

Three Dozen Ways to Improve Math and Science Learning

Suggestions from the Kentucky Education Association

Growing Our Own Math and Science Teachers

1. Pay the full cost (tuition and books, released time) plus a one-time \$5,000 stipend for every elementary and/or K-8 middle school teacher who acquires a minor in mathematics or science. If all elementary teachers who teach math had at least a minor in the subject, this alone would probably make more difference in improving the instruction of mathematics in Kentucky.
2. Identify students talented in math and science who are interested in teaching as early as middle school; pay their full tuition and expenses for a college degree through a conditional loan repaid by the state as long as the individual continues to teach in Kentucky
3. Pay the full tuition and expenses and a paid leave of absence for those currently-certified teachers (not in math and science) to go back to school to pick up math or science certification through a conditional loan repaid by the state as long as the individual continues to teach in Kentucky
4. Pay the full tuition and expenses and a paid leave of absence for current classified employees to go back to school to gain math or science certification through a conditional loan repaid by the state as long as the individual continues to teach in Kentucky.
5. Urge Congress to repeal Social Security offsets which penalize mid-career individuals who might like to teach.
6. Provide an intensive, two-year teacher-induction program that compares favorably with the best medical-residency programs for every teacher of mathematics and science. During the first year of the program, the intern teacher would be paired with and team teach all classes with a veteran teacher.

Improving Skills, Knowledge and Retention of Current Math and Science Teachers

7. Provide better professional development for all teachers of math and science, especially focusing on elementary and middle school teachers who may not be math and science specialists.
8. Employ math and science specialists in all elementary schools to assist other teachers and provide one-on-one assistance to the most challenging and gifted students (an approach successfully implemented in China)
9. Provide math and science mentors and coaches in elementary and middle schools

10. Include teachers and their professional organization in designing any differentiated compensation plan.
11. Summer internship and paid sabbatical opportunities in math and science fields for teachers to learn more about the application of the content they teach.
12. Improve teacher working conditions (a research-based way to reduce teacher attrition, since about half of all new teachers leave within five years), with a special focus on time, leadership, and materials/facilities.
13. Provide common planning time for teachers so they can collaborate on curriculum development and articulation, examine student work, and problem solve how to reach struggling students

Creating a Better System of Math and Science Education, P-16

14. Expand opportunities for high-quality, developmentally appropriate pre-school for all Kentucky three- and four-year olds so that they begin primary school ready to learn math and science fundamentals
15. Make sure all students can read before they try to learn math and science. Spend K-2 on reading and math only. Teach science and any other subject through the writing process. (This has been implemented successfully in some Pacific Rim countries.)
16. Examine all the current math initiatives in the state to assess their success in improving student learning; expand statewide those proven successful
17. Provide time for the recently enacted changes to be fully implemented and their success assessed before mandating additional changes: increased graduation requirements in math; end-of-course exams in math; administration of the ACT
18. Mandate curriculum articulation between high schools and higher education along with examination of teaching methods in higher education.
19. Examine the breadth and depth of Kentucky Core Content in math and science, with a goal of narrowing and focusing content coverage so that deeper mastery can be accomplished through a greater use of inquiry-based instruction which is best practice but can require more time than traditional approaches.
20. Pay student fees to take Advanced Placement examinations
21. Provide additional support for schools (through professional development, appropriate university coursework for teachers, and providing materials and supplies) starting or continuing AP, IB, dual credit courses, Commonwealth Diploma, etc.
22. Provide math and science instruction improvement and innovation grants to be used improve student success in math and science, with grants available to all districts and schools at all levels, with the ability for schools to determine what specific programs would best address their own issues.
23. Fund the Math and Science Academy at WKU
24. Reduce class size, especially for struggling students and gifted students, so teachers have the time to address individual needs

25. Significantly increase equipment, materials and technology in schools with a goal of integrating technology to support math and science learning. Provide math manipulatives for all students to help them move from the concrete to the abstract; provide daily access to graphing calculators to all students beginning in 7th grade; assure that all high schools have well-equipped, safe, up-to-date labs; assure that teachers are trained in the use of technology and laboratories.
26. Pair individuals with strong math and science skills from business with teachers not certified in higher level science and math to team teach high level courses.
27. Bring the same amount of attention, experimentation, and investment to community- and technical-college education as exists for K-12 and traditional four-year colleges. This is especially important because many teachers start their collegiate education in two-year institutions, and also because developmental-math courses have proved to be a gatekeeper to technical careers.
28. Invest seriously in the emerging revolution in the learning sciences and in places designed to translate that knowledge into curricula, innovative programs, and other resources that will work for ordinary teachers and students.
29. Consistently stimulate instructional experimentation to find better ways of learning through curricula, technology, instructional practice, etcetera, so that new innovations are constantly tested, improved, abandoned, or moved into commercial or public markets.

Support Families' Efforts to Help Students Achieve

30. Sponsor a statewide public service campaign to show parents, school counselors and students the importance of rigorous math and science courses.
31. Change the KEES system so students are not penalized for lower GPAs because of taking challenging courses.
32. Provide significant, systematic homework assistance for students taking challenging math and science courses, especially disadvantaged students who may not have parents who are able to assist them.
33. Provide summer camps/institutes for novice and apprentice students (elementary, middle and high school) to assure that they begin the following school year proficient in math and/or students
34. Provide summer internship opportunities in math and science fields for students.
35. Use and support the informal education sector—museums, media, and after-school programs—to motivate children and adults to engage in everyday questions about the world around them.
36. Have several interchanges each year between elementary and middle schools and between middle and high schools to showcase math and science at the higher level, encouraging students to strive for high achievement. Invite families to participate.