

Math Curriculum Guiding Questions

Responses from K-5 Teachers

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1). How well is your grade's curriculum aligned with the Massachusetts State Frameworks?

We have spent extensive time over the past several years aligning our Math Curriculum to the Massachusetts State Frameworks. Currently, Grades Kindergarten and One are implementing the Bridges in Mathematics program, a math program created by the authors of Math Their Way and the University of Oregon, and published by the Math Learning Company. Kindergarten began to implement the program in 2006-2007, while Grade One is just beginning to implement the program in 2007-2008. Grade Two will pilot incorporating the Number Corner piece of the Bridges program with their use of the Everyday Math Program during the 2007-2008 school year. Grades Two through Five implement the Everyday Math Program, out of the University of Chicago. Grade Two has been using this curriculum since the early to mid 1990's, while Grades Three through Five began to implement the program in 1998.

The math curriculum for grades K-5 has been thoroughly analyzed and its alignment to the Frameworks documented. All teachers have copies of this analysis. Where it was deemed that our curriculum was weak in any particular area, supplemental materials and lessons were gathered and distributed to all teachers. Where it became apparent that a particular unit came too late in the year (ie. the symmetry unit in the 4th grade EDM curriculum), we made adjustments for all teachers to take that unit out of sequence. We have yet to make any adjustment to the K and Grade 1 curriculum, as we are just now implementing them. However, prior to the adoption of this program, extensive analysis was conducted. This program is exceptionally-well aligned to the Massachusetts Math Frameworks.

When asked this question, the teachers (8 at each grade level) responded as follows: (The responses make sense to us in that we began the alignment process at the upper grades and worked our way down to K and Grade 1.)

- K: Mostly – 7; Entirely – 1
- 1: Mostly – 6; Entirely – 2
- 2: Somewhat – 1; Mostly – 4; Entirely – 3
- 3: Mostly – 2; Entirely – 6
- 4: Mostly – 2; Entirely – 6
- 5: Mostly – 1; Entirely – 7

2). How is assessment of student learning in math accomplished at your grade level? (list assessment methods).

Students are assessed in many different ways during the course of the school year. In the Primary Grades, formative assessments include interviews, observations of student class participation and daily work, teacher anecdotal records, and in Grades One and Two, some homework. Summative assessments at the Primary level include "Common Experiences" (more formal assessments that have been created by our classroom teams, focused on the Math Strands, and administered to all K-2 students at set points during the school year), Mid-Year and End-of-Year interviews with all Kindergarten students, and a "standardized" written End-of-Year assessment for students in Grades One and Two.

For students in the Upper Elementary grades formative assessments include observations of student class participation on a daily basis, student "Morning" work (daily drill and practice), homework and quizzes. For summative assessments, all teachers administer weekly quizzes, common "standardized" End-of-Unit assessments – complete with an Open Response question, and a common "standardized" End-of-Year written assessment.

At this point, all students in Grades K-5 participate in a Beginning-of-Year Assessment and End-of-Year Assessment that we have created. All students at the Primary Level (Grades K-2), participate in an individual, oral interview with the teacher (approximately 20 minutes in length), combined with a written component (Grades One and Two only). Students in Grades 3-5 all take a written Beginning-of-Year Assessment. Then at the end of the year, all students in K-5 are expected to complete a written End-of-Year assessment. Data on student achievement is recorded, shared with the classroom teacher, Curriculum Coordinator and Principal. The student's End-of-Year Assessment score will now become part of the student's cumulative record. The "standardized" Beginning-of-Year and End-of Year assessments have been in place for Grades 3-5 since the fall of 2002 with their focus being primarily Number Sense. The current K-2 Beginning-of-Year Interview, with written component, and End-of-Year assessment have been in place since the 2005-2006 school year.

3). Is ~~their~~ uniformity within the grade for assessment methods and instruments?

Every teacher in Grades K-5 answered in the affirmative to this question. We have spent a lot of time over the past several years focusing on assessment. We have worked in grade-level teams to produce common assessments for all students at each grade level.

4). Is there uniformity within your grade for math instruction?

There are some differences in how much time each teacher spends on math in a given week, and how teachers group students. Some teachers in grades 2-5 team up. They pre-test students prior to a unit, then divide the class into 2-3 groups ("Flexible Grouping Model). Several Kindergarten teachers have also experimented with this model in past years. The number of groups depends on how many adults are assigned to the particular classrooms.

When first and second grade teachers responded to this question (2006-2007 school year), there were two teachers at each grade level piloting the Bridges in Mathematics program. It is for this reason that most teachers in these two grades answered "No." We had six teachers at each grade level implementing the Everyday Mathematics Program with supplementary materials, and two piloting Bridges.

5). Are Mathematics Learning Goals articulated for your grade level?

With the exception of teachers in First Grade, all teachers responded in the affirmative to this question. At the first grade level, though goals were written and shared with teachers shortly after the 2000 Massachusetts Math Frameworks were published, we have had some changeover in staffing. We have some veteran teachers who have been teaching for many, many years. They were familiar with the Learning Goals and have been teaching the Everyday Mathematics program since it was first implemented in the early 1990's. They then began to develop their own sequence of lessons based on the Math Learning goals that we had articulated. We also have a core of relatively new first grade teachers who were new to the Everyday Math program. In the early years of their teaching, the primary focus of their time was spent on school goals, which until just the past year or two, did not include math. Now, as a team, the First Grade teachers have begun to focus on the Math Learning Goals for their students. They spent much of the 2005-2006 school year developing "Common Experiences" and a written End-of-Year assessment for their grade. This experience forced them to converse about expected Learning Goals for the grade, though teachers indicated they would appreciate more time talking about mathematics. The First Grade teachers are excited about the adoption of the new Bridges in Mathematics program that is to be implemented in all First Grade classrooms in the 2007-2008 school year. They will work very closely as a team to implement this new curriculum.

6). How much instruction time are you able to allot to math in a given week?

(Please be truthful...not just wishful thinking.)

Kindergarten: All teachers responded between 3-4 hours a week (Our Kindergarten program is a 4-Day, Full-Day program.

First Grade: Answers ranged from a low of about 3.5 hours to a high of 6 hours. (The 6 hours was with the new Bridges curriculum.) The average time seemed to be about 40 – 45 minutes per day.

Second Grade: Most teachers indicated 45 min. per day – not quite 4 hours

Third Grade: Answers ranged from 4.25– 5 hours. The majority of teachers indicated they teach one hour a day for 5 days.

Fourth Grade: Answers ranged from 3.5 – 5 hours. Five (out of eight) teachers indicated they teach one hour a day for 5 days. Three teachers indicated they teach between 40 – 45 minutes a day for 5 days.

Fifth Grade: With one exception, all teachers teach between 45 –60 minutes per day. One teacher indicated 40 minutes, 4 days a week.

Clearly, there is variability in this answer. The expectation starting in the 2007-2008 school year is that all teachers at the Primary Level (K-2) will teach math for a minimum of one hour a day. One hour a day has been recommended at the Upper

Elementary Level since the adoption of the Everyday Math program, though scheduling one hour has not always been possible due to other schedule constraints.

7). How is mathematics instruction differentiated in your classroom? Explain what you are able to do, and how you do it.

At the Primary Level (K-2), teachers responded with the following:

- Math Centers activity modifications – adjusted to individual child's skill level.
- Grouping students in flexible ways to provide support on specific skill areas, or to extend a concept.
- Questioning techniques
- Flexible grouping with a collaborating teacher (SPED, TA, EA or another classroom teacher) to provide extra practice or enrichment.
- Small group, or 1-on-1, support in classroom when another adult is available to help.
- Different math packets, handouts and games assigned
- Enrichment activities, packets and weekly, small-group pull-out for high-ability students provided by the G/T teacher
- Title I Math Remedial support is available to First and Second Graders

At the Upper Elementary Level (Grades 3-5), teachers responded with the following:

- 75% of the classroom teachers team up with another classroom teacher (and sometimes the SPED teacher as well), pre-test a unit, divide the students up homogeneously into teaching groups until the end of the unit. The groups remain "flexible", in that there is some moving around from teacher to teacher depending on the student's skill level in the different units. This model provides students with the instruction that they need on a daily basis. The lower group gets more practice on individual skills, while the mid-high group is given more independent work at a higher level with enrichment. Depending on the number of adults available, some additional small-group or one-on-one can be provided in the classroom.
- Enrichment packets, activities and a once-a-week pull-out math enrichment class is offered by the G/T teacher.
- Title I math remediation services are available for students in Grades 3-5 (These consist of a once or twice a week pull-out class for approximately 30 minutes each.).

8). In what ways are the needs met of those students who struggle with math?

For the most part, teachers responded that they did several things depending on the needs of the students and the additional teacher support that they had, but they all feel that more support would be beneficial. At the Kindergarten level, the needs of students who seem to take longer to master a new concept or skills are met by the teachers either individually, or in small groups, during math center time in the classroom or other times during the day like quiet time or choice time. Games are played and counting skill

reinforced. In grades 1-5, in addition to whatever individual, or small group, attention the classroom teacher can find to work with students, the needs of students are met through a pull-out Title I Math Remediation program that supplements the math program, through in-class or pull-out support of the Special Education teachers and Educational Assistants. Sometimes the pace of the work is slower, sometimes homework and classroom practice is modified, often communication with parents occurs with informational newsletters related to the skill or concept the student might be practicing with request for family support at home, and sometimes games are sent home to reinforce concepts (but mostly at the primary level). On occasion, a teacher will offer before-school, or lunch recess, extra-help sessions (not-for-pay). At the 3rd, 4th and 5th grade levels, many, but not all, needs are addressed by the flexible groupings that occur with the teachers who team with each other (described in #7). Everyone agrees, however, that the Everyday Math program is not well-suited for the struggling student. It is hard to meet all the needs of these students when the curriculum continues to move at such a rapid pace and spiral as quickly as it does. It is not always easy to provide the extra help to a student who does poorly on an End-of-Unit test when he or she is expected to continue to move ahead into the next unit. Often these children struggle with the language of the program as well. We recognize that this continues to be an area that needs some corrective action.

9). In what way are the needs of the high ability students met?

We have several things in place for our high ability students. In all grades, classroom teachers differentiate their curriculum, extend the activities and expectations, provide enrichment packets, and sometimes provide small group instruction during math centers. Teachers use questioning techniques to help extend a child's thinking about a particular concept. In Grades 3-5, most of the classroom teachers team with a partner and divide the students up into flexible groups. One teacher takes the higher ability students for the unit. These students can then move at a faster rate through the unit. The teacher can then provide additional enrichment activities that have been prepared by both the classroom teachers and by the "Gifted and Talented" teacher. The G/T teacher works very closely with the classroom teachers to provide enrichment materials for the high ability students. She is also the Elementary Mathematics Curriculum Coordinator, so is very familiar with all aspects of the math curriculum. This teacher also offers a once-a-week math enrichment class for students who meet a set of criteria that is distributed to teachers in the beginning of each year. This year (2006-2007), there is one small Kindergarten group, one small first grade group, three small second grade groups and 2-3 larger groups for each of the 3rd-5th grades. The 4th and 5th grade high ability students are enrolled in the National Math Olympiad Program that is taught by the G/T teacher once a week. The 4th grade class meets during the school day, while the 5th grade one has to meet before school because it is much more difficult to do a pull-out enrichment program during the school day for the fifth graders. This teacher also provides consultation and direct service programming for those math students who are exceptionally gifted (of whom we have had several over the years). These are students who are performing at least one-two grade levels above their current grade level. A plan is developed for each of these children. Programming often consists of a compacted curriculum, some enrichment

and some acceleration (depending on the needs of the individual student). These students meet regularly during the week with the G/T teacher (though not on a daily basis due to the part-time schedule of this teacher at each elementary school). This teacher provides additional or alternative work that is to be completed during the course of the school week. Generally, the older the student, the more independent and the more responsible he or she is for being able to work on his or her own.

10). To what extent do you use technology to support your math curriculum?

For the most part, all the teachers responded that they use some (but not much) technology, but would like to set a goal of doing more. Many teachers responded “minimally”. We recognize this as a need and are currently in the process of matching all the Everyday Math units in grades 2-5 to relevant web sites that can be used as an additional resource to the classroom teacher or as an interactive site for students. This process should be complete by August, 2007 and shared with teachers during the fall. While we have some teachers who already have their favorite sites or programs (ie. Tom Snyder’s Tessellations (gr. 4 & 5), Graph Club, Excel) that they use on a regular basis, we cannot say that everyone accesses the same sites or software. We are beginning to use the SMART board for some geometry, patterning and fractions activities, especially at the primary level. Some teachers indicated that they have also found some useful videos on United Streaming that tie in to their curriculum. We want to make sure that whatever technology teachers use enhances the curriculum rather than just to meet the goal of “using technology”.

11). Do you feel that you possess sufficient content knowledge in mathematics to be the most effective math instructor as you can be? If not, please indicate any areas where you would like some professional development.

Kindergarten: The teachers mostly responded that while they are comfortable with what they know, they would like to work on differentiating some of the Bridges lessons for High-Ability Students. This has been the first year of a full implementation of the Bridges program for Kindergarten, the teachers have identified a need to work on differentiation.

First Grade: All but one teacher felt confident in their ability to teach effectively, though they did indicate that they always welcome learning new techniques to extend and enrich practice. One teacher indicated a need to develop a deeper knowledge of children’s development of number sense, and how to recognize what stage a child is at and where to lead him/her next.

Second Grade: Generally all the teachers felt confident in their ability to teach effectively now and that they have received sufficient math professional development, though they welcome new ideas, materials, and strategies.

(Just as an aside, we have spent several years at Davis School providing in-house mathematics professional development. See attached Davis School Math Professional Development work in recent years.)

Third Grade: The overall response was that even though they felt they were effective teachers, they would like additional professional development in the effective use of technology with students for math instruction.

Fourth Grade: All teachers felt confident in their content knowledge, though they welcome new ideas, materials and strategies for differentiating and meeting the needs of all learners when there is only one teacher. Some teachers indicated a desire to incorporate technology into the math program.

Fifth Grade: All teachers indicated that they felt that they possess sufficient knowledge to teach effectively. However, one teacher indicated that she/he would benefit from reviewing the math of students in middle or high school to see where the 5th grade students are headed. Another teacher indicated a desire to incorporate technology; and yet another would benefit from finding new ways to present the curriculum to “spark” lessons that have “become humdrum”.

Lane School SPED: Teachers would like to have additional help in preparing Special Needs students for the MCAS testing and for dealing with Open Response-type questions and word problems.

12). What suggestions might you have to improve student learning here?

Kindergarten: Teachers requested additional time to collaborate on the new Bridges program. Significant time had been initially set aside in the 2006-2007 school year for discussing the implementation of this new curriculum, but a reading-assessment initiative (DIBELS) took priority at the last minute. Teachers also indicated a desire to have more opportunity to communicate about math instruction between different grade levels. Some teachers requested additional help in meeting the needs of all levels of learners, especially the neediest learners.

(The responses to Grade One were done before the decision was made to move forward next year with the Grade One Bridges curriculum. Teachers' responses reflect a frustration with the Everyday Math curriculum at Grade One.)

First Grade: The suggestion was made to devote more time to math, and pull back on other curriculum areas (ie. social studies). A desire to find more collaborative time with the grade level team was expressed, as was the interest in exploring new materials. (The First Grade team will implement the Bridges in Mathematics program next year for the first time. Math will be a focus of their collaborative meeting time.)

Second Grade: A suggestion was made to provide a “Math Room” which would be filled with games, tools and activities for teachers to borrow. The concern was raised that the current classroom budgets are not sufficient to provide for all the math

manipulatives and games one might want. A couple of requests were made to provide additional support for small group math instruction especially for struggling students. A suggestion was made to provide more interactive instruction and less pencil/paper activities. One of the Bridges pilot teachers promoted the Bridges curriculum because of its ability to allow all students access to the lessons.

SPED at Davis: There is a desire to have math be given a higher priority in the collaborative meetings the special educators have with the classroom teachers, that at least one hour a day be allocated for math with a higher scheduling priority than is currently given, and that some students be able to meet with the Special Educator 5 times a week.

(Note: As of the 2007-2008 school year, all teachers at Davis School are being asked to allocate one hour a day, minimum, to math instruction).

Third Grade: Several teachers indicated that more support for struggling students is needed. Other suggestions included having more time available for math instruction, team teaching to provide for flexible groupings, having students engage in more hands-on activities and use more manipulatives, and ensuring that students arrive in third grade with a solid grasp of their addition and subtraction facts.

Fourth Grade: One suggestion included making sure not to place the very highest students with the very lowest (when doing class placement from year to year). This makes it very difficult to meet the needs of such a diverse group. One teacher suggested before-school and after-school MCAS prep classes, while another suggested that the Title I services be more aligned with the classroom curriculum (The Title I services have intentionally focused primarily on number sense skills and concepts).

Fifth Grade: Several teachers indicated a need to develop a better way to meet the needs of those students who are struggling (primarily those students who are not on an IEP, and who do not get enough attention or help). The teachers indicated the need for a clear, organized remediation program (not just Title I). One teacher encouraged the continuation of the math flexible grouping model that 75% of the team uses, while another teacher and the SPED teacher suggested supplementing the Everyday Math program with basic fact practice.

The most frequent suggestion across all grade levels was to provide a more structured way to provide services for those students who are struggling in math. They are not necessarily talking about the SPED students, but rather those who need additional time to master a skill or concept. We know this is something that we need to find creative ways to address.

Teacher Survey – Math – JGMS – Winter 2007
(Each new bullet represents a new person's answer.)

1. How well is your grade's curriculum aligned with the Massachusetts state frameworks?

- Due to the extensive time and energy put in last year as part of the "Math Initiative", the sixth grade math curriculum is strictly aligned with the Massachusetts state frameworks. Given the money and time spent on accomplishing this task it is disheartening to think that this is still a concern. Furthermore, it is also unsettling to have the district administration imply that all frameworks must be covered, and at the same time, have the building administration imply that it is "unrealistic" to think that this could be accomplished. The district administration has made it clear that making AYP is paramount and to accomplish this all frameworks must be covered because all frameworks may appear on the MCAS. The building administration has stated that it is "unrealistic" to cover all of the frameworks on several occasions. In fact most of our professional development time has been directed at determining what standards are "essential".
- Because of our extensive department work during the 2005-2006 school year, I feel that the sixth grade curriculum is well aligned with the state frameworks. Comprehensive binders were created that accomplish this task.
- Last year, we aligned all of our grade levels to the Massachusetts state frameworks. Evidence of this is in the large notebooks compiled by the math department found in the Superintendent's office. The alignment for each course can be found at the beginning of those notebooks.
- There is a curriculum map that is aligned to the frameworks by strand available in the binder made during the 2005-2006 school year.
- Last year, the math department was given five (5) full days to work on our curriculum. During those days, we created curriculum maps for each and every math class offered at the middle school. Our curriculum was aligned to each strand of the state frameworks.
- I received a binder containing framework alignment for each topic, correlated to textbook/supplementary material. Curriculum, including assessment instruments is carefully and completely aligned.

2. How is assessment of student learning in math accomplished at your grade level?

- In the sixth grade, formal and informal assessments are used to evaluate the learning of students. All units are pre and post tested and quizzes are often used at appropriate points within a unit. In addition, homework provides both the students and teachers with additional feedback. Projects are often used as a tool to provide review of several different topics. For example, students may be assigned a project in which both graphing (Unit: Data About Us) and the use of fractions, decimals and percents (Units: Bits & Pieces I and II) are necessary.
- In terms of informal assessments, student learning is observed in both individual and group settings. This form of assessment is often the best indicator of students' abilities and understandings; however, it is also the form of assessment that is least valued or accepted.

- Formally, tests, quizzes and MCAS open-response questions are given to assess learning. Towards the end of the year, projects are frequently incorporated. A typical end-of-the-year project might be somewhat comprehensive in nature - developing a board game that reflects topics from the year.
- Informally, student progress is assessed through lesson warm-ups, extra help sessions, homework, and daily discussion/group work.
- Quizzes are given once or twice for each unit with a test at the end of the unit. Informal assessment happens daily with general questioning and homework performance.
- Assessment of student learning is done formally and informally. Daily I assess learning through warm up activities, class discussion, and class activities. Formally, students are given tests, quizzes, and homework to assess their learning. Example: Number line activity: The students were assigned a fraction, decimal, or percent. Each child had to place it in the appropriate location on a floor sized number line. As a class, we checked for accuracy. Based on this activity, I gained knowledge about student's ability to use a number line appropriately and how well they were able to use fractions, decimals, and percents.

Informal assessment is accomplished continually in the classroom using questioning strategies, smartboards, peer evaluation of student work and other informal means.

Formal assessment is accomplished via: quizzes, computer programs (Study Island), projects which incorporate mastery of objectives (Students calculate and compare surface area and volume of commercially available box; construct flat pattern of the box, analyze the cost of packaging contents, etc.) and paper-and-pencil tests.

- The students are formally assessed through tests and quizzes. The students are also informally assessed on a regular basis through teacher observation. Students are evaluated on their class participation, daily homework and work completed in class. Projects are often a part of the curriculum as well. My 8th grade Algebra students complete a linear equations project. They create a design on a coordinate grid using the slope-intercept form of a line. My 7th grade students create Bike projects in accordance with Variables and Patterns. They also enlarge and shrink a picture based on what was learned in Stretching and Shrinking.

3. Is there uniformity within the grade for assessment methods?

- The eight grade teachers use the same assessment in their Algebra classes as well as the level two class. In the 7th grade, many of the same assessments are used.
- Tests may differ slightly – some teachers use the test provided in the curriculum binder while others add on to those to assess supplementary instruction. Some teachers add clarifications to the directions for the tests. The format may vary slightly but the learning assessed is the same.

- Yes. We frequently touch base regarding unit goals and how we are developing quizzes/tests.
- We all use quizzes and tests in our units. Informal assessment varies from teacher to teacher.
- All sixth grade units begin with identical pretests. From there, both my colleague and I work diligently to ensure the same material is presented in a similar pace and style allowing for differences in personality. We also share formal assessment tools and check in with each other regularly to informally compare student performance. The formal assessment methods are covered in more detail with in the binders created last year as part of the "Math Initiative".
- We give pretests that were developed last year located in the math binder. The posttests I use are a combination of tests in the binder and questions from Testworks, the CMP computer program. The math department is very good about sharing tests.

4. How often are you able to meet with the other people teaching the same course as you?

- There is no formal time allotted to meet with the other sixth grade math teacher. However we are fortunate to have some of the same prep periods and often use this time to touch base. It would be wonderful to have a scheduled "just math" time built into the week; a time such as the grade level team meeting times would be of great benefit.
- On an informal basis I meet with other math teachers daily to discuss students learning, progress, and timing of units. It is difficult to formally meet because time is not built into the schedule for this. Unfortunately, most preps I have do not match other teachers. We have made some arrangements to get this work done at other times.
- Currently, there is no common planning time specifically allotted for teachers who teacher the same course. Despite this, my colleague and I make it a point to touch base on almost a daily basis to compare assessment tools and lesson plans. Additional time would allow us to compare grading practices, create project rubrics, develop supplementary material, evaluate the effectiveness of the assessment tools and plan units and lessons more effectively.
- We meet once a week at on our own time for 30-40 minutes. This is a very valuable time in the week for me. I would love to have time built into our schedules to do common planning. We also check in with each other almost every day.
- It is difficult to meet with other teachers during the school day on a formal basis. We do check in constantly with each other for 5 or 10 minutes here and there. In the 8th grade, the only time we can meet is before school starting at 7:00 am because we do not have common planning times.
- I team teach every day, yet we have no common planning time.

5. Are the mathematics learning goals articulated for your grade level?

- Because of the state frameworks and our work last year for the "math initiative", math topics are fairly well articulated. However, I do think it would be beneficial to have the time to talk about the nuts and bolts of the frameworks; what specifically does a seventh grade teacher expect all

students to know. I would like to "shrink" down the frameworks into a smaller, more practical list.

- I think that the goals for 7th grade are not specifically stated anywhere but there is a general understanding of what they are based on the books that we teach from and the Massachusetts frameworks.
- They are clearly stated in the curriculum binder as well as in the teacher material, which accompanies the textbook – generally in agreement, with exceptions noted and provided for in the curriculum binder.
- From a frameworks standpoint, I believe the learning goals are outlined. However, I do not believe that the learning goals are clearly articulated for all aspects of the grade level. I alluded to the implications of both the district administration and our particular buildings administration in regards to the frameworks. This has created a situation in which mixed messages are being sent, further complicating the understanding of what we are expected to accomplish. Furthermore, it would be beneficial for time to be allotted to address this situation.
- They are articulated in the Massachusetts state frameworks.
- We have a good understanding of what general topics we have to cover over the course of a year. The frameworks guide these topics.

6. How is mathematics instruction differentiated in your various classes?

- By using pretests, flexible grouping has been incorporated into my math classes. Students that perform well and show mastery on the pretest have the opportunity to work on alternative material that parallels the current unit of study. However, within this flexible grouping there is variation. One of my learning groups has the opportunity to work with Ms. Rainen and unfortunately the other 3 do not.

In addition, three of my math classes are "team-taught" with a special educator. This allows students of lower ability to have better access to the curriculum.

A third way instruction is differentiated is through the curriculum. CMP is set up to incorporate a tremendous amount of group work which allows for great flexibility within the class.

- Level 1: Students are given a pre-test to see what prior knowledge they have before beginning a unit. Students in one of my honors classes have the opportunity to pretest out of my class and proceed through the unit at an accelerated pace with the gifted and talented teacher. Unfortunately, this opportunity is not available to my other level one class. Students in that class have the opportunity to do challenge problems to extend their knowledge. These problems are from the gifted and talented teacher.

Level 2: Students have the opportunity to gain knowledge through multimodal instruction. For example, we use manipulatives, guided reading, warm ups, etc.. Once a topic is presented they

will have the opportunity to try problems independently. There are certain problems that I would like them to complete. For students who are advanced I will give them harder but related problems to work on. Also, if I have a co-teacher in the class we will at times split the class so that one group of students can get the practice they need and the other group can extend their learning.

- This question needs to be answered twice. The special education department, specifically in the sixth grade, does a fantastic job modifying the material to best meet the needs of their students. They spend countless hours changing directions, rewording problems, creating templates for homework, simplifying directions, and making countless other appropriate changes.

On the other hand, there is no true differentiation done in the other direction. There are enrichment opportunities provided in the form of "challenge" activities and alternative "pull-out" situations, however, no true differentiation is done. The problem is that instead of differentiation students are accelerated through the curriculum. Although this provides a solution for students who are ready for more challenging work, it creates a snowball effect. For example, students in grade five are exposed to the grade six curriculum and then when they get to grade six they are exposed to the grade seven curriculum and so on.

To solve this problem, the learning goals must be clearly articulated at each grade level and there must be vertical alignment. The sixth grade teachers need to know what the fifth grade teachers are exposing their students to in the same way, seventh grade teachers need to know what the sixth grade teachers are exposing their students to. Students of "high-ability" should not work vertically through the curriculum, but, horizontally (covering units more in-depth than their peers).

- Pre-tests are given for Algebra students who may test out and work with the gifted and talented teacher. Challenge questions are offered.
- Pre-testing allows students who have already mastered material move out for on-topic enrichment. Pre-testing also allows thoughtful grouping of students in the classroom so that strong students benefit from explaining/demonstrating their knowledge and skills and weaker students benefit from seeing and hearing the thoughts and methods of those who understand well.

New concepts are presented as outgrowths of established learning. There is ample opportunity to hear vocabulary, see different examples of the concept and use three-dimensional modeling when possible and appropriate. Students collaborate during the learning process to make use of growing social skills as an instructional tool.

Students who have difficulty with topics may come in before school for extra help. Many do so.

- All math teachers pre-test before each and every unit. This allows us to see whether or not students have had exposure to the topic(s) we will be covering. The students who pre-test out of a unit, in most cases, have the opportunity to work with Lisa Rainen on related topics.

7. In what ways are the needs met of those students who struggle with math?

- Title I
 - Teacher extra help sessions: before school, after school, flex
 - Team-teaching
 - Manipulatives as part of CMP
 - Different modalities of instruction
 - Learning center instruction
 - Extra Help
 - Lots of examples
 - Practice Problems
 - Relating math to real life
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- Leveling reduces the range of differences in ability within any one classroom – more homogeneity of skill and ability levels – similar struggles.

Material learned in previous courses is reviewed prior to spiral addition of new concepts. When necessary (as demonstrated by pre-tests) a more intensive review of previous course work is accomplished.

Cooperative, collaborative learning groups help students who struggle by allowing them to question peers about their thinking and processing of math topics. Students have opportunity to compare their thoughts and work with the thoughts and work of others and make adjustments if they self-assess that they have fallen short – before more formal assessments are taken.

Hands-on, tangible manipulatives and real-life objects are used to introduce, explore, and study concepts whenever possible and practical.

Classroom environment which is open to inquiry is very important – every comment or answer is met with respect by teacher and other students. In this environment questions are welcome and there is more comfort in asking.

Every attempt is made to show how each topic relates to something concrete or familiar to the student's life outside of school.

Students who struggle are encouraged to come in before school for extra help – and this time is designed to be enjoyable – relaxed, student-centered and positive.

Informal assessment is ongoing continually – instructional adjustment is ongoing continually.

Parent contact, parent contact, parent contact, and then some more parent contact.

8. In what ways are the needs of high-ability students met?

- Through pre-testing we are able to create flexible groups. The “high-ability” students are then pulled out for alternative instruction if their class matches up with Ms. Rainen; if not, the

students work independently in a small group on alternative material that coincides with the current unit.

- Students of “high-ability” that have math during period one have the opportunity to participate in an alternative pull-out group should they perform exceptionally well on the pretest for a given unit. Students who do not have math during period one yet pretest exceptionally well do not have this opportunity. These students follow the regular curriculum with limited variations.

This question may be more effectively answered if “high-ability” was clearly defined.

- All of the students in my Algebra class are given a pre-test for each chapter we teach. If any of the students shows mastery, they work with the gifted and talented teacher while I work with the rest of the class for that chapter. There are also challenge problems available.
- Leveling reduces the range of differences in ability within any one classroom – more homogeneity of skill and ability levels.

Students who demonstrate quick mastery of concepts in the classroom are asked to explain and broaden that mastery within the context of cooperative groups – compare their ideas, work with others, and self evaluate, making adjustments where needed. They may take on leadership roles in classroom and group instruction. These students may be assigned more challenging or broader applications for the concept being studied.

When students demonstrate mastery of a concept at pre-test, they may leave the class for the period of instruction on the concept and attend class for enrichment.

- High ability students often pre-test out of a unit and work with Lisa Rainen on more difficult and challenging material. Students who do not pre-test but still need a challenge are given alternative problems and challenge problems that can be completed in class. These problems are directly related to the curriculum. They may also be given alternative homework assignments when appropriate.

9. To what extent do you use technology to support your math curriculum?

- Brainpop.com
- Studyisland.com
- Smartboard gallery – graphing, 2-dimensional shapes, notes, formulas, etc.
- Graphing calculators
- Instructional videos from United Streaming
- Interactive online websites
- Students have limited access to calculators (exploratory problems; checking calculations, etc.) in the classroom. We walk a fine line between computational competency and use of technology in this area.

10. Do you feel that you possess sufficient content knowledge in mathematics to be the most effective math instructor you can be?

- Yes.
- Yes, I feel that I possess sufficient content knowledge. We all have room for growth, so I continue to pursue professional development opportunities.
- Yes, I do believe that I possess sufficient content knowledge in mathematics to be an effective math instructor. If I didn't believe this I would be doing a great disservice to every student that entered my classroom. Having said this, I would be a fool to think that I know everything. I always believe that there is more to learn and an unending list of ways to improve. This is the essence of teaching; improving yourself to be able to further educate the students that you impact on a daily basis.

This question could be more accurately answered by a supervisor who evaluates not only my content knowledge but my classroom management, my ability work with colleagues, and my understanding of adolescents needs through observations.

11. What suggestions might you have to improve math learning?

- Longer class periods
- More department time to use to talk about the nuts & bolts
- Time to review common assessments by grade
- Time to discuss vertical alignment (with 5th and 9th grade present)
- The most important thing we can do to improve student learning is to allot more time to teach math.
- More practical, hands-on applications for level 2 students. More complete embrace of CMP curriculum, especially for level 2 students (perhaps more teacher training in CMP).

Schedule which allows more time per class period to utilize the strength of the CMP curriculum. CMP problems are written for 60-minute class blocks to allow more complete student analysis of the exploration and experimentation activities. More learning takes place when students have time to think about what they have done during an activity – if the teacher sums up the work because time is running short the summary doesn't "stick" as well as when students make conclusions for themselves with limited teacher guidance.

- To improve math learning we need more time to teach. Longer class periods would help, especially when using the Connected Mathematics Program (CMP). This curriculum cannot be properly executed in the 40 minutes of class we are given now. We also need more time to meet as a department. This time can be used to work with each other on ironing out many issues such as common assessments, ideas for lesson plans and research about what seems to be working and what needs to be adjusted.

- I think that affording the math department time to meet would be beneficial. We are taking on two projects right now and there is limited time to complete them. We are undertaking the middle school project of working on enduring understandings and essential questions as well as the self-study.

I think it would help to have time to meet as a department to discuss student and departmental issues. We would benefit from time allotted to common assessments and collaboration.

- Develop clear and realistic learning goals at all grade levels that allow for mastery. This has been started through the curriculum work that has been going on at the middle school during curriculum workshops.

Vertical alignment. Clear and realistic learning goals at the sixth grade level can only be developed with an understanding of what the clear and realistic goals for the fifth grade are. Time for sixth grade and fifth grade teachers to collaborate would be extremely beneficial.

Differentiation rather than acceleration. Once there are clear and realistic goals in place there needs to be a unified understanding of what differentiation truly is. From this understanding a differentiated curriculum needs to be developed. This will be a time consuming endeavor but one that would be well worth the effort.

Time for collaboration at grade level. I believe that the math department does a very good job of horizontal alignment, however, only so much can be accomplished when no common planning time is allotted specifically for this purpose.

Time management. It needs to be understood that every time that something new is required something else will suffer. For example, completing this survey (a worth while and necessary task) has taken time away from planning lessons, updating Edline, developing assessments, and curriculum work. It is helpful to clearly understand the purpose and necessity of each task so that priority can be appropriately placed.

Bedford Public Schools

Curriculum Study Group
High School Math Teacher Survey

1. How well is the current K – 12 Mathematics curriculum aligned with the Massachusetts state curriculum frameworks?

Curriculum Mapping

During the past three years we have created a curriculum mapping for the mathematics courses offered at Bedford High School. To achieve this objective, learning outcomes and student proficiencies for each of the units within the courses have been described, along with a timeframe for unit completion. Assessment practices for each course are included, as well as a description of the materials needed by students and teachers. To date (March, 2007), with the exception of Discrete Math, Pre-Calculus and Calculus, curriculum maps have been completed for all of the mathematics courses in our Program of Studies. (We expect to complete the mapping project this summer.)

In addition, each unit is aligned to the Department of Education's Mathematics Curriculum Framework. The frameworks describe learning standards for Number Sense and Operations, Patterns, Relations and Algebra, Geometry, Measurement, Data Analysis, Statistics and Probability. The learning standards specify what students should know and be able to do as learners of mathematics at the end of each grade span or course. Following the descriptions of learning outcomes and student proficiencies is a list of those Learning Standards met by that unit.

The completion of this project provides the Mathematics Department with a valuable resource for designing effective instruction that meets the goals of education reform and assures that the department offerings are aligned to the expectations set forth in the Mathematics Frameworks. The remaining courses within the department will be mapped and aligned in the Summer of 2007.

Replacement of Texts, and Framework Alignment

As part of an ongoing upgrade, we replaced our D.C. Heath Algebra texts with McDougal-Littell (2006 edition) texts this year, and we will be replacing the level 3 Geometry text with its McDougal Littell counterpart in the coming year. These texts align topics to the state framework; in addition, they provide a wealth of web-based teacher and student resources, including test-generating software that links test questions with the math frameworks. For the level 4 and 5 Geometry courses, the content is structured to conform to the frameworks and to meet the requirements of MCAS. We do not introduce trig relations (sine, cosine, and tangent) in the Algebra II levels 3 and 4 courses (AII.G.1 and AII.G.2); these topics are introduced in the Pre-calculus and Discrete Math courses. Similarly, framework AII.D.2 (referring to probability) is covered in the Discrete Math course. In the Geometry level 3 course, we do not do proofs by contradiction or inverse/contraposition (framework G.G.2), nor do we cover vectors (G.G.18) in our math courses.

2. **How is assessment of student learning in math accomplished at each grade level? How varied are the assessment methods? Is there uniformity within grade levels/courses in the assessment methods?**

Types of assessment:

Assessment is done through quizzes, tests, daily homework checks, class participation, and maintenance of a notebook. In addition, unit projects and Geometer's sketchpad labs are included as alternative assessments. These techniques are used throughout all grade levels.

Uniformity:

Communication among the department members ensures uniformity for each course. All teachers of a specific course align materials to stay consistent throughout the year. Each course follows a predefined syllabus, allowing for variation in teaching style. Teachers work together to create a uniform Mid-year and Final exam for each level of each course.

Rubrics:

At the start of each school year, teachers provide their students with an explanation of how grades are determined; this includes weighting of grades for tests, quizzes, homework, notebooks, class participation, etc. In addition, teachers explain to their students how tests are scored. Some teachers provide rubrics through their website.

3. **Are the mathematics learning goals articulated at each grade or for each course?**

At the start of the school year, students in each course are provided with a course outline, along with a syllabus for the course. The textbook for each course clearly states what the unit goals are, as well as objectives for each section within a given unit. Teachers emphasize and elaborate on these goals and objectives.

4. **How do we define mathematically literacy for a learner in Bedford and does our curriculum reflect that definition?**

Mathematical literacy is the ability to logically interpret information, critically analyze everyday situations and solve common numeric, geometric and algebraic problems. Literacy in each of these three areas is as follows:

- Numeric literacy includes an understanding of fractions, decimals and percents, and the manipulation of these representations of numbers in applications.
- Geometric literacy includes an understanding of spacial relationships, basic properties of common 2- and 3-dimensional geometric shapes, and applications of the Theorem of Pythagorus.
- Algebraic literacy includes an understanding of the relationship between two or more sets of numbers (e.g., time and distance), and the representation of these relationships

numerically, symbolically, and graphically, as well as applications of these properties to "real world" problems.

[See Appendix A for examples of how literacy comes into play in BHS math courses.]

5. How is mathematics instruction differentiated in Bedford? What evidence exists that the curriculum supports the needs of students with special needs?

Courses required for admission to four-year colleges are taught at three (3) different levels. Level 5 courses are designed to meet the needs and abilities of the most talented and highly motivated mathematics students, those who are able to work independently and can learn difficult concepts with relative ease; level 4 courses are designed to challenge motivated students who are quite capable but who need more direction and explanation of concepts; and level 3 courses are designed for students who struggle with concepts and require more direction and structure in order to understand concepts and develop skills.

As a department we try to accommodate the visual, auditory, and hands-on learners by combining teacher instruction supported by group and board work. Occasional exploratory work is used to discover the concepts being taught.

a) Regarding low-ability students:

Most major courses meet four times per six-day cycle; however, Bedford's mathematics program includes two Level 2 courses, Math Intensive and Algebra Intensive. These courses meet every day and are designed for students with pronounced academic needs. In the Level 2 and 3 courses, classes are limited to 18 or fewer students per section (typically, the average number of students in each section is 15, or fewer). To support different learning styles the material is taught in a variety of ways. All concepts are presented symbolically, graphically and numerically. This is to help both abstract and visual learners. All topics are done in context by making connections between previous learning and new learning. Short-term memory difficulties are addressed by frequent review of the key concepts and by practice problems before a quiz or a test. Guidelines and expectations are clear and consistent. This helps students with organizational difficulties. Homework and upcoming test information is left on the board and attention drawn to it several times during the period. Assignments are broken down into manageable parts to accommodate those that find multi-step problems difficult to handle. Students on with 766 or 504 education plans may be given extra time on tests and/or they may take tests in a learning center if their IEP provides these accommodations. All students are encouraged to come for extra help during the X-Blocks (twice per six-day cycle), or after school. Teachers coordinate closely with SPED liaisons to provide timely intervention for students at risk.

b) Regarding high-ability students:

To keep high-ability students interested and involved in the courses, teachers provide thought provoking class exercises and projects that add value to the students' knowledge of the subject. The challenging questions on tests (and quizzes) require mature

mathematical skills and lateral thinking. The objective in a level 5 course is not merely to have the students be familiar with the terms, but rather to acquire a deeper understanding of mathematics and the mathematical method.

[See Appendix B for a description of the distinctions between course levels.]

6. Is there evidence that sufficient instructional time is being devoted to mathematics?

Time and Pace are issues of concern. The pace required to cover concepts necessary for success in subsequent courses is faster than many students can go, forcing the instructor to choose one of three less-than-desirable goals:

- mastery of less than a complete course,
- coverage of a complete course without mastery of all, or
- a very quick and shallow dip into each concept pool which may or may not be sufficient to prepare students for the next course.

In short,, we feel locked into the “mile-wide and inch-deep” curriculum alluded to in the 1995 Trends in International Math and Science Study (TIMSS);. That we haven’t tailored our curriculum to the recommendations of the TIMMS report (i.e., provide less breadth and more depth) is not for want of doing so. The paradigm of mathematics education has not significantly changed since the Commonwealth’s 1993 Education Reform Act, other than to add layers of tests (MCAS) to an already overcrowded curriculum. In short, students, particularly those whose fundamental skills are lacking, are ushered through topics too quickly; consequently, they fail to master essential skills and they are often fail to develop a thorough understanding of fundamental concepts.

“Instructional time” may be distinguished from what might be called “supervised digestion”. We may have sufficient “instructional time” devoted to instruction in new content, along with limited practice and review, but the time allotted is not sufficient for those students who cannot be rushed through the thinking process. As a result, students often cannot complete the thinking they need to do before the bell rings; consequently, they may go home and attempt an assignment, but, because they did not fully digest a concept or skill, or make a connection between the two, they are often unsuccessful. (Currently, the Bedford Schools are running some CRISS workshops that might offer direction here.)

To compensate for inadequate class time, all math teachers provide extra help; however, this is not the same as ongoing instruction that guides students to connect with their own thinking and strategies.

7. In what ways does the current math curriculum meet the needs of accelerated learners?

The top of the pyramid of courses that we offer on site is the level 5 AP Calculus; the course covers the BC Advanced Placement syllabus. Typically, students taking AP

Calculus are seniors. There are, however, particularly gifted students who take the level 5 Calculus course prior to their senior year in high school. Students who complete AP Calculus prior to their senior year may take distance-learning courses through Stanford University's Education Program for Gifted Youth (EPGY). This year, two students are taking Multivariable Calculus and Number Theory through EPGY. Students who qualify to take EPGY courses beyond calculus earn level 5 credit for their work.

In addition to students taking EPGY courses, we have occasionally designed the high school and John Glenn Middle School schedules to accommodate middle school students who have completed all of the mathematics available to them at the middle school so that these gifted students can take high school math courses while still enrolled in the middle school. For example, in the coming school year we hope to make AP Calculus available to a middle school student by having the calculus course meet during the first period of the school day, and then he can go to the middle school for the remainder of the day.

8. What evidence exists that the curriculum supports the needs of students with special needs?

See Section 5, part (a).

9. What professional development programs are offered within the district, in math?

The district offers very limited professional development specific to mathematics. Available programs that include mathematics are:

- Teachers as Scholars
- EDCO (The Education Collaborative)
- Leadership Initiatives for Teaching and Technology
- MEET (Massachusetts Educators Enhancing Education with Technology)
- CRISS workshops

FILL IN DETAILS ABOUT EACH OF THE ABOVE

10. Do Bedford teachers possess sufficient content knowledge in mathematics?

Huff

- B.A. Secondary Education, Boston College
- 36 years secondary teaching

Sweet

- B.A. in medieval studies
- M.Ed. in teaching Reading
- Bachelor's Plus equivalent in math
- National Board Certification in Secondary Math
- 18 years secondary teaching

Mayo

- B.S. Ed in Biology/Spanish
- 11 years secondary teaching (4 years teaching math)

Larimore

- B.A. in Anthropology/ Pre-Med, University of Notre Dame
- MPH, Boston University
- M.Ed. in mathematics, Salem State College
- 4 years secondary teaching

Peters

- B.S. in Mathematics, St. Lawrence University
- M.Ed. in Instructional Technology and Media Management, SUNY Potsdam
- 10 years secondary teaching

Irving

- M.A. in Mathematics for teaching option, UMASS at Lowell
- B.S. in Mathematics, Merrimack College
- Standard certification 9-12 Mathematics
- 8 years secondary teaching

Dotty Blake

- M.Ed. in middle-school mathematics, Leslie College
- B.S.E. in civil engineering, Princeton University
- Standard certification 5-9 and 9-12 Mathematics
- 6 years secondary teaching

Jean Miele

- M.A. in Mathematics for Teaching, UMASS at Lowell
- B.S. in Mathematics, UMASS at Amherst
- Standard certification 9-12 Mathematics
- 33 years secondary teaching

Venkatesh

- Ph.D. Chemical Physics, University of Chicago
- M.A. in Mathematics, Northeastern University.
- 20 years secondary teaching

Burns

- B.A. in Mathematics Education, Merrimack College
- M.S.T.M (Teaching Math), Boston College
- M.Ed. in Computers and Education, Leslie College
- 18 years secondary teaching

Stephenson

- B.A. in Mathematics, Suffolk University
- M.A. in Mathematics, Boston College
- M.Ed. in Education, Suffolk University
- 28 years teaching secondary mathematics

Summary: 11 teachers

- 11 Bachelors degrees
- 11 Masters
- 1 Doctorate
- 181 years teaching experience (average: 16.5 years)

11. To what extent is technology used in support of the mathematics program?

The use of technology within the Mathematics Department varies from teacher to teacher. There are core technologies utilized by most teachers; these include: email, calculators, overhead projectors, DVD players, LCD projectors, Power Point, Web-based texts and related resources, and use of the Computer Lab (e.g., for Geometer Sketchpad activities). Access to these technologies is readily available to all teachers.

A second tier of technologies is in use less frequently due to accessibility and training issues. This group includes: web pages, graphing calculators, Smart Boards, Excel, Geometer's Sketchpad and Nicenet. Teachers with advanced experience and training are making use of Internet resources, video cameras; web based graphing utilities, and, MIT Open Courseware.

12. How is the District's mission, vision and value statements – and the recently adopted Strategic Plan as a whole – reflected in the mathematics learning goals at each curriculum level?

[TO BE COMPLETED]

Appendices:

Appendix A. Defining literacy:

Mathematical literacy is the ability to gain information from a math statement or math problem for the purpose of working with (analyzing) that information or for solving a problem.

Examples of how mathematical literacy applies to our courses include:

- understanding the meaning of statements like 3×7 as “three times that the value 7 is taken” – this is a different statement than 7×3 , even though the products are the same OR using reading for meaning to understand the difference between $x^5(x^3) = x^8$, while $(x^5)^3 = x^{15}$ OR
- $2/3 \div 1/5$ means “how many times does $1/5$ fit into $2/3$?”
- being able to define variables for use in equations and as labels for axes of graphs
- translating wordy English into succinct algebra as in “the length of a rectangle is 3 times the width” $\rightarrow l = 3w$.
- obtaining information from mathematical statements as in, from $y - 4 = 8(x - 5)^2$, the figure graphed is a parabola, the vertex is (5, 4), and there is a strong vertical stretch at play.
- using the ability to interpret given information to create a statement as in “given (2, 100) and (6, 300), write an equation for a linear relationship and find the rate of change” $\rightarrow y = 50x$ OR using a pattern to create a math statement (or secondarily, a verbal statement that describes the general pattern).
- obtaining information from graphs
- comprehending that “sin x” is a ratio while “x” is an angle measurement
- bringing the generic thinking skill of classifying to the task of understanding relationships among geometric figures (a square is both a rhombus and a rectangle as well as a parallelogram, etc)
- applying the generic skill of recognizing form to seeing the underlying unity among the formulas $y - k = a(x - h)$, $y - k = a(x - h)^2$, $(x - h)^2 + (y - k)^2 = r^2$, etc.
- applying formulas in spreadsheets to accomplish a global set of calculations
- using logical thinking to put forth an argument
- having the ability to check for error using proof-reading and processing skills
- being able to follow a basic textbook example
- communicating understanding of a process to a classmate (using appropriate vocabulary and terminology)
- recognizing proportional relationships and apply proportional thinking to find new values.
- being able to use a ruler to obtain linear measurements in metric and English units.

With the exception of linear measurement (with a ruler), all of the above are well represented in the curriculum. However, the lens through which they are taught and approached may not be one of “literacy.”

Appendix B: Description of course levels

Level 2 and 3 courses progress at a pace that allows for skill development and reinforcement of concepts. Each course is designed to support the learning of students who may not have fully retained the skills and concepts covered in prior courses which will be reviewed when needed in the course. New ideas are often developed through student investigation with significant guidance from the teacher. Students will receive support from the teacher in developing study skills and using the textbook as a resource. Classes typically include substantial review of homework and previously covered content. Students are expected to take responsibility for their own learning with guidance from the teacher, and seek help when needed. The course is designed to meet the needs of a student who thrives in a directed learning environment.

Level 4 courses progress at a fast pace. Students are expected to have developed a good understanding of most of the content covered in prior courses, but the course will include some review of difficult topics that may not have been fully retained. New ideas are often developed through student investigation with moderate guidance from the teacher. Students will be expected to work independently, with some teacher support. Students will be expected to use the textbook and other course-related materials resources, and occasionally to learn new material independently. Typical classes may include some review of homework and previously covered content before new material is introduced. Students are expected to be self-motivated, taking responsibility for their own learning and seeking help when needed. The course is designed to meet the needs of a student who thrives in a guided learning environment.

Level 5 (Honors) courses progress at a very fast pace covering the greatest breadth and depth of topics. Students are expected to have mastered the concepts covered in prior courses. They are expected to have retained this past knowledge, which will generally not be reviewed in the course. New ideas are often developed through student investigation with minimal guidance from the teacher. Students will be expected to apply their knowledge. Students will sometimes be expected to learn material by reading the textbook and other resources. Typical classes include minimal review of homework and previously covered material. Students are expected to be highly self-motivated, taking the fullest responsibility for their own learning and seeking help when needed. The course is designed to meet the needs of a student who thrives in a more independent learning environment.