

ASPIRA MAS ACADEMY CURRICULUM AND GUIDE

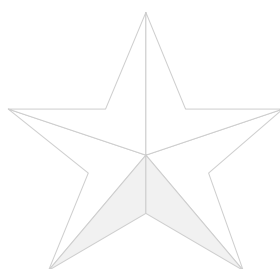


TABLE OF CONTENTS

WELCOME!	1
USING THE SAMPLE MAS ACADEMY CURRICULUM	6
SAMPLE ASPIRA MAS ACADEMY CURRICULUM	8
BUILDING YOUR OWN MAS ACADEMY CURRICULUM	12
CURRICULAR SOURCES	17
MAS ACADEMY CURRICULUM (ALPHABETICAL LISTING)	18
WEB SITES THAT SUPPORT THE MAS ACADEMY CURRICULUM (ALPHABETICAL LISTING)	23
MAS ACADEMY CURRICULUM (ORGANIZED BY AREA)	25
MAS ACADEMY CURRICULUM (ORGANIZED BY SCIENCE CONTENT)	26
MAS ACADEMY CURRICULUM (ORGANIZED BY MATH CONTENT)	27
WEB SITES THAT SUPPORT THE MAS ACADEMY CURRICULUM (LISTED ALPHABETICALLY ALONG WITH CONTENT AREAS)	28
EXTRA-CURRICULAR ACTIVITIES	29
SUGGESTED LIST OF VENDORS	30
APPENDIX A: COMPLIANCE WITH NATIONAL SCIENCE EDUCATION STANDARDS (NRC)	31
APPENDIX B: COMPLIANCE WITH CURRICULUM AND EVALUATION STANDARDS FOR SCHOOL MATHEMATICS (NCTM)	42

WELCOME!

WHAT IS THE ASPIRA MAS ACADEMY?

The ASPIRA Math and Science (MAS) Academy is a comprehensive enrichment math and science program for middle school Latino youth. The program includes hands-on activities, visits to scientific institutions, career guidance, role modeling, parental involvement, and other components.

The purpose of the MAS Academy is three-fold: *i)* To increase student motivation and interest in math and science; *ii)* To increase the math and science literacy of Latino youth; and *iii)* To increase Latino representation in math and science-related careers.

The MAS Academy is an after-school program that operates during the academic year and summer. During the Academic year, students meet twice a week to take part in a variety of enrichment activities. Students of the MAS Academy are not involved in textbook activities, long discussions, or lectures about math and science. Instead, they participate in hands-on activities where they learn by *doing*. As a result they are *engaged* and *become part* of the discovery process in math and science. The Summer MAS Academy is an intensive program where students meet daily for four weeks. It is modeled after the academic year program and adds to this experience topics that were not covered during the year. More information on the MAS Academy can be obtained through ASPIRA's web site at www.aspira.org/MAS.htm.

WHAT IS THE MAS ACADEMY CURRICULUM?

The MAS Academy curriculum is a set of educational materials that can be used to implement the hands-on and other activities of the MAS Academy. These materials cover a wide range of math and science topics and are designed to teach fundamental scientific and mathematical concepts to middle school youth. The curriculum is also designed to be of high interest to students. As such, its focus is to increase student motivation towards and participation in math and science educational activities. The materials presented in the curriculum have been tested nationally with various groups including minority and at-risk youth. The objective of the curriculum is to provide a fresh perspective in math and science through a series of fun and engaging activities.

WHY WERE THESE MATERIALS SELECTED?

The curricular materials selected and presented here have special characteristics. The materials were screened for a variety of features. All the selected materials selected have the following outstanding characteristics or features:

- The materials are easy to use by teachers and include a teacher's guide and background information
- The materials are student-centered , hands-on, interesting, and fun
- The materials teach important math and science concepts and skills
- The materials foster cooperative learning and are relevant to applications of daily life
- The materials are low in cost and rely on simple, inexpensive materials
- The materials have been tested at a national level by teachers and students in typical classroom and with minority and at-risk student populations

- The materials were created in conjunction with teachers
- The materials are easy to fit into the current curriculum and the teacher training program
- The materials contain a built-in student assessment or such assessment can be easily produced
- The materials meet the *National Science Education Standards* and the *Curriculum and Evaluation Standards for School Mathematics* and can assist teachers in implementing these standards in the classroom (see Appendix A and B for a full description on how the materials comply with these standards)

Selecting materials with specific characteristics is helpful for various reasons:

- It eases duplication of the program at a national level since significantly different curricula are not used through different MAS Academies (for example, a similar curriculum is used in the MAS Academy of Chicago and the MAS Academy of Miami)
- It facilitates implementation of the Academy at new sites
- It makes it possible to assess and evaluate the impact on students and teachers at a national level since they all use a similar curriculum
- It eases training of teachers and staff on its use
- It underscores the use of high quality educational materials
- It reinforces connection to the national standards

WHY THE NATIONAL STANDARDS?

What are the national standards anyway? The standards are not any set of materials or curricula. Nor is it a method for teaching with such materials. The national standards are guidelines, independent of any materials, to aid in the successful education of a scientifically literate society. The standards signal a consensus concerning good science education and a common vision about the basics of science education. The standards address issues such as: What should students learn? How are they to learn it? Who should be science literate?

Let's take the analogy of baking a cake. Imagine for a moment that you wanted to bake a cake. In this case the standards would not give you a recipe for the cake but tell you some fundamental aspects of the content and process to accomplish this such as: if you don't add water it probably will not work and if you overcook it taste may be compromised. The standards, however, will not tell you to bake a chocolate cake or even whether or not to add frosting. That is up to you! There are many ways to bake a good cake if a few guidelines are followed. So, in this sense the standards are not a particular set of rules or must dos but rather a set of guidelines to ensure that a good cake is baked. In the same manner, the standards do not tell us exactly what to do or how to do it but guide us by fostering good science education without being rigid. Another reason the standards were created is to have a common ground for all (uniformity). By using the standards, students being taught in say, Richmond, can achieve the same level of science literacy as those being taught in Los Angeles. The standards are like helpful road map which guides us towards the successful education of a scientific literate society.

The National Science Education Standards (NSES) were produced by the National Research Council (NRC), an operating agency of the National Academy of the Sciences. In order to be inclusive and achieve national consensus on the standards, the Council distributed a draft copy of the standards to 18,000 individuals and 250 groups. Reviewers included teachers, scientists, educators, parents - the gamut of

concerned individuals. Comments were analyzed and incorporated into the final draft of the document which was completed in 1996. The *Curriculum and Evaluation Standards for School Mathematics* were developed through a similar process by the National Council of Teachers of Mathematics (NCTM). Since their development, both sets of standards have had a major impact on the math and science education of this country. States and school districts have used them to create sound math and science education policies. Other organizations (and also individual schools) have also used it to structure their math and science education programs.

It is not our objective to present an in-depth definition of the standards at this point except to say that the materials presented meet a variety content standards listed in the NSES (such as specific concepts in physical science, life science, earth and space science, history of science, science as inquiry, unifying concepts and processes, and other content areas – see table in the following page). What exactly does this mean for this program and for the teacher? Well, for one thing it means that the materials provided are of high quality and teach fundamental science concepts. It also means that these materials can be successfully used to increase the science literacy of the students (see Appendix A and B). Furthermore, it means that some of these materials may be able to meet some of the standards set by the state and the district and can thus be used for this purpose during the regular school year.

HOW DO I USE THE MAS ACADEMY CURRICULUM?

The ASPIRA MAS Academy curriculum was created with flexibility in mind. It is meant to supplement the teacher's existing in-class curriculum by emphasizing a series of mathematics or science concepts. As such, the activity guides can be sequenced according to the particular needs of the teacher and students.

It is not necessary to be an expert to use the enclosed activity guides. You do, however, need to be a math or science teacher to best understand and use them. All guides come with a section destined for teachers on the use of the materials, logistics for setup of activities, time for conducting the activities, background information, and all student sheets needed. Because the materials meet the national standards, you may also wish to implement some of these activities through your regular classroom later on. We suggest that you familiarize yourself with the activity guides prior to classroom use. All activity guides are easy to use and straight-forward in their language.

There are two main ways you can use the curriculum for the ASPIRA MAS Academy: you can custom-build your own, following a set of enclosed guidelines OR you can use the ready-to-go sample curriculum provided in this booklet. Each of these options is explained in greater detailed in the following sections.

WHERE DO I GET TRAINING ON THE USE OF THE CURRICULUM?

Professional development is available for teachers and staff by the ASPIRA National Office. Training can include: use of curricular guides, training on hands-on activities, training on cooperative activities, creating a custom curriculum, implementation of extra-curricular activities, purchase of materials, and other topics. If you would like to schedule a professional development session please set up an appointment by calling the ASPIRA National Office at (202) 835-3600 x123 or through e-mail at jvillamil@aspira.org

USING THE SAMPLE MAS ACADEMY CURRICULUM

In the following pages you will find a sample one-year enrichment curriculum for middle school (grades 6 through 8) hands-on math and science activities. The sample curriculum can be used in one of two schedules: as an after-school program (two sessions of 2 hours each week) or as a Saturday Academy (one session of 4-5 hours each week). Each schedule is divided into a Fall session (September through December) and a Spring session (January through May).

Activities in *italics* denote hands-on activities. Activities in **bold** denote extra-curricular activities. Some of the extra-curricular activities can take place outside of the classroom (such as the **Visit to Museum or Scientific Institution I**) while some can take place in the classroom in a day that does not coincide with instruction (such as the **Family MAS Festival I**). Blacked-out squares indicate weeks where there may be no classes or where students and teachers may be busy with other school-related matters. The extra-curricular activities listed in **bold** below the table (such as the **Opening Ceremony**) can be implemented in addition to the two days of hands-on activities (at night or during a weekend day). The **bold** activities listed inside the table (such as the **Visit to a Museum or Scientific Institution I**) can take place instead of the hands-on activity.

A description of all hands-on activities can be found in the *MAS Academy Curriculum (Alphabetical Listing)* Section. This section provides a small description of the activity, along with the number of sessions it will take to complete as well as its source. More information on the sources (manufacturers) of the curriculum can be found in the Section entitled *Curricular Sources*.

Overall, the curriculum is balanced by presenting a near equal amount of activities in math and science. The activities presented in the sample curriculum were selected with the teachers and students in mind. For example, the first activity, *Fingerprinting*, is very easy to use (it only requires tape and pencils!) and is therefore a good way to start the program and ease into the activity guides. Fingerprinting is also very engaging and fun for the students. *Bubble•ology* and *Oobleck* have been equally successful in being of high interest to the students. These activities are suggested as opening activities at the beginning of each of the semesters to create enthusiasm in the students (and teachers!). *In All Probability* and *Height-O-Meters* are math-based activities that can be also done at home and are a good introduction to the **Family MAS Festivals** where parents and students meet to learn how to do math at home. *Paper Towel Testing* and *Oobleck* introduce students to the scientific method and to what scientists do. These activities are a good preface to **Ask-A-Scientist Day** when scientists will be coming into the classroom to relate what they do.

Two activity books *Get It Together!* and *United We Solve* are excellent sources for warm up activities. Each activity in these books takes approximately 10 minutes to complete and they can be used to warm up the class or can be grouped together to cover one or more days of instruction. *Bubble Festival* is an activity of high interest and is an excellent way to close the program by getting everyone involved. This activity can be used as an in-classroom activity or as a school-wide activity where other students, parents, teachers, and staff can participate. Any of the hands-on activities can be complemented through **Surf for Science**. This activity is designed for students to surf the internet for math and science sites that support the curriculum presented. A listing of the sites and their description is given in the *Web Sites that Support the MAS Academy Curriculum* Section. Although by themselves these sites do not provide all the curricular material necessary for a complete science education, they are of good use in addition to the activity guides. This optional activity can be held in lieu of the **Visit to a Museum or Scientific Institution II**. We present **Surf for Science** as an optional activity because we are aware that not all schools have the technology necessary to carry it out.

The *MAS Academy Curriculum (Alphabetical Listing)* Section lists the number of sessions in each activity guide. A good rule of thumb is that each session takes approximately one hour. There are exceptions to this – some take more and some less than an hour. There are approximately four hours of instruction a week in each of the schedules. This allows for the approximate coverage of one guide per week. The actual time listings can be found inside each activity guide. Activity guides that are especially

long (such as *Secret Codes*) have been split into parts 1 and 2. The teacher may choose to present half of the activity guide one week and the other half the next or skip a week to allow for variety.

In addition to providing flexibility in selecting the guides for instruction, we wanted to also provide two different schedules for the delivery. The After-School schedule presents one full guide per week – half of the guide on one day (2 hours) and the other half on the other (2 hours). The Saturday Academy closely mimics the After-School program by covering one full guide each Saturday (4-5 hours). We do not recommend to exceed five hours of instruction on any single Saturday. Covering any single subject matter for more than this amount of time will probably result in a loss of interests by the students. Nonetheless, converting the After-School schedule to the Saturday Schedule – where one full guide (or half a guide for the ones split into two parts) is covered in a day – allows coverage of approximately the same amount of material throughout the year. The particular days and times for implementation are left up to the school and teachers who know best the needs of their students.

We want to emphasize the flexibility of the sample curriculum. Many of the activity guides include sections to further explore the topics presented. Therefore, a teacher may choose to implement an activity guide for more than a week. Or, alternatively, a teacher may wish to skip an activity altogether due to lack of time or interest. Inevitably, the speed at which the students complete each of the activities will set the tone for the implementation of the curriculum as a whole. We have one week open in the sample curriculum specifically for this reason. This miscellaneous week allows for some wiggle room in adjusting the implementation of the curriculum or can be used to make up for other unforeseen circumstances.

We recommend that as much of each of the guides be covered. The sessions in each of the guides are sequential with the latter sections uncovering deeper scientific concepts based on the discovered explorations of the first sections. This is why we recommend to do as many activities of the guide during the same week whenever possible. Students that complete one activity of the guide on one week and a second activity later on may forget previous lessons learned and be confused in understanding how to do the following sessions or in the understanding of the deeper concepts later presented.

All activity guides necessary to implement the hands-on activities will be provided to the teachers before the program begins. A listing of vendors of some materials necessary to implement the activities is included in the *List of Vendors* Section.

If you are new to the teaching guides, hands-on instruction, or plain short of time, the Sample ASPIRA MAS Academy Curriculum may be the best way to go.

Good luck and happy teaching!

SAMPLE ASPIRA MAS ACADEMY CURRICULUM AFTER-SCHOOL • FALL

SEPTEMBER

WEEK ONE	WEEK TWO	WEEK THREE	WEEK FOUR
	<i>Fingerprinting</i>	<i>Bubble•ology</i>	<i>Get It Together! United We Solve</i>

Opening Ceremony

OCTOBER

WEEK ONE	WEEK TWO	WEEK THREE	WEEK FOUR
<i>Convection: A Current Event</i>	<i>Secret Codes (1)</i>	<i>Secret Codes (2)</i>	Visit to Museum or Scientific Institution I

NOVEMBER

WEEK ONE	WEEK TWO	WEEK THREE	WEEK FOUR
<i>QUADICE</i>	Career Exploration Lab	<i>Discovering Density</i>	<i>In All Probability</i>

Family MAS Festival I

DECEMBER

WEEK ONE	WEEK TWO	WEEK THREE	WEEK FOUR
<i>Structures (1)</i>	<i>Structures (2)</i>		

SAMPLE ASPIRA MAS ACADEMY CURRICULUM AFTER-SCHOOL • SPRING

JANUARY

WEEK ONE	WEEK TWO	WEEK THREE	WEEK FOUR
		<i>Oobleck</i>	<i>Chemical Reactions</i>

FEBRUARY

WEEK ONE	WEEK TWO	WEEK THREE	WEEK FOUR
<i>In the Pharmacy (1)</i>	<i>In the Pharmacy (2)</i>	<i>Paper Towel Testing</i>	Ask-A-Scientist Day

MARCH

WEEK ONE	WEEK TWO	WEEK THREE	WEEK FOUR
<i>Classifying Fingerprints (1)</i>	<i>Classifying Fingerprints (2)</i>	<i>More than Magnifiers</i>	Visit to Museum or Scientific Institution II OR Surf for Science (Optional)

APRIL

WEEK ONE	WEEK TWO	WEEK THREE	WEEK FOUR
<i>Math Around the World</i>	<i>Of Cabbage and Chemistry</i>	<i>Color Analyzers</i>	<i>Height-O-Meters</i>

Family MAS Festival II

MAY

WEEK ONE	WEEK TWO	WEEK THREE	WEEK FOUR
<i>Miscellaneous</i>	<i>Bubble Festival</i>		

Closing Ceremony

SAMPLE ASPIRA MAS ACADEMY CURRICULUM

SATURDAY ACADEMY • FALL

SEPTEMBER

FIRST SATURDAY	SECOND SATURDAY	THIRD SATURDAY	FOURTH SATURDAY
	<i>Fingerprinting</i>	<i>Bubble•ology</i>	<i>Get It Together! United We Solve</i>

Opening Ceremony

OCTOBER

FIRST SATURDAY	SECOND SATURDAY	THIRD SATURDAY	FOURTH SATURDAY
<i>Convection: A Current Event</i>	<i>Secret Codes (1)</i>	<i>Secret Codes (2)</i>	Visit to Museum or Scientific Institution I

NOVEMBER

FIRST SATURDAY	SECOND SATURDAY	THIRD SATURDAY	FOURTH SATURDAY
<i>QUADICE</i>	Career Exploration Lab	<i>Discovering Density</i>	<i>In All Probability</i>

Family MAS Festival I

DECEMBER

FIRST SATURDAY	SECOND SATURDAY	THIRD SATURDAY	FOURTH SATURDAY
<i>Structures (1)</i>	<i>Structures (2)</i>		

SAMPLE ASPIRA MAS ACADEMY CURRICULUM SATURDAY ACADEMY • SPRING

JANUARY

FIRST SATURDAY	SECOND SATURDAY	THIRD SATURDAY	FOURTH SATURDAY
		<i>Oobleck</i>	<i>Chemical Reactions</i>

FEBRUARY

FIRST SATURDAY	SECOND SATURDAY	THIRD SATURDAY	FOURTH SATURDAY
<i>In the Pharmacy (1)</i>	<i>In the Pharmacy (2)</i>	<i>Paper Towel Testing</i>	Ask-A-Scientist Day

MARCH

FIRST SATURDAY	SECOND SATURDAY	THIRD SATURDAY	FOURTH SATURDAY
<i>Classifying Fingerprints (1)</i>	<i>Classifying Fingerprints (2)</i>	<i>More than Magnifiers</i>	Visit to Museum or Scientific Institution II OR Surf for Science (Optional)

APRIL

FIRST SATURDAY	SECOND SATURDAY	THIRD SATURDAY	FOURTH SATURDAY
<i>Math Around the World</i>	<i>Of Cabbage and Chemistry</i>	<i>Color Analyzers</i>	<i>Height-O-Meters</i>

Family MAS Festival II

MAY

FIRST SATURDAY	SECOND SATURDAY	THIRD SATURDAY	FOURTH SATURDAY
<i>Miscellaneous</i>	<i>Bubble Festival</i>		

Closing Ceremony

BUILDING YOUR OWN MAS ACADEMY CURRICULUM

In the next pages you will find a blank table that can be used to facilitate the creation of a custom curriculum. We encourage you to read the previous Section *Using the Sample MAS Academy Curriculum* as it may contain ideas and tips that may be useful while building your own curriculum. Perhaps a good way to start is to first schedule all the extra-curricular activities first. A list of these activities, including the time necessary for their implementation and the best date to implement them (based on previous experience) is located in the Section entitled *Extra-Curricular Activities*.

Once these are in place, the next step would be to select the hands-on activities to be used. A comprehensive list of hands-on activity guides is included in the *MAS Academy Curriculum (Alphabetical Listing)* Section. A quick read of this section at this time will help to give a good overview of the materials available to build the curriculum. You may also want to become familiar with the sources for each of the materials (this can be done by reading the *Curricular Sources* Section). Each of these guides has been carefully selected and reviewed to be part of the MAS Academy curriculum. Selection of these activity guides is made under strict guidelines – including meeting of the national standards (see Standards Table). You will note that the Alphabetical listing contains more guides than there are slots available in the custom curriculum table. This is done purposefully in order to provide flexibility, choice, and to allow for emphasis in different areas.

Next, we select whether we want to implement the program using the Saturday or the After-School Schedule. Once this is done, activities can be selected by math or science content (chemistry, physical science, algebra, etc) by using the charts provided in the sections entitled *MAS Academy Curriculum (Organized by Math Content)* and *MAS Academy Curriculum (Organized by Science Content)*. These sections cross-reference each of the activity guides and their main content area. This table can be useful if a specific content emphasis is desired. Or it may come in handy if the teacher wishes to match the content area of the activities provided through the Academy to those being taught during regular classroom hours. In addition to the hands-on activities we have listed a series of internet web sites that support the materials presented through the guides. A teacher may decide to link these to the activities presented in order to increase student interest and add a technology-based activity to the curriculum. The sites are listed in the *Web Sites that Support the MAS Academy* Section. A teacher may also decide to create a custom curriculum based on certain national standards. For this reason we have included an extensive set of tables that cross-references all the educational materials listed to each of the national standards. Appendix A lists all science standards, which guides meet such standards, and the grade levels for each guide. Appendix B is similar but lists the math standards.

The alphabetical listing of all curricular materials also includes the number of sessions in each activity guide. A good rule of thumb is to cover one activity guide per week (either through two weekly sessions or through a single Saturday session). Each session presented in the activity guides requires approximately one hour of teaching. There are exceptions to this! Some sessions last longer (and others shorter) than an hour. The suggested time to cover each session is provided inside each activity guide. It may be a good idea tally all session times for the curriculum when slotting a sequence of activities in the table.

Once the sequence and schedule for the guides has been chosen – and the extra-curricular activities set – you are ready to go. All guides come with a section destined for teachers on the use of the materials, logistics for setup of activities, time for conducting the activities, background information, and all student sheets needed. Thus the long-term planning is concluded and the custom curriculum is set. All that's needed now is a group of students and the love for teaching math and science.

Good luck and happy teaching!

**ASPIRA MAS ACADEMY CUSTOM CURRICULUM
AFTER-SCHOOL • FALL**

SEPTEMBER

WEEK ONE	WEEK TWO	WEEK THREE	WEEK FOUR

OCTOBER

WEEK ONE	WEEK TWO	WEEK THREE	WEEK FOUR

NOVEMBER

WEEK ONE	WEEK TWO	WEEK THREE	WEEK FOUR

DECEMBER

WEEK ONE	WEEK TWO	WEEK THREE	WEEK FOUR

ASPIRA MAS ACADEMY CUSTOM CURRICULUM AFTER-SCHOOL • SPRING

JANUARY

WEEK ONE	WEEK TWO	WEEK THREE	WEEK FOUR

FEBRUARY

WEEK ONE	WEEK TWO	WEEK THREE	WEEK FOUR

MARCH

WEEK ONE	WEEK TWO	WEEK THREE	WEEK FOUR

APRIL

WEEK ONE	WEEK TWO	WEEK THREE	WEEK FOUR

MAY

WEEK ONE	WEEK TWO	WEEK THREE	WEEK FOUR

SAMPLE ASPIRA MAS ACADEMY CURRICULUM SATURDAY ACADEMY • FALL

SEPTEMBER

FIRST SATURDAY	SECOND SATURDAY	THIRD SATURDAY	FOURTH SATURDAY

OCTOBER

FIRST SATURDAY	SECOND SATURDAY	THIRD SATURDAY	FOURTH SATURDAY

NOVEMBER

FIRST SATURDAY	SECOND SATURDAY	THIRD SATURDAY	FOURTH SATURDAY

DECEMBER

FIRST SATURDAY	SECOND SATURDAY	THIRD SATURDAY	FOURTH SATURDAY

SAMPLE ASPIRA MAS ACADEMY CURRICULUM SATURDAY ACADEMY • SPRING

JANUARY

FIRST SATURDAY	SECOND SATURDAY	THIRD SATURDAY	FOURTH SATURDAY

FEBRUARY

FIRST SATURDAY	SECOND SATURDAY	THIRD SATURDAY	FOURTH SATURDAY

MARCH

FIRST SATURDAY	SECOND SATURDAY	THIRD SATURDAY	FOURTH SATURDAY

APRIL

FIRST SATURDAY	SECOND SATURDAY	THIRD SATURDAY	FOURTH SATURDAY

MAY

FIRST SATURDAY	SECOND SATURDAY	THIRD SATURDAY	FOURTH SATURDAY

CURRICULAR SOURCES

CUISENAIRE (CSN)

Cuisenaire has been a leader in the use of classroom manipulatives to teach math and science. The activity guide selected has been tested by students and teachers in several classrooms. Each activity has been designed to serve two broad purposes: to be meaningful to students at a personal level and to act as a stimulus for better scientific understanding of the world. The activities within the activity guide allow the students to explore, investigate, and experiment in a way that is appropriate to their prior background and abilities. The format and sequence of activities is designed to lead students to look closely and carefully at each phenomenon and to formulate conceptions in line with formal scientific theory.

EEPS MEDIA (EEPS)

The activities presented are designed to supplement problem-solving oriented mathematics curricular in the middle grades. As such, they are of excellent use as a warm up exercise to kick-off the day or can be used for one of more full-day sessions. The activities are designed for groups: they provide a structure for learning to work together. Through a collaborative environment students are exposed to interesting mathematics problems. The activities provide high standards for student performance, communication, and understanding of mathematical ideas.

LAWRENCE HALL OF SCIENCE (LHS)

The Lawrence Hall of Science has for many years been at the forefront of the creation of hands-on mathematics and science educational materials. The aim of each activity guide is to captivate the imagination of the student while illuminating essential scientific concepts and methods. Originally developed by the Lawrence Hall of Science, and subsequently tested by hundreds of teachers nationwide, each of the guides is prepared to be of optimum use to the classroom teachers.

The guides use a hands-on approach to create independent learners and critical thinkers, increase student understanding of pivotal math and science concepts, promote mastery of key math and science skills, and build positive attitudes towards science and mathematics. The activity guides use easy-to-obtain, inexpensive materials. Each teacher's guide provides an introduction, detailed information on the materials needed for the unit, how to prepare each activity, the time required to perform the activity, and additional topics.

MATHEMATICS, ENGINEERING, SCIENCE ACHIEVEMENT (MESA)

Washington MESA has created and field-tested a variety of middle-grades instructional activity guides to teach real-world mathematics through science. The guides weave important mathematics themes with relevant, exciting science topics. Students emulate real-world work environments by collaborating in small groups and striving for group consensus. They work with concrete materials and evaluate open-ended problems – the combination that helps the transition from concrete to abstract thinking and crucial to intellectual development of students at this age. Each activity guide includes an overview, teacher's instructions, assessment strategies, student sheets, career links, and family involvement sections.

MAS ACADEMY CURRICULUM

(ALPHABETICAL LISTING)

Bubble Festival • 12 Sessions (LHS)

This guide includes 12 classroom table-top activities with set-up instructions. Learning stations encourage independent thinking and cooperative learning – brining fun and excitement to the classroom, while “bubbling over” with science and math. From Bubble Shapes and Bubble Measurement to Bubble Skeletons and Body Bubbles, intriguing and classroom-appropriate bubble activities are featured. The guide features a detailed introduction full of suggestions to assist teacher in flexibly presenting the units, including tips on classroom logistics, ways to further explore mathematical and scientific content, and writing and literature extensions.

Bubble•ology • 10 Sessions (LHS)

In this very popular guide, students combine fun and intense enjoyment with an exploration of important concepts in chemistry and physics through imaginative experiments with soap bubbles. Students devise an ideal bubble-blowing instrument; test dishwashing brands to see which makes the biggest bubbles; determine the optimum amount of glycerin needed for the biggest bubbles; employ the Bernoulli principle to keep bubbles aloft; use color patterns to predict when a bubble will pop; and create bubbles that last for days. Bursting with fun and energy, this guide is packed with solid scientific, technological, and mathematical concept learning.

Chemical Reactions • 2 Sessions (LHS)

An ordinary ziplock bag becomes a safe and spectacular laboratory, as students mix chemicals that bubble, change color, get hot, and produce gas, heat, and odor. They experiment to determine what causes the heat in this chemical reaction. This exciting activity explores chemical change, endothermic and exothermic reactions, and is a great introduction to chemistry.

Classifying Fingerprints • 6 Sessions (MESA)

Classifying Fingerprints give students a sampling of activities that forensic scientists do as well as an introduction to the mathematics involved. Students learn how forensic scientists must be top-notch problem solvers who rely on their perceptive and organizational skills, particularly for pattern recognition and differentiation. They also explore the statistical analysis utilized in all phases of forensic work. The activity is highly engaging and fun.

Color Analyzers • 4 Sessions (LHS)

Students investigate light and color while experimenting with diffraction gratings and color filters. They use color filters to decipher secret messages, then create their own secret messages. By taking part in these activities and drawing conclusions from their experience, students gain further insight into questions such as: Why does an apple look red? A background section provides concise information on color, light, and what is known of how the eye and brain sense and comprehend color. Sufficient materials for a class of red and green filters and diffraction gratings is included in an envelop attached to the inside back cover of the guide.

Convection: A Current Event • 3 Sessions (LHS)

Students explore this important phenomenon by observing and charting the convection currents in a liquid. Through their own experience, students gain understanding of how patterns they observe in a heated pan represent one of the three main ways that the heat moves, then go on to apply their understanding into other settings. They learn that convection is also one of the primary motivating forces that influences the movements of the Earth's crust and volcanic eruptions, the weather, the wind, and many other natural events.

Discovering Density • 5 Sessions (LHS)

In a highly involving and colorful hands-on activity, students attempt to layer liquids in a straw, leading them to explore the concept of density. The teacher introduces the mathematical equation for determining density. Students have fun creating secret formula sheets, while reinforcing their practical understanding of this important concept in the physical sciences. Why does a scoop of ice cream float in root beer? A number of such Puzzling Scenarios encourage students to explore real-life connections to density.

Earth, Moon, and Stars • 16 Sessions (LHS)

In this extensive unit, students learn a great deal about the Earth, gravity, and astronomy. Three main sections focus on the shape of the Earth and gravity; moon phase and eclipses; and the stars. Students question questions such as: If the Earth is a ball, why does it look flat? Why does the moon change its shape? How can I find constellations and tell time by the stars? Activities include observing and recording changes in the sky and creating models to explain observations.

Family Math (Spanish and English) • 50+ Sessions (LHS)

Family math focuses entirely on parents and teachers learning mathematics together. The activities provide parents and students with a wide variety of ideas and materials for parents to use at home to help their children learn mathematics. The parents do not need to know extensive mathematics in order to participate and the activities are fun and can easily be conducted with materials available in most homes. Thousands of families have taken a Family Math course taught by their child's classroom teacher, a parent, a teacher aid, a community instructor, or a retired person. The goal of the activities is for parents to act as role models in the math and science education of their children. It is extremely important for children to have opportunities to talk about mathematics with their parents, and equally important for parents to be able to talk with other adults about mathematics.

Fingerprinting • 3 Sessions (LHS)

Students explore the similarities and variations of fingerprints in these “fingers-on” activities. Students take their own fingerprints, devise their own classification categories, then apply their classification skills to solve a crime. The mystery scenario, Who Robbed the Safe? Includes plot and character sketches. The fingerprinting technique does not involve ink but a simple method using pencil and transparent tape. Several additional mystery scenarios are provided in the guide, along with background information on fingerprints.

Get It Together! • 24 Sessions (LHS)

Get it Together is a collection of math problems for groups (cooperative logic problems). The problems span a wide range of mathematics topics and are presented in a special format. They are problems for groups, not individuals, to solve together. Each problem has the same format: the information a group will

need to know has been placed on clue cards. Each member of the group will have a different bit of information, so everyone will have to cooperate to solve the problem. Topics covered include: logic, geometry, algebra, probability, measurement, functions, and others. These problems are an excellent way to warm up a class.

Height-O-Meters • 4 Sessions (LHS)

Students are introduced to the principle of triangulation by making simple cardboard devices called “Height-O-Meters.” Students measure angles to determine the height of the school flagpole, and compare how high a styrofoam and rubber ball can be thrown. “Going Further” activities relate triangulation to the real-life activities of forest rangers and astronomers and also introduce the tangent function of trigonometry.

In All Probability • 11 Sessions (LHS)

Students play games that involve coins, spinners, dice, and Native American game sticks. They investigate chance and probability with concrete materials, learn how to gather and analyze data, make predictions, and draw conclusions. As they gain direct experience, they also build confidence in their ability to explore probability and statistics. Background information on probability and statistics is provided, with information on real-life connections and careers, and on the probabilities involved in each of the games. These activities provide a solid basis for the development of much needed (and often neglected) real-life understanding and skills. Cooperation is stressed and students learn that mathematics is fun.

In the Pharmacy • 5 Sessions (MESA)

Students understand the words pharmacist, medicine, and dosage, but many have never thought about the math and science involved in this field. In the Pharmacy examines ratios, proportions, percents, mixtures, and dilutions. In one activity, students learn the concepts of part-to-part ratios and part-to-whole ratios as they compare the number of red M&M’s® in a small bag to the number of orange M&M’s® and the total number of M&M’s® in the bag. In another activity, students simulate a pharmacist reading and filling prescriptions. Using Color Tiles to model the drug and filler, they then determine the ratio of drug to filler. They also determine what the dosage should be, how many doses are to be given, and the amount of mixture needed. Other activities include learning about percents and dilutions. All activities show a clear connection to real-world mathematics.

Math Around the World • 8 Games (LHS)

With a wide range of games and other challenges from many continents, Math Around the World sets mathematics with a multicultural and international context. The fun and excitement of the games greatly facilitates learning, and complete presentation instructions help make the mathematical concepts more explicit and powerful for all students. Games included are: NIM, Kalah, Tower of Hanoi, Shongo Networks, Magic Squares, Game Sticks, Games of Alignment, and Hex.

Measuring Dinosaurs • 5 Sessions (MESA)

Measuring Dinosaurs introduces students to activities that zoologists and paleontologists do as well as to the mathematics involved. In studying the sizes of large animals, students learn about uncertainty in measurement. They use their knowledge of ratios, proportions, powers, and roots as they investigate two different methods of scaling size and shape.

More than Magnifiers • 4 Sessions (LHS)

In this ingenious unit, students use the same two lenses in different ways to create optical instruments, and in so doing find out how lenses are used in magnifiers, simple cameras, telescopes, and slide projectors. They learn that lenses have certain measurable properties that can help determine which lenses are best for specific purposes. This guide brings into practical “focus” important understanding related to physics, optics, and light. The background section includes information on lenses, optics, and the human eye.

Of Cabbages and Chemistry • 4 Sessions (LHS)

This series of activities offers students a chance to explore acids and bases using the special indicator properties of red cabbage juice. The color-change game Presto Change-O helps students discover the acid-neutral-base continuum. Students discover that chemicals can be grouped by behaviors, and relate acids and bases to their own daily experience. The guide also includes an Acid and Aliens from Outer Space extension activity that can be presented to reinforce student learning. The activities of this unit provide students with a direct example of how chemistry is part of all aspects of our lives.

Oobleck: What Do Scientists Do? • 4 Sessions (LHS)

Students investigate and analyze the properties of a strange green substance, Oobleck, said to come from another planet. The class holds a scientific convention to critically discuss experimental findings. Students design a spacecraft to land on an ocean of Oobleck. In the final session, the methods the students used to analyze Oobleck are compared to those on the Mars Viking mission. A large poster illustrating the Mars Viking mission is included. Oobleck is not only a great hands-on experience for all ages, the unit provides students with authentic insight into the real work of scientists.

Paper Towel Testing • 4 Sessions (LHS)

In a series of experiments, students rank the wet strength and absorbency of four brands of paper towels. The experiments are elegant in their clarity and the materials needed are very easy to obtain. Students investigate eagerly, gaining important skills and understandings as they do. Based on their findings and the cost of each brand, they determine which brand is the “best buy”. These activities provide a stimulating introduction to both consumer science and the concept of controlled experimentation. Students can go on to devise their own controlled experiments, design tests for other consumer items, or create advertisements for paper towels based on their test results.

QUADICE • 5 Sessions (LHS)

This original, challenging, and fun mathematics game encourages students to perform mental calculations, handle fractions with greater confidence, and explore probability. The game format enables the practice in skills related to mental arithmetic and strategic thinking to take place within an exciting context. Teams of three students, using a special set of four easily made dice, play 12 rounds that involve the skills of addition, subtraction, division, and multiplication. A cooperative version of the game helps students work together to solve problems. The guide also contains mystery puzzles to solve and encourages players to create mystery puzzles of their own.

Secret Codes • 6 Sessions (MESA)

In Secret Codes, students explore the mathematics involved in cryptology by devising, enciphering, and deciphering codes. The materials in Secret Codes is presented in a problem-solving mode. Each type of code is introduced via an encoded message that students need to decipher, as though they are breaking “the

enemy's" secret messages. In studying secret codes students learn about modular arithmetic and equivalency, and they use their own knowledge of prime numbers and factors as they investigate different methods of encoding and decoding private information.

Structures • 5 Sessions (CSN)

Structures involves students in the building of models of real life structures (houses, columns, bridges, towers) using drinking straws and other materials. In the process of constructing their models, students must solve a variety of problems in order to keep their models rigid and strong. Together, the activities offer a foundation of developing the basic concepts of force, tension, compression, and equilibrium forces.

United We Solve • 24 Sessions (EEPS)

United we solve is the follow-up book to Get It Together! It follows an almost identical method (group logic problems) but includes science as well as mathematics problems. (See Get It Together for more information).

Vitamin C Testing • 4 Sessions (LHS)

This guide is a stimulating introduction to chemistry and nutrition. The students perform a simple chemical test using a vitamin C indicator to compare the vitamin C content of different juices and then graph the results. In addition to gaining experience in conducting and designing experiments, students enter the realm of consumer science as they use chemistry to evaluate various juices. "Going Further" research projects can include finding out more about how vitamin C and its nutritional significance were discovered, and learning more about vitamin C's importance in human health.

WEB SITES THAT SUPPORT THE MAS ACADEMY CURRICULUM (ALPHABETICAL LISTING)

Amazing Space *<http://amazing-space.stsci.edu>*

The Space Telescope Science Institute located in Baltimore, Maryland is responsible for the scientific operation of the Hubble Space Telescope. During the summer of 1996, the institute was set abuzz by the invasion of ten science teachers. These teachers teamed up with scientists and engineers from the institute and staff members from the Office of Public Outreach to develop interactive lessons for the World Wide Web. In these pages you will find the lessons they developed. The suggested levels for individual lessons vary from elementary to high school, (K-12).

Discovery Online *<http://www.discovery.com>*

A wide variety of science articles and activities are available on this site. The site is loaded with Science News Briefs, Mind Games, Live Cameras, Conversations, Program Listing, Shopping and more.

Dragonfly *<http://www.muohio.edu/dragonfly>*

The companion web site for Dragonfly magazine. Dragonfly, a magazine for young investigators, is published bimonthly, September through June, by the National Science Teachers Association. The site has a wide variety of science activities for young children.

The Howard Hughes Medical Institute *<http://www.hhmi.org/coolscience/>*

The Howard Hughes Medical Institute invites curious kids to explore science on-screen, off-screen and in between. On-line activities include: Dive into a miniature world – without a microscope, Why are snakes like lizards and monkeys like moose?, Butterflies don't look like caterpillars. What is the connection?, Meet the dust – and other strange stuff – in your air. Do we really breath this?, and other activities.

Kinetic City Cyber Club *<http://www.kineticcity.com>*

This is the famous science radio series that is broadcast nationally. The site contains some of the most popular mystery cases, a lab car loaded with experiments that students can do at home, and other interesting activities. The site also has a listing of times when the program will be aired.

National Geographic On Line *<http://www.nationalgeographic.com>*

The companion web site to the famous science magazine. The site receives more than a million visits each month, and has grown to more than 10,000 screens. As of August 1, 1998, visitors had posted 12,308 messages on the forums section. The Software Publishers Association hailed us in 1997 as the best site on the Web, and a gratifying number of awards have repaid the hard work for creating the site.

National Geographic World On Line <http://www.nationalgeographic.com/world>

This is National Geographic's magazine for young explorers. The site contains a wide variety of articles and activities for kids. (see National Geographic On Line).

Math in Daily Life <http://www.learner.org/exhibits/dailymath>

When you buy a car, follow a recipe, or decorate your home, you're using math principles. People have been using these same principles for thousands—even millions—of years, across countries and continents. Whether you're sailing a boat off the coast of Japan or building a house in Peru, you're using math to get things done. This site explores how math can help us in our daily lives. In this site, you'll look at the language of numbers through common situations, such as playing games or cooking. Put your decision-making skills to the test by deciding whether buying or leasing a new car is right for you, and predict how much money you can save for your retirement by using an interest calculator.

The Math Forum <http://forum.swarthmore.edu>

The Math Forum, an online community funded in part by the National Science Foundation and hosted by Swarthmore College, has been built with the contributions of math educators, interested volunteers, and online programming groups. The site contains: problem of the week, ask Dr. Math, Math Library, Teacher2Teacher, Student Center and much more.

Smithsonian Magazine <http://www.smithsonianmag.si.edu>

This is the companion site to the Smithsonian Magazine. The site includes articles presented in the print magazine. Readers can also subscribe to the Smithsonian electronic newsletter which has articles, events and programs sponsored by the museums.

The Yuckiest Site on the Internet <http://www.yucky.com>

An interesting and fun science site. Kids find it cool to learn more about the science behind yucky phenomena such as stinky feet, worms & bugs, and mold. The site includes games, articles, electronic postcards, and other activities.

MAS ACADEMY CURRICULUM (ORGANIZED BY AREA)

SCIENCE ACTIVITY GUIDES

Bubble Festival
Bubble•ology
Chemical Reactions
Color Analyzers
Convection: A Current Event
Discovering Density
Earth, Moon, and Stars
Fingerprinting
More than Magnifiers
Of Cabbages and Chemistry
Oobleck
Paper Towel Testing
Structures
Vitamin C Testing

MATHEMATICS ACTIVITY GUIDES

Bubble Festival
Bubble•ology
Classifying Fingerprints
Get It Together!
Height-O-Meters
In All Probability
In the Pharmacy
Math Around the World
Paper Towel Testing
QUADICE
Secret Codes
United We Solve
Vitamin C Testing

Note: Some activity guides include sessions in both math and science and are thus listed in both columns.

MAS ACADEMY CURRICULUM

(ORGANIZED BY SCIENCE CONTENT)

CHEMISTRY

Bubble•ology
Bubble Festival
Chemical Reactions
In the Pharmacy
Of Cabbages and Chemistry
Vitamin C Testing

EARTH AND SPACE SCIENCE

Convection: A Current Event
Discovering Density
Earth, Moon, and Stars

GEOGRAPHY

United We Solve

LIFE SCIENCE

Classifying Fingerprints
Fingerprinting
In the Pharmacy

PHYSICAL SCIENCE

Bubble•ology
Bubble Festival
Color Analyzers
Convection: A Current Event
Discovering Density
More Than Magnifiers
Oobleck
Structures

SCIENTIFIC METHOD

Oobleck
Paper Towel Testing

Note: Some activity guides include sessions that cover more than one science content area and are thus listed in several columns.

MAS ACADEMY CURRICULUM

(ORGANIZED BY MATH CONTENT)

ALGEBRA

Get It Together!
In the Pharmacy
Math Around the World
Secret Codes
United We Solve

GEOMETRY

Bubble Festival
Bubble•ology
Earth, Moon, and Stars
Get It Together!
Height-O-Meters
Math Around the World
Measuring Dinosaurs
United We Solve

PATTERNS, FUNCTIONS

Bubble Festival
Bubble•ology
Classifying Fingerprints
Earth, Moon, and Stars
Fingerprinting
Get It Together!
In All Probability
In the Pharmacy
Math Around the World
Measuring Dinosaurs
QUADICE
Secret Codes
United We Solve

TRIGONOMETRY

Height-O-Meters

COMPUTATION, ESTIMATION

Classifying Fingerprints
Get It Together!
In All Probability
In the Pharmacy
Math Around the World
Measuring Dinosaurs
QUADICE
Secret Codes
United We Solve

MEASUREMENT

Bubble Festival
Bubble•ology
Convection: A Current Event
Discovering Density
Earth, Moon, and Stars
Height-O-Meters
Measuring Dinosaurs
Paper Towel Testing
United We Solve

RATIOS, FRACTIONS, PROPORTIONS, PERCENTS

Discovering Density
Get It Together!
Height-O-Meters
In the Pharmacy
Measuring Dinosaurs
QUADICE

STATISTICS, PROBABILITY

Bubble•ology
Classifying Fingerprints
Get It Together!
Height-O-Meters
In All Probability
Math Around the World
Measuring Dinosaurs
Paper Towel Testing
QUADICE
Secret Codes
United We Solve
Vitamin C Testing

Note: Some activity guides include sessions that cover more than one math content area and are thus listed in several columns.

**WEB SITES THAT SUPPORT THE
MAS ACADEMY CURRICULUM
(LISTED ALPHABETICALLY
ALONG WITH CONTENT AREAS)**

Amazing Space *http://amazing-space.stsci.edu*
(EARTH AND SPACE SCIENCE)

Discovery Online *http://www.discovery.com*
(EARTH AND SPACE SCIENCE, GEOGRAPHY, LIFE SCIENCE, SCIENTIFIC METHOD)

Dragonfly *http://www.muohio.edu/dragonfly*
(LIFE SCIENCE)

The Howard Hughes Medical Institute *http://www.hhmi.org/coolscience/*
(LIFE SCIENCE)

Kinetic City Cyber Club *http://www.kineticcity.com*
(READING AND SCIENCE)

National Geographic On Line *http://www.nationalgeographic.com*
(EARTH AND SPACE, GEOGRAPHY, LIFE SCIENCE)

National Geographic World On Line *http://www.nationalgeographic.com/world*
(LIFE SCIENCE AND GEOGRAPHY)

Math in Daily Life *http://www.learner.org/exhibits/dailymath*
(GEOMETRY, COMPUTATION, MEASUREMENT, RATIOS/FRACTIONS/PROPORTIONS/PERCENTS)

The Math Forum *http://forum.swarthmore.edu*
(ALGEBRA, GEOMETRY, PATTERNS/FUNCTIONS, TRIGONOMETRY, COMPUTATION, MEASUREMENT,
RATIOS/FRACTIONS/PROPORTIONS/PERCENTS, STATISTICS/PROBABILITY)

Smithsonian Magazine *http://www.smithsonianmag.si.edu*
(CHEMISTRY, EARTH AND SPACE SCIENCE, LIFE SCIENCE, SCIENTIFIC METHOD)

The Yuckiest Site on the Internet *http://www.yucky.com*
(CHEMISTRY, PHYSICAL SCIENCE, SCIENTIFIC METHOD)

Note: The content on the above sites is updated periodically and thus can change. Please check the sites frequently for new or modified content.

EXTRA-CURRICULAR ACTIVITIES

<u>ACTIVITY</u>	<u>ACTUAL ACTIVITY TIME (DOES NOT INCLUDE PLANNING TIME)</u>	<u>BEST DAY TO IMPLEMENT</u>
Ask-A-Scientist Day	Two Hours	Weekday
Career Exploration Lab	Two to Four Hours	Weekday
Closing Ceremony	One Full day	Saturday or Sunday
Family MAS Festival I & II	One Night (2 hours)	Weekday Evening
Opening Ceremony	One Full day	Saturday or Sunday
Surf for Science (Optional)	Two to Four Hours	Weekday
Visit to Museum or Scientific Institution I & II	One Full day	Weekday or Saturday

SUGGESTED LIST OF VENDORS

CURRICULAR MATERIALS

Curricular materials by Mathematics, Engineering, Science Achievement (MESA), Cuisenaire (CSN), and EEPS Media (EEPS) can be obtained from:

Middle School Catalog
Cuisenaire • Dale Seymour Publications
PO Box 5026
White Plains, NY 10602-5026

Web site: www.cuisenaire-dsp.com
Customer Service: (800) 237-3142
Fax: (800) 551-7637

Curricular materials by Lawrence Hall of Science (LHS) can be obtained from:

Eureka! Catalog
Lawrence Hall of Science
University of California
Berkeley, CA 94720-5200

Customer Service: (510) 642-1016
Fax: (510) 642-1055

OTHER MATERIALS

For other materials including manipulatives, consumables, non-consumables, and general supplies please see the list of vendors and materials provides in the publication *ASPIRA MAS Academy Materials List and Vendors*.

APPENDIX A

COMPLIANCE WITH NATIONAL SCIENCE EDUCATION STANDARDS (NRC)

HOW TO USE THE STANDARDS TABLES

In the next few pages, you will find how each of the educational materials in the curriculum meet the standards. Generally speaking, standards are used to ensure quality and to indicate goals. You can also see each standard as being a destination and the curriculum as being a road to the destination. As such, the standards are listed in the next pages in case that you may want to select your own destination for your students and prepare your custom curriculum with the selected materials (see *Building Your Own MAS Academy Curriculum* Section). Once the destination is chosen (say, to teach the content standards in Physical Science) the road will become apparent (that is, the choice of materials to cover the standards). It is not intended that all standards should be covered by this or any curriculum, as is indicated below.

The standards are not intended to each constitute a chapter in a text or a particular unit of instruction; rather, learning activities should incorporate topics and ideas across the standards. For example, an instructional activity might involve problem solving and use geometry, measurement, and computation.

—*Curriculum and Evaluation Standards for School Mathematics, NCTM (page 67)*

The content standards presented in this chapter outline what students should know, understand, and be able to do in natural science. The content standards are a complete set of outcomes for the students; they do not prescribe a curriculum.

—*National Science Education Standards, NRC (page 103)*

The standards are therefore goals, not methods. As goals they are very important because the indicate direction and movement towards the specified direction. Eight major areas of the science content standards are listed in the next pages:

- Unifying Concepts and Processes
- Science as Inquiry
- Physical Science
- Life Science
- Earth and Space Science
- Science and Technology
- Science in Personal and Social Perspectives
- History and Nature of Science

You will find a table for each of the above areas and each table will list the specific standards for that area. The table will also list which activity guide covers that standard as well as the grade level of the activity guide. The grade level of the guide will give you a perspective on the level of difficulty of the guide. Some guides are listed for only one grade or middle school grades while others cover a wider grade range well into high school. Some areas can also be used at the elementary level but these grade levels were not listed for sake of simplicity and because the MAS Academy is a program for middle school programs. Each guide is also listed against a standard. This, in combination with the grade level, are good indicators for forming the curriculum according to the teaching goals and the needs of the students. If you are using the sample curriculum, the tables will give you a good indicator of which standards are covered by using this curriculum. This will help you emphasize or de-emphasize any standards throughout your instruction.

As described on the quotes above, you will find that most guides cover more than one standard. The guides were designed this way intentionally. Each (LHS) guide contains more than one activity (usually four or five activities per guide). In order for the student to correctly grasp each standard, the guides were designed so that each activity reinforces the next, presenting a broader or more difficult

concept. **As such, it is not recommended that the activities be done in isolation or out of sequence within the guide.**

Although most standards are covered by the curricular materials listed, not all are. It is not the intention of the MAS Academy to cover all the standards but to reinforce those in-class areas which need reinforcement. The standards tables can also be useful for this purpose. Also, as the curriculum grows in the ensuing years, more standards will be covered.

We greatly encourage everyone to read the two publications that were used to key the curricular materials to the standards: *Curriculum and Evaluation Standards for School Mathematics* (<http://www.nctm.org> or 800-235-7566) and *National Science Education Standards* (<http://www.nap.edu> or 888-624-8373). They latter can be read on-line, printed, or downloaded at no cost. Each of these books will explain in great depth the national math and science education standards.

APPENDIX B

COMPLIANCE WITH CURRICULUM AND EVALUATION STANDARDS FOR SCHOOL MATHEMATICS (NCTM)

HOW TO USE THE STANDARDS TABLES

In the next few pages, you will find how each of the educational materials in the curriculum meet the standards. Generally speaking, standards are used to ensure quality and to indicate goals. You can also see each standard as being a destination and the curriculum as being a road to the destination. As such, the standards are listed in the next pages in case that you may want to select your own destination for your students and prepare your custom curriculum with the selected materials (see *Building Your Own MAS Academy Curriculum* Section). Once the destination is chosen (say, to teach the content standards in Physical Science) the road will become apparent (that is, the choice of materials to cover the standards). It is not intended that all standards should be covered by this or any curriculum, as is indicated below.

The standards are not intended to each constitute a chapter in a text or a particular unit of instruction; rather, learning activities should incorporate topics and ideas across the standards. For example, an instructional activity might involve problem solving and use geometry, measurement, and computation.

—*Curriculum and Evaluation Standards for School Mathematics*, NCTM (page 67)

The content standards presented in this chapter outline what students should know, understand, and be able to do in natural science. The content standards are a complete set of outcomes for the students; they do not prescribe a curriculum.

—*National Science Education Standards*, NRC (page 103)

The standards are therefore goals, not methods. As goals they are very important because they indicate direction and movement towards the specified direction. Thirteen major areas of the mathematics content standards for the middle school grades are listed in the next pages:

- Mathematics as Problem Solving
- Mathematics as Communication
- Mathematics and Reasoning
- Mathematical Connections
- Number and Number Relationships
- Number Systems and Number Theory
- Computation and Estimation
- Patterns and Functions
- Algebra
- Statistics
- Probability
- Geometry
- Measurement

You will find a table for each of the above areas and each table will list the specific standards for that area. The table will also list which activity guide covers that standard as well as the grade level of the activity guide. The grade level of the guide will give you a perspective on the level of difficulty of the guide. Some guides are listed for only one grade or middle school grades while others cover a wider grade range well into high school. Some areas can also be used at the elementary level but these grade levels were not listed for sake of simplicity and because the MAS Academy is a program for middle school programs. Each guide is also listed against a standard. This, in combination with the grade level, are good indicators for forming the curriculum according to the teaching goals and the needs of the students. If you are using the sample curriculum, the tables will give you a good indicator of which standards are covered by using this curriculum. This will help you emphasize or de-emphasize any standards throughout your instruction.

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Although most standards are covered by the curricular materials listed, not all are. It is not the intention of the MAS Academy to cover all the standards but to reinforce those in-class areas which need reinforcement. The standards tables can also be useful for this purpose. Also, as the curriculum grows in the ensuing years, more standards will be covered.

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APPENDIX A

**COMPLIANCE WITH
NATIONAL SCIENCE EDUCATION STANDARDS (NRC)**

APPENDIX B

**COMPLIANCE WITH
CURRICULUM AND EVALUATION STANDARDS FOR SCHOOL MATHEMATICS (NCTM)**