acceptable Better Not

	Necessary	Desirable	Acceptable	Better Not
Commercial Puzzles	29%	18%	53%	—
Building Blocks/Legos	12%	18%	59%	12%

Building Blocks/Legos, and **Commercial Puzzles** (in contrast to the Puzzle Maps) were more acceptable to trainers in AMS centers than those in AMI centers, but several trainers from both trainings who gave them a negative evaluation also said that they were suited to transition or full-day programs.

Duplicate Materials

The end of the survey asked trainers if duplicate materials were ever okay, beyond duplicates of the Stamp Game, Moveable Alphabet, and small Equation Cards. Just one trainer thought it was always okay to have duplicate materials but only when the age span of the class warranted. Eighteen trainers said sometimes, and of this group, four specified that it is okay when there are many young students or the age span is particularly broad. For young students, an extra table washing set was endorsed by two trainers and specifically advised against by one. The materials most often cited as okay for duplication were the Bank Game/Decimal Beads, but several others were named, including Metal Inset Trays, Sandpaper Letters and Numerals, Number Cards, Art/Craft Activities, Cooking, and Sewing. Those who did not think a second copy of other materials was okay rarely gave reasons, but one stated that having just one copy eliminates competition, and another pointed to this passage from *The Child, Society, and the World*:

The fundamental fact in the preparation of the environment is to have only one set of each type of material. In many schools the teachers that came from our courses thought it would be better and give greater scope to have two whole sets in the school.... but it became evident that the discipline of the school is hereby slackened; and if one lessens the number of sets the discipline returns. (p. 64)

In sum, Montessori seemed to speak against having additional materials, although trainers were more open to having duplicates of a small set of materials under certain conditions.

Discussion

In discussing Montessori's ideas of what the Primary materials are, one faces a task that is perhaps not unlike those of justices attempting to interpret the Constitution: the world is different today, and we do not know what modern tools she would have used in the classroom (whiteboards? tape recorders?). We can only surmise, based on reasoning about materials that did exist in Montessori's time. Secondly, in going back to her books, one is asserting that her voice is paramount. This might well be contested. At AMI, the Pedagogical Committee periodically reviews materials and has made changes. AMS was founded on the claim that "American Montessori education needed to be as diverse and pluralistic as America itself" (Rambusch, 1992, p. 11).

Sensorial Materials

Inscribed/Concentric Figures

Perhaps the reason why a sizeable minority of trainers saw this material as just acceptable or even negative is that existing materials could convey the concepts well enough, and thus the Inscribed/Concentric Figures represent just more material to clutter a shelf. On the other hand, most trainers thought it a good material for the Primary classroom.

Tone Bars

By allocating the Tone Bars to the Elementary classroom, AMI trainers seem to suggest that the activities they engender are suited to the second plane of development. Perhaps they are used in some Primary classrooms as a material to explore sound, similar to the Bells, and this explains the divergence. Alternatively, in a classroom where children were very advanced in their musical composition with the Bells, the Tone Bars might be used at the end of the Primary cycle in the ways Montessori describes.

Language Materials

Punctuation Exercises

The divergent opinions here might rest on whether one is thinking of a basic introduction to punctuation, or a particular set of exercises aimed at Elementary children.

Tape Recorders

Several trainers noted that they saw no purpose in using Tape Recorders. A question that arises, then, is what purpose do they serve? Three possibilities that come to mind are: 1) the entertainment value of hearing a story; 2) the educational value that might stem from the content of a book on tape; and 3) as an assist to early reading. Regarding the first issue, Montessori clearly did not include among the materials items that were of entertainment value only—she describes in several books having initially had toys in the classroom, but removing them because they were not used.

The mark of Montessori materials is that they challenge the child. "Every item of culture that enters the syllabus must stimulate the child's intellect. . . . [and] draw his attention and demand his concentration" (Montessori, 1989c). To the extent that books on tape can do this, it might be due to content. It is difficult to speak to the content issue since no books on tape could also challenge the child by assisting with early reading. Research on using books on tape to assist reading is clear. Beginning readers are not helped by listening to books on tape while "reading" (Reitsma, 1988) although older readers (3rd and 4th grade level) are sometimes helped (McKenna,

1998; Rasinski, 1990). Reitsma (1988) suggests that children using books on tape often do not attend to the written words, but merely listen and look at the pictures.

I wonder about the place of a book on tape in the Montessori language sequence. Do teachers present it with Sandpaper Letters, or is it used once the child is deep into the Moveable Alphabet, or later? In Montessori, reading emerges spontaneously from learning to write, so the phonetic mappings are well learned during the beginning writing stage; once the child has the phonetic mappings, he or she has the tools to begin to read. Books on tape in the classroom would seem to be aimed at helping the child with these mappings, but as I've just noted, research has shown that they do not. In addition, supplying the Tape Recorder is supplying one more material to take the child away from others, like the phonetic objects and cards that assist reading in a more direct way. Montessori was quite clear that the materials she developed comprised a complete set: ". . . the experimental use by the children has determined the quality and quantity of the material" (Montessori, 1997, p. 13). For these reasons I think the Tape Recorder is questionable on theoretical grounds. There may of course be other considerations, and I hope this preliminary assessment will spur discussion about the use of this material in Primary classrooms. Specific content for books on tape was given in the questionnaire.

Sand Tray

Does the Sand Tray offer needed help beyond what is offered by the Sandpaper Letters? The child must produce the letter's shape in the sand, rather than simply trace it, but is there some advantage of producing it in sand over doing so with chalk or a pencil (both of which are mentioned in Montessori's books)? Although research on learning to write is clearly in support of Montessori's method of tracing letters while uttering phonemes, I don't know of research showing particular benefits for any particular type of writing instrument.

Whiteboards with Markers

Whether the place of Whiteboards in the culture warrants having them as a material in the classroom might be a matter of individual choice; certainly the place of video games and television in the culture does not mean they should be in classrooms. Some trainers eschew Markers because they are not sensitive to pressure: the same amount of ink goes out regardless of whether the child presses hard or lightly. Montessori was clearly concerned with children learning to use a light touch, and having materials that give feedback on the degree of pressure the child uses (see *Creative Development in the Child I*, Chapter 37). Markers lack this feature. It would be interesting to examine how developing penmanship is affected by use of a pencil versus chalk versus a marker.

Fantasy Books

Current research does weigh in on the best types of books for children's learning. For example, we know that children do not learn words as well from cartoon-like illustrations as they do from straightforward photographs and realistic line drawings; Fantasy Books showing (for example) letters of the alphabet as animals fail to teach letters; children learn less from pop-up books than from books that have plain pages; and children who are told stories about trains with families and feelings later are more apt later to judge that trains really do have families and feelings (Ganea, Ma, & DeLoache, in press; Ganea, Pickard, & DeLoache, 2008; Ganea, Richert, Bean, & DeLoache, 2004; Tare, Chiong, Ganea, & DeLoache, in press). This evidence would suggest that simple, realistic books are most appropriate to Primary classrooms. Given that both Montessori and the research literature lean against the use of Fantasy Books for young children, particularly deep consideration of their uses for children in the classroom would seem to be in order. It is not that children cannot tell the difference between reality and fantasy—researchers conclude that they typically do (Woolley, 1997)—but evidence thus far does not suggest that fantasy is useful for preschool education.

Writing Workbooks/Worksheets

My own observations are that children find Workbooks very attractive, but just as Montessori early on had preprinted outlines of drawings for children to fill in, which she later removed (see change from *The Montessori Method* to *The Discovery of the Child*), my guess is that she would not endorse today's Worksheets and Workbooks but rather would want 1) for the child primarily to interact with three-dimensional materials and 2) when working in two dimensions, to choose their own words rather than use preselected ones. Workbooks offer an entirely different form of education that theoretically does not seem to jibe well with Montessori, a judgment with which this group of trainers appears to concur.

Math Materials

Equation Booklets

It is possible that some of the divergence concerning this material was around the issue of whether the equations are preprinted, thus like a workbook for a child to fill in, or are blank booklets for the child to write equations. Montessori teachers sometimes discuss the importance of children making up their own problems, rather than being assigned problems by a teacher, thus giving the child more ownership of the work as opposed to the idea that the work is for the teacher. The divergence of opinions about this material might thus stem from lack of clarity in the questionnaire.



The Hundred Board

My guess is that the controversy surrounding this material stems from whether abstract counting with The Hundred Board has a place in the sequence of Primary math materials, or whether a child at the stage of counting should be using concrete, representative materials. Although I find Montessori's sequence of Math materials (rooted in the Sensorial objects) generally supported by the empirical math literature (e.g., Halberda, Mazzocco, & Feigenson, 2008), and long-term math/science outcomes of children who were in Montessori schools are superior to those who were in other schools (Dohrmann, Nishida, Gartner, Lipsky, & Grimm, 2007), more specific studies of the Montessori Math sequence remain to be done. Such studies could help shed light on whether introducing abstract counting with the Hundred Board is a useful addition to the original set of Math materials.

Geography and Science Materials

Animals of the Continents

Whether the Animals of the Continents material helps to direct interest to different areas of the globe for further research—in line with geography folders—would seem to be key in deciding its necessity. On the other hand, one can imagine a temptation to animate the small animal figures. Although pretend play is charming, I have raised the issue of whether children derive the same benefits from materials when they engage in fantasy play with them rather than use them as they are intended (Lillard, 2005, Chapter 5).

Sink and Float

One question is how useful it might be for Primary children to use the Sink and Float material: What do they learn from it? Research on pure discovery learning has clearly concluded that children rarely learn what adults think they might from interacting with a set of objects without specific guided instruction (Klahr & Nigam, 2004; Mayer, 2004). Thus, although they might learn that the wood floats and the metal sinks (is this very useful to know?), children probably derive no deeper understanding of what makes one object sink and another float from this activity. One might consider it useful as a Sensorial material imparting the abstract quality of flotation/buoyancy, but unless one lives by a large body of water, that quality does not seem particularly important to abstract. The material also might be useful in introducing early systematic testing, although children do not tend to test systematically until they are much older. So, for what purpose do we have Sink and Float? It does evoke concentration, but might activities that evoke concentration and also teach something useful be more appropriate?



Botany and Animal Puzzles

Perhaps the source of the divergence in responses about the usefulness of Botany and Animal Puzzles is whether it would be better for a real plant to be found outside and brought in to illustrate the feature. Or it may be that it is simply one more material, and one must choose whether and when to reserve shelf space for other materials that Montessori did design. Whether children get a better introduction to biological systems in one manner or another is a topic for empirical research.

Practical Life Activities

Montessori's writings make it clear that her criteria for Practical Life was that the activity be of real value and be an activity of the culture (Montessori, 1989c, p. 11), so perhaps the difference in trainers centered on whether they are from communities where braiding and weaving, for example, are more common. Extrapolating from Montessori's discussion of Practical Life, one would guess that in a culture where soap was routinely grated for use in washing, or shells were scrubbed so they could be used as dishes, such activities would make sense, if the child (or classroom) went on to use the grated soap or shells in the classroom. Dropper and tonging activities seem, at the level of preliminary activities, like the pouring of dry materials.

As to the Lock Boxes, I would guess the importance of this activity would depend on the child's need to know how to use locks. In some communities where theft is common and doors are kept locked, knowing how to use locks at a young age could be very important.

Peace Table or Peace Stick

My guess is Montessori would not find such material necessary, and would ask in what ways the classroom was not serving children's needs so that peace was disrupted and a special material was needed to restore it. Another question about this material arises from its not being part of the larger culture. If a child gets into a dispute in a store, for example, where there is no Peace Table or Stick, will that interfere with his ability to resolve the conflict? The material is reminiscent of the Talking Stick used in some Native American council meetings, and its use would seem appropriate for children in such cultures. The material also has some similarity to the use of an "ear" for buddy reading in the Tools of the Mind (Bodrova & Leong, 1996) program: one child holds a model of an ear and listens to another child who holds a model of a mouth and reads. When the roles switch, the children switch items. An external device can be a helpful reminder to a child with little self-control. In my research I have found that children in Montessori classrooms tend to have strong self-control (executive function), but early in the year in a class of young children some external aids might be helpful. The issue of whether these materials are necessary and useful seems ripe for exploration.

In sum, there was a large set of agreed-upon Practical Life activities, but there were also some divergences. These revolved mainly around two issues: one was whether an activity was aiming too low, in which case it might be useful as a preliminary activity in a class of young children but should be moved out early or when competence is demonstrated. The other was whether the activity was real and useful in the culture. In general, AMI trainers seemed to put more emphasis on whether an activity is really and truly done in the culture, whereas AMS trainers seemed to see more value in providing preliminary and preparatory activities so that the child could later perform the real activity.

Art Materials

Crayons

Crayons were commercially available when Montessori was establishing her first schools but I know of no mentions of them in her books. They are sensitive to pressure, unlike markers, but their tips easily lose sharpness, making it difficult to draw precisely with them. Colored pencils with sharp points might be a better material for drawing than Crayons, unless the Crayons could be kept sharpened as pencils are.

Clay versus Playdough

Teacher trainer responses may suggest that strengthening the hand might be an indirect benefit of working with Clay, as Playdough was considered too soft by some. Markers fail to discriminate lightness of touch, as just discussed, and this might explain their being eschewed by some trainers; they are clearly, however, tools of the culture that some might consider a reason to include them in the classroom.

Art materials are an interesting point of discussion with Montessori, particularly as her own views of them seemed to evolve quite a bit from the first edition of *The Montessori Method* in 1909 to her revision of it in 1948 in *The Discovery of the Child*. The art materials Montessori mentions in her later writings include colored pencils, particularly with reference to Metal Inset designs (Montessori, 1989b, p. 242), and paints and paintbrushes (Montessori, 1989b, p. 240). She has a section on Drawing and Representative Art in *The Discovery of the Child*, again specifying use of the metal insets, also noting watercolors and brushes (not the opaque tempura paints

more common today), and colored paper for cutting and making designs. She mentions that children learn to use these items spontaneously, without teacher intervention, building on the foundation of hand control brought about by the Metal Insets. Montessori clearly put high value on precision in drawing, discussing the interesting designs and botanical drawings children spontaneously made. On the other hand, she disparaged self-expressive young children's art as "nothing but monstrous expressions of intellectual lawlessness [which] show only that the eye of the child is uneducated, the hand inert, the mind insensible" (Montessori, 1916/1965, p. 308).

The basis for free drawing that children spontaneously did to decorate their work in Montessori's classrooms is the geometric shapes of the Metal Insets and the Geometry Cabinet (Montessori, 1989b, p. 133). But training of the hand and eye were fundamental, and at issue are the most compelling instruments for helping children with these tasks. Earlier, *The Montessori Method* referred to giving a child a pencil and blank sheet of paper for free drawing, as well as giving outlines of objects to color in (Montessori, 1912/ 1965, pp. 240-1), but this section was removed from *The Discovery of the Child*, replaced by, "The so-called free drawing has no place in my system" (Montessori, 1967, p. 280), and that, by having started with geometrical Metal Inset designs to train the hand, children would later (still in Primary) adorn their work with lovely free drawings. She also mentions using pastels in this section. In her 1939 lectures in Madras, Montessori described painting leading to drawing as means of self-expression, and of the need for very careful selection of and training in the use of the implements for these tasks (Montessori, 1989b, pp. 218-221). In sum, it would seem that Montessori would not endorse having much in the way of art materials in the classroom, save a set of drawing implements and a set of painting implements with which to decorate one's work and make illustrations (like botanical drawings), and, perhaps, pastels and collage materials. Her contemporaries were interested in self-expressive art by children, but she was not, preferring instead to have them do art once they had the skills to produce beautiful and accurate pictures. Today, art in schools is viewed as a valued activity by some and an expendable one by others, and interestingly there is a dearth of high-quality research on the issue.

Toys and Games

For transition (when starting a new class, or bringing many new children in), Montessori talked of having group activities, such as singing a song together, or walking carrying chairs together, and having this then turn into children pursuing individual Practical Life activities. She also mentioned that it is appropriate to give the child Toys during the transition time (Montessori, 1989b, p. 183). Hence, she would concur with the views of the trainers who reserved these materials for transitioning children into classrooms. The materials themselves certainly convey some information of use to children (gravity in blocks, the visual-perception exercise of a puzzle), but the Montessori materials offer those things and more (Pink Tower, Puzzle Maps), and it is not clear to me why a teacher would opt for having children use ordinary blocks/Legos or a commercial puzzle instead of the Montessori materials that convey more important information for a child to ponder.

Conclusions

This survey points out what materials are highly agreed on by teacher educators from both AMI and AMS centers to be necessary and/or desirable in a Montessori Primary classroom. There is a large set of agreed-upon materials across most areas, and with Art and Science/ Geography—two areas to which Montessori herself allocated little attention in discussions of the first plane of development. For other areas, when there were divergences, they stemmed from two sources: materials appearing to aim too high or too low (some Math and Language materials, for example, that are for children more advanced or some Practical Life materials that are preliminary to other skills), or they stem from divergent opinions as to whether the activity has a clear positive developmental purpose (the tape recorder or fantasy books, for example). I have tried to supply some preliminary discussion from research, Montessori's writings, and my own sensibilities, but those with much more knowledge and classroom experience than I have will do better. I do know that teachers are not always certain about what materials they should have in their classrooms, and hope that this will provide some foundation and elicit deeper consideration as well as fuller understandings within and across organizations.

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