KENTUCKY CENTER FOR MATHEMATICS

# Considerations for Selecting a K-12 Supplemental Mathematics Diagnostic Intervention Program

## UNDERSTANDING MATH™

Responses submitted by: NEUFELD LEARNING

**KCM DISCLAIMER:**
This document presents useful criteria along with publisher-responses regarding a particular diagnostic intervention program and may be used as an informal tool. It is important to note that these **publisher-responses may not necessarily reflect the educational positions of the Kentucky Center for Mathematics**. Towards this end, we encourage the reader to critically evaluate each response with respect to the particular consideration. W*e strongly recommend consulting with a mathematics education specialist when making any decisions regarding mathematics curricula.*

**KCM Definitions:**
A *supplemental mathematics diagnostic intervention program* is a research/evidence-based program that is used in conjuntion with a core curriculum. The essential components of such a program include dynamic diagnostic assessments that inform data-driven differentiated instruction.

A *dynamic diagnostic assessment* is a measure designed to precisely ascertain a student's level of readiness for learning mathematics. These assessments typicall focus on interactions among student, teacher, and task with the intention of dynamically reforming the testing landscape to accommodate the individual. See explication here: PDF.

**Connection to NCTM Guidelines**

This document was prepared independently of the NCTM guidelines regarding the creation or selection of an intervention program. Alignment to NCTM intervention guidelines are noted where appropriate. NCTM intervention program guidelines and additional information concerning mathematics intervention may be found by searching for keyword *intervention* at www.nctm.org or access the NCTM guidelines directly at the following web address: http://www.nctm.org/uploadedFiles/Lessons_and_Resources/Intervention_Resources/Intervention%20Programs%20(NCTM,%20Nov%202007).pdf

**Document Categories**

- Program Foundations
- Professional Development
- Diagnostic and Formative Assessment
- Instruction and Differentiation
- Summative Assessment
- Logistics

**Program Foundations** ***(NCTM Topic 1:*** *Diagnostic Assessment****; Topic 2:*** *Instructional Activities;* ***Topic 5:*** *Research Supporting Intervention****)***

1. **To what extent is the program based on accurate mathematics and solid theories of teaching and learning which develop conceptual understanding among students?** ***NCTM 2.4***

   ***Vendor Response:***

   *The program is driven by conceptual learning as the foundation of all mathematics education. Multiple processes and representations are used throughout the materials and NCTM standards are the guiding principles of the program and are reflected throughout. Learning theory guides each detail of the development. Probably the best conceptual-driven software available.*

2. **To which levels of the intervention program does the developer's research apply?**

   ***Vendor Response:***

   *See the attached research report (Power Point form) on the Houston public schools. Also a video report can be made available to expound on the research if desired.*

3. **Are there randomized trial experiments that prove positive effects on student achievement?** ***NCTM 5.1***

   ***Vendor Response:***

   *See the attached research report or video report if available.*

4. **To what extent do the program's theoretical framework, diagnostic assessments, instructional design, and content align with your school's overall vision for mathematics education?** ***NCTM 1.3, 5.2***

   ***Vendor Response:***

   *[T]he framework paralleled the ordinary curriculum with a "topic-based" approach rather than "textbook-based" approach. All elements of the curriculum are addressed. Diagnostic assessments are built in at the end of each lesson. Randomized questions allow for doing pre and post testing easily, with immediate feedback and item analysis. A vision of mathematics education that grows out of the NCTM standards finds perfect alignment in Neufeld's work.*

**Professional Development (*NCTM Topic 4:* *Organizational Structure of the Intervention*)**

5. **To what extent does the program provide rigorous professional development that contributes to a teacher's robust understanding of program framework, instructional technique, and use of materials? *NCTM 4.3***

   ***Vendor Response:***

   *The professional development not only acquaints the teachers with how to use the software and how to integrate it into learning, it also awakens teachers to the under-girdings of mathematics and how to teach it conceptually. Materials are provided and a variety of techniques are presented. The program framework is over-viewed and teachers are shown how to connect this with the particular mathematics framework of their particular schools.*

6. **To what extent does the professional development aid teachers' growth to conduct formative assessment by deliberately reflecting on practice and student performance following each lesson?**

   ***Vendor Response:***

   *Good software by its very nature embodies formative assessment. Part of Neufeld's philosophy is that you learn by making mistakes. If a student provides an incorrect response this is cleverly used as a learning opportunity. Several layers of "hints" are given so that the student can find her way through the lesson with little teacher assistance. Students know at each frame if they are on target, because they cannot go on without coming to grips with the concept being taught. If students work in groups, teachers can work in "PC" and "TC" formative assessment structures. At the end of each lesson a post-assessment is given that is immediately available to the teacher, with objectives clearly listed as obtained or not obtained. These, in turn are stored and displayed in a "utility" system.*

7. **To what extent does the professional development incorporate coaching visits?**

   ***Vendor Response:***

   *This is worked out as needed with the individual schools. Coaching is readily available and encouraged in the KY area. Also email networking is always available both through the local consultant and other teachers who have found success in using the software. (see attached "framework" document regarding PD elements and rates)*

8. **To what extent does the professional development facilitate establishment of an engaged learning community?**

***Vendor Response:***

*The software is ideal for helping form and nurture learning communities. The 4-tiered Professional plan of the company leads to creating a "professional learning community" that is self-sustaining in the school. (refer to the PD framework file attached). The learning community is especially a powerful possibility if several teachers in the same building are using the software on a regular basis.*

9. **To what extent does the professional development prepare teachers to guide student attainment of conceptual understanding of mathematics?**

***Vendor Response:***

*Again the software runs the show. It is conceptually based from the start. If teachers learn to let the program lead and offer carefully directed "coaching" assistance, the students learn the concepts. The teachers do not teach concepts in a deductive kind of way, but stand by as the students discover concepts through the multiply spectrum of activities incorporated in the program.*

10. **To what extent does the professional development support teachers in becoming mathematics education leaders within their schools?**

***Vendor Response:***

*We encourage a "lead teacher" in each building. This person masters the use of the software, stays in touch with the company representative as needed, and uses leadership skills to coach colleagues on how to better use the tool and to risk stepping outside the box in teaching their students. The "lead teacher" also keeps the administration aware of financial support that will be needed down the road.*

11. **To what extent does the professional development prepare teachers to advance student thinking?**

***Vendor Response:***

*Teachers who use Neufeld's software have found that it works not only as an intervention tool, but also accommodates the "enrichment" needs of students who are ready to lurch ahead. Because of the variety of topic strands (ten in all at the 4-10 grade levels), students who need to be challenged can branch into a different area of mathematics while others are trying to catch up with fundamentals. There are supportive project materials that are also offered to advance student thinking.*

12. **To what extent does the professional development foster a sense of purpose and commitment to the instructional mission?**

***Vendor Response:***

*The professional development reflects the whole spirit of Neufeld's mission, which is to sell teachers on being great teachers. The software is a tool that awakens teachers to the possibilities for learning among students of all kinds. It is our hope that each teacher who participates "catches the fire" that drives Rudy Neufeld and his team. (Again refer to the "framework document" attached to this report.)*

13. **To what extent does the professional development incorporate reading materials that provide teachers with rigorous exposure to current research in teaching and learning?**

***Vendor Response:***

*The professional development focuses on the use of the product and how to build mathematics teaching around conceptual development. The website offers supportive resources. Other reading materials current with the direction of effective education are not provided, but a list of references can easily be provided.*

14. **To what extent will teachers enjoy and engage in the professional development?**

***Vendor Response:***

*As someone who has led professional institutes for teachers during the past 14 years, I can assure you that teachers will leave saying this was one of the most enjoyable and engaging professional experiences of their lives. In many cases it will be a professionally and personally transforming event.*

15. **To what extent does the professional development align to the KDE Professional Development Standards?**

***Vendor Response:***

*I have worked with KDE professional leaders for a number of years, and see that Neufeld materials support the best of what KDE provides and expects On the website (neufeldmath.com) there is a correlation report on how the software supports the KY standards.*

**Diagnostic and Formative Assessment (*NCTM Topic 1: Diagnostic*)**

16. **To what extent does the program prepare teachers to diagnose, with precision, a student's level of readiness for learning mathematics? *NCTM 1.2***

***Vendor Response:***

*The nature of the program is meticulously tied to learning objectives. Skill tests are given at the start of each K-3 lesson and diagnostic tests are given at the*

*end (and start if needed) 4-10 level. It is easy to see exactly where a student stands regarding her readiness to move to a next step.*

17. **To what extent does the program provide systems for organizing student data for the purposes of instructional design and for anecdotal reporting in ways that both teachers and parents may understand?** ***NCTM 1.4***

    ***Vendor Response:***

    *Data is saved in the system and organized in a chart. The recording system, to my knowledge does not have an open door for anecdotal reporting. This would have to be done by the teacher in conjunction with the test data.*

18. **To what extent does the program prepare teachers to fully utilize formative assessment to design data-driven instruction targeted at each student's zone of proximal development?**

    ***Vendor Response:***

    *Formative assessment lets a student know where she stands each step of the way and assures her and the teacher that she has grasps what has recently been taught. The nature of the software is to provide this kind of assessment each step of the way. When a student is able to navigate through a lesson, the teacher can be confident that they are on top of things. When a student "gets stuck", a "teacher check" is automatically called for. Teachers then give the individual help and design strategies to coach the student through that particular barrier. The summative assessments at the end of a lesson are short and target the specific learning objectives of that lesson. A printed result is immediately available and profile the student's need in that area. Teacher intervention can be given as needed both by "back up" work with the software and by the use of other supplemental learning tools available to them.*

19. **To what extent do the formative assessment mechanisms allow a teacher to explore student progress in different domains of learning (i.e. conceptual/critical thinking as it relates to supporting procedural/skill performance)?** ***NCTM 1.1***

    ***Vendor Response:***

    *Assessment involves both critical thinking as well as skill performance. The assessments grow out of what has been just taught rather than from some abstract test bank provided by an outside source. Some test items are skill-directed, others require a type of thinking that goes beyond mimicking a process. Most assessment items require "thinking" on the part of the student.*

**Instruction and Differentiation (*NCTM Topic 2:* *Instructional Activities*)**

**20. To what extent does the program require that students engage in sustained hard thinking in order to construct concepts that build facility with mathematical skills?**

***Vendor Response:***

*The interactive nature of the software maximizes "sustained hard thinking". The lesson does not move to the next step unless the student thinks and responds correctly. There is no "coasting time" such as often exists in a classroom setting where the teacher talks and students can be thinking of something else instead of being engaged in what the lesson is about.*

**21. To what extent does the program allow students to experience and internalize the idea of *quantity* in a variety of settings presented by the teacher with a progression of diminishing support in order to guide thinking from concrete/unitary to abstract/composite?** ***NCTM 2.5***

***Vendor Response:***

*One of the most powerful features of the software is its use of multiple representations. Fractions, for example, are presented through about seven models, all concrete. There is a gradual move from simpler to more complex models and the transition from concrete models to abstract ones is artfully done. Through animation, for example, 2 parts of an object represented concretely, magically turn in the symbol "2", followed immediately by the verbal expression of the word "two". The software is masterful in this respect…the best I have seen.*

**22. To what extent can the program be flexibly adapted to meet the instructional needs of students who are at a variety of readiness levels?**

***Vendor Response:***

*All topics are incrementally presented in a logically-arranged way. Students can be directed by a "jump to" tool to any topic quickly and take up where they left off last time. One student might need to be on "introduction to fractions", a second on "adding fractions with the same denominators", and a third might be learning how to "divide fractions" at the same time. While the software does not replace curriculum, it parallels the standard curriculum by topics and can be navigated easily.*

**23. To what extent is the intervention instruction carefully linked with the results of each student's diagnostic assessment?** ***NCTM 2.1***

***Vendor Response:***

*If the assessments from the software are used, each test item is designated by a named objective. Students can "jump to" the part of the lesson that addresses this objective and work there almost immediately. If outside*

*assessments are used, the teacher will have to do some simple correlation to accomplish effective intervention.*

**24. To what extent are formative assessments embedded within ongoing instructional activities?** ***NCTM 2.3***

***Vendor Response:***

*Formative assessment at its best gives a "check "system for students each step of the way. As mentioned earlier, the very nature of the software demands that students "check" understanding as they proceed through a lesson. Formal, summative assessment does not occur until the end. A teacher with imaginative classroom management can devise a "peer check" system that allows partners who are working on the same lessons, to confer with each other at critical junctures. And, of course, since teachers are free to roam from student-to-student, there is a natural "teacher check system" built into this style of learning.*

**25. To what extent can the program be flexibly adapted to meet the optimal instructional pace of the individual?**

***Vendor Response:***

*The program, because of its software nature, has optimal flexibility to adapt to individual pace. Students are free to move as slowly or quickly through the lesson as meets their particular learning styles. Some students dwell at length on a particular "page" to allow their processing rate to be honored. There is no "group" pace that frustrates slower learners, and restricts faster learners. No teacher could create this kind of flexible pacing even with a small group.*

**26. To what extent does the program provide specific remediation strategies for recognizing and addressing *common* student misconceptions?**

***Vendor Response:***

*The program was designed by an experienced classroom teacher who was quite familiar with "common student misconceptions". These areas are handled carefully, with multiple representations and step-by-step presentation so that students will not glide over difficult concepts. There is no "branching" in the software that explicitly directs students to a remediation strategy other than the "jump to" feature which allows the students to go back to a portion of the lesson that was not fully grasped. In the K-3 software students are asked to choose a strategy in the problem-solving section.*

**27. To what extent does the program encourage the development of students' abilities to communicate their mathematical ideas?**

***Vendor Response:***

*There is no writing component as such within the software. Journal pages (paper not electronic) are provided so that students can confer with their group and articulate what they have learned on within a particular lesson or problem-solving task.. Teachers are encouraged to present "writing prompts" as a way of articulating concepts that have been learned.. These, in turn, can supply a "formative assessment" opportunity for the teacher.*

**28. To what extent is the mathematical content appropriately focused (according to the National Council of Teachers of Mathematics *Focal Points*) to deepen understanding of key concepts?**

***Vendor Response:***

*The very backbone and philosophical foundation of the program is "conceptual-based" learning. This was the driving force that motivated the author to create the software in the first place. It also lines up carefully with the framework and spirit of the NCTM standards. One piece of the video presentations is completely devoted to explaining the NCTM standards and describing how the software is build on these standards.*

**29. How can this program be used or expanded to accommodate all the tiers of intervention associated with RtI under IDEA 2004?**

***Vendor Response:***

*(I am not familiar with IDEA 2004…I need to be briefed on this)*

**30. To what extent will teachers and students enjoy and engage in the teaching of this program?** ***NCTM 2.6***

***Vendor Response:***

*Teachers testify with enthusiasm the difference the program has made for them as a teacher and for their students. It is not a rarity to watch students experience an "aha" moment when they have at last grasped a mathematical concept that they had previously struggled with. Moments of understanding represent the peak of the learning experience. Teachers also learn much about how to teach math by witnessing the process with which the author develops lessons, using multiple approaches, clever interactive moments, and proceeding gradually from the concrete to the abstract.*

**31. To what extent are the student materials and technology user-friendly and developmentally appropriate?**

***Vendor Response:***

*Worksheets are provided for every lesson. These parallel carefully the lesson, and their format matches, to a large extent, what the students see on the computer screen. There is no "transitional gap" for the students. And if*

*students are placed at a fitting place in the program, the student materials are automatically developmentally appropriate.*

**Summative Assessment (*NCTM Topic 3: Postassessment*)**

**32. To what extent do summative assessments illustrate the degree of instructional efficacy by identifying aspects of student progress over time? *NCTM 3.1***

***Vendor Response:***

*There are two kinds of summative assessment. At the end of each lesson is a 10-question assessment with named objectives attached to each test item. The report that is immediately generated names the objectives and gives students an opportunity to check their answers against the correct ones. At the end of each unit is a 25-question cumulative assessment that tests 25 objectives in the lesson. The assessments are created from a randomized test bank and so can be taken multiple times for those students who do not reach the bar the first of second times. Teachers can get an immediate print-out after an assessment (objectives listed on the printout) or review the electronic records that are kept.*

**33. To what extent do summative assessments generate practical data in a timely manner that may be used to guide further instruction? *NCTM 3.2, 3.3***

***Vendor Response:***

*The data is carefully organized both by lesson and are available electronically for the teacher. If a student has shown repeated difficulties with a particular objective, teacher intervention is needed. In this case the teacher might have the student "jump to" (the easy navigational tool built into the software) a place in the lesson (or previous lesson) where help is needed.*

**Logistics (*NCTM Topic 2: Instructional Activities; Topic 4: Organizational Structure of the Intervention*)**

**34. What are the grade levels targeted by this program? *NCTM 4.1***

***Vendor Response:***

*Understanding Math (nine topic-based programs) is designed for grades 4 through 10. Understanding Numeration is designed for grades K through 3.*

**35. What is the cost of training? *NCTM 4.2***

***Vendor Response:***

*See the attached "framework" regarding nature and flow of PD and current rates.*

**36. What is the cost of materials?** ***NCTM 4.2***

***Vendor Response:***

*It depends on number of stations that are purchased.*

**37. What materials and/or software are included in the cost?** ***NCTM 4.2***

***Vendor Response:***

*The disk and manual are included. All other materials are free downloads from the website.*

38. **What are the suggestions and costs for additional materials?** ***NCTM 4.2***

***Vendor Response:***

*There are no additional materials except to extend the purchase to include more stations. This is pro-rated. There are no renewal fees. Purchase gives use of the product indefinitely.*

**39. What is the recommended group size?** ***NCTM 4.1***

***Vendor Response:***

*While the materials are designed for individual students rather than groups, a suggested group size is three. The roles of "navigator", "pilot", and "co-pilot" are suggested. The "pilot" uses the keyboard, the others assist. After a certain time the roles and positions can be rotated. (More details are available on this in the video presentation)*

**40. How can this program be used to benefit additional struggling students not directly participating in the intervention?**

***Vendor Response:***

*Its flexibility lends itself to be used in many situations. Students who need review, enrichment, or brush-up help also find it useful. Parents may purchase parts or all of the materials at half-price if the school has purchased a site-license. This gives an opportunity for parents to work at home or in the summer with children who are struggling with a particular aspect of mathematics. Currently one program from the Understanding Math selection would cost parents around $50—the price of one tutoring session.*

**41. What is the recommended lesson length?** ***NCTM 4.1***

***Vendor Response:***

*There is no time recommendation since each student (or group) works at her/his (their) own pace.*

**42. What, if any, is the total recommended pull-out time (missed regular class time) per student?** ***NCTM 4.1***

***Vendor Response:***

*There is no time recommendation on this. It depends on the intervention needs of the students. In one school that I worked with the "pull-out" time was one 45-minute period per week. In the Houston school district some classes use the software 3 class period per week.*

**43. Since mathematics intervention is intended to be supplemental to the core mathematics program, is the mathematical content of the intervention program appropriate for accommodating each student's foundational learning needs and aligned to a *subset* of the *Kentucky Core Content for Assessment, Kentucky Program of Studies, National Council of Teachers of Mathematics* standards, and the school's overall vision for mathematics education, rather than being an attempt to cover all topics?** ***NCTM 2.2***

***Vendor Response:***

*Yes. The program is a "library" of lessons with each lesson sub-divided into smaller portions. After intervention needs have been assessed, a student can go directly to that piece of the program that is needed to meet her/his individual needs.*