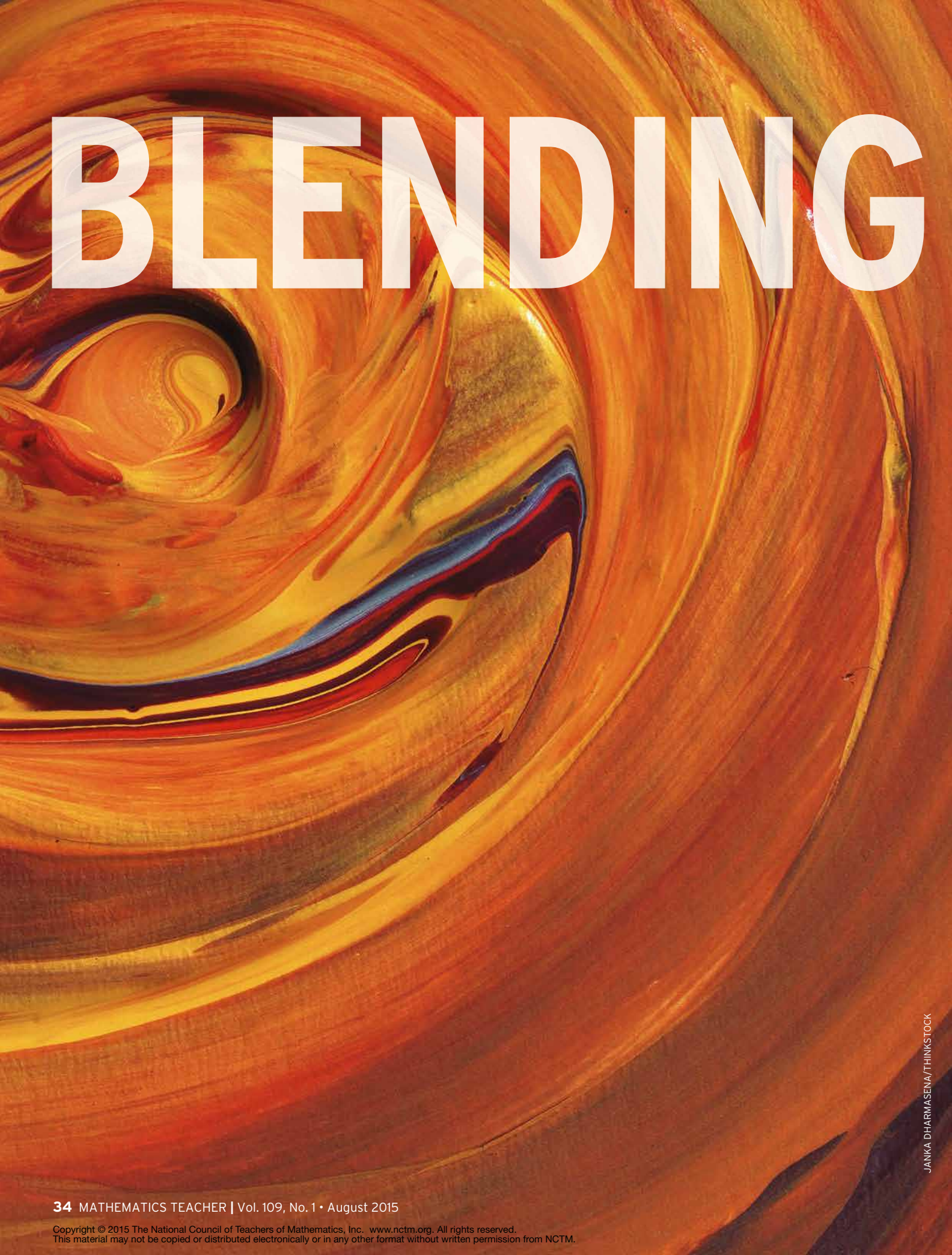
BLENDING



JANKA DHARMASENA/THINKSTOCK

INSTRUCTION WITH KHAN ACADEMY

With the proper use of KA, the teacher's role changes from a deliverer of knowledge to a facilitator or an organizer of learning experiences.

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Khan Academy landed on the education landscape in about 2011, when it was featured on the popular weekly news show *60 Minutes*. The free Web-based tutorial program has since been highlighted by *TED, The New York Times, The Wall Street Journal, edutopia,* PBS, CBS's *The Early Show,* CNN, and NPR. The program is now used worldwide by more than 10 million learners each month (Murphy et al. 2014) and is used in more than 29,000 classrooms in 216 countries (Taylor 2013). Are classroom teachers using the program as envisioned by its founder Salman (Sal) Khan? Unfortunately, from my observations, many are not. Ineffective use of any instructional strategy could increase students' rampant dislike of mathematics and jeopardize reforms aimed at increasing mathematics achievement.

THE KHAN ACADEMY PROGRAM

Khan Academy (KA) contains more than 5,500 tutorial videos in various subjects. Its instructional mathematics videos are aligned to practice problem sets and a real-time discussion board. The practice problems are available in a variety of interactive formats. Student progress on the practice problem sets is displayed in a colorful dashboard. Teachers, parents, and students can at a glance determine progress on any learning topic, including the Common Core State Standards for Mathematics. Users also accumulate points and badges as an incentive for participation.

Many mathematics teachers use KA as a tool for creating blended learning classrooms. The term *blended learning* has evolved in recent years as technology has been increasingly integrated into traditional instruction. A more widely accepted definition of blended learning is the use of online instruction "with some element of student control over time, place, path, and/or pace and at least in part at a supervised brick-and-mortar location away from home" (Staker, Horn, and Innosight Institute 2012).

Flipping and *station-rotation* are two popular blending models. In the flipping model, students are introduced to topics through instructional videos viewed as homework, resulting in fewer teacher lectures. More class time is available for higher-order activities, such as collaborative group projects and meaningful classroom discourse (Bergmann and Sams 2012; Khan 2012). In the station-rotation model, students rotate in small groups or with the

whole group through different learning stations. At least one station is dedicated to online learning.

Throughout his first book *The One-World Schoolhouse: Education Reimagined* (2012) and in his many interviews, Sal Khan shares his singular vision for KA's use in classrooms as a resource for blended learning. Khan Academy is not a stand-alone product that should be used in isolation, especially for learners who have access to a live teacher. Instead, KA should be used to provide teachers with the data needed to plan individualized and activity-based instruction. I believe that teachers should align their instructional use of KA with Khan's vision of how the program should be used.

Khan's vision is grounded in the educational psychologist Benjamin Bloom's theory of mastery learning. Decades ago, Bloom determined that designing targeted small-group instruction according to the results of formative student assessment data improved student learning by 84 percent, in comparison with students who were taught as a whole group (Bloom 1984). Bloom coined the term *mastery learning* for the process of planning more personalized small-group instruction based on student progress data. The term is now part of the vernacular for most K–12 teachers.

In mastery learning, the teacher analyzes student results from a formative assessment and creates small learning groups with similar needs. Recent studies have confirmed Bloom's findings regarding substantial increases in student achievement and have determined that mastery learning also leads to improved student attitudes toward learning (Kulik, Kulik, and Bangert-Drowns 1990; Wambugu and Changeiywo 2008; Yildiran and Aydin 2005). Khan believes that KA facilitates mastery learning because the program generates detailed formative progress data for teacher use (Khan 2012).

FOUR TENETS

From Khan's book, his many televised and online interviews, and the highlighted pilot case studies and best practices available at https://www.khanacademy.org/coach-res/k12-classrooms, I have gleaned four components of his vision for KA's use as a tool for blending mathematics instruction. Teachers can use these tenets as a checklist to know whether they are indeed using the program as envisioned. Instruction with KA should include these four components:

1. Formative assessment data
2. Goal setting
3. "Playlists," or task lists
4. Active and collaborative learning

Use Data to Drive Instruction

The days of meticulously grading assessments, recording scores, and disaggregating progress data manually are a thing of the past. "The promise of technology is to liberate teachers from those largely mechanical chores so that they have more time for human interactions" (Khan 2012, p. 123). Let data drive your instruction.

Carefully read student progress reports after each computer lab day or assignment (the dashboard includes a variety of displays.) Focus instruction on individual student needs (mastery learning) with rotating small-group minilessons during computer lab sessions or on the days following lab sessions. The minilessons should take up about fifteen to twenty minutes. The students work with a partner or in a small group with the teacher, a peer tutor, or on their own to do enriching, reinforcing, or remediating assignments that address their data-based needs.

The work groups are often homogeneous but are always fluid. Groupings change for each minilesson according to student data, creating a differentiated learning environment. The students are not stigmatized by being in the same group for multiple minilessons. Focus on improvement and effort rather than solely on performance. Closely monitor student progress on the problem sets and modify instruction to reflect learning growth. Each child has his or her own learning path in data-driven instruction.

Set Goals

Encourage autonomy and empowerment by using goal setting. Teach students how to read their own progress reports. Provide instructions to parents on how they can check their child's progress. Require students to set weekly, biweekly, or monthly goals and plan checkups to routinely review individual progress. If students meet their goals, celebrate their progress. If goals are not met, create an action plan.

Explain the rationale for using KA so that parents and students know that it is a resource that enables the teacher to deliver more-individualized instruction.

Work from "Playlists"

Provide students with a checklist, or "playlist," of expectations. The checklists typically include what should be completed in one week—which practice problem sets, project or miniproject tasks, homework, and any other class assignments for the time period (Bergmann and Sams 2012). Students and parents should know that assignments are not intended as unmonitored busy work; their purpose is to free up class time for engaging activities.

The use of KA should be deliberate and intentional. KA should be used for about 20 percent of total class time. Ideally, students should work online in class about once or twice a week for about forty-five minutes each session. The teachers who use KA more than once a week typically serve students with higher remediation needs. "At a given moment, perhaps one-fifth of the students would be doing computer-based lessons and exercises aimed at a deep and durable grasp of core concepts . . ." (Khan 2012, pp. 203–4).

Flipped instruction should be implemented only if all students have consistent computer and Internet access at home, before school, or after school. Many teachers find equitable home access to be an ongoing issue even in affluent school districts. According to the U.S. Census Bureau (2014), in 2012 only 78.9 percent of U.S. households had a computer, 74.8 percent had access to the Internet, and only 45.3 percent of adults age 25 or older had smartphones.

Choose Projects for Active Learning

Projects, projects, and more projects! Instructional videos and practice problems should be used as the bottom layer of a constructivist plan. Every major set of skills should be paired with at least one project or activity. Choose projects and activities that foster conceptual understanding with the use of real-world situations, problem solving, simulations, critical thinking, collaboration, and discourse. Active learning is integral to mathematics instruction and is not a reward reserved for the students who meet behavioral or academic expectations. KA displays links to some recommended project lessons; go to https://www.khanacademy.org/coach-res/k12-classrooms/est-practices-k12/a/projects.

Simply merging KA or any other Web-based intelligent (adaptive) tutor with traditional "sage on the stage," whole-group instruction is contrary to Khan's vision of engaging and personalized instruction. In fact, the overuse of KA becomes a "sage" on the computer. With the proper use of KA, the teacher's role changes from a deliverer of knowledge to a facilitator or an organizer of learning experiences. Instead of frequent lecture, the teacher uses KA as continuous formative assessment to make dynamic instructional changes.

Using KA as an unmonitored tutor is the antithesis of Khan's vision. For more than a decade, the National Council of Teachers of Mathematics has urged teachers to include opportunities for student mathematical discourse, investigations, and problem solving, particularly nonroutine problems (NCTM 2000). Khan's vision of mathematics instruction is consistent with NCTM's recommendations.

Despite its popularity, research on the effectiveness of blended learning is only beginning to surface.

THE GOOD, THE BAD, AND THE CONTROVERSIAL

Many parents and school administrators believe that technology will aid in school improvement efforts because of its potential to produce self-paced and differentiated learning. Blended learning has quickly emerged as a fast-growing trend. In the school year 2013–14, at least twenty-four states had blended learning schools (Watson et al. 2013). Further, 78 percent of teachers who participated in a study conducted by the Flipped Learning Network and Sophia Learning indicated that they had flipped at least one lesson in 2014. The percentage increased substantially from 48 percent in 2012 (Yarbro, McKnight, and Arfstrom 2014).

Despite its popularity, research on the effectiveness of blended learning is only beginning to surface. A 2013 meta-analysis of forty-five research studies on online and blended instruction concluded that "on average, students in online learning conditions performed modestly better than those receiving face-to-face instruction" (Means et al. 2013, p. 1). Students in fully online classes achieved at about the same levels as students in face-to-face classes, but students in blended classes performed slightly better than students in their face-to-face comparison group. These early results inspired the use of blended learning and the plethora of available online tutoring programs to support it.

Most tutorial software programs are available only commercially and can cost school districts upwards of $40 per student per school year. One of KA's compelling features is that it is free for all

users. Since its inception, KA has been funded by the Bill and Melinda Gates Foundation, Google, and other philanthropic organizations. The Gates Foundation's involvement in public education has endured some controversy because of its support of teacher evaluation restructuring, Teach for America, the Common Core State Standards, and other education hot topics. Some have criticized the Gates Foundation for financially usurping a lead role in America's public education reform effort. KA, a clear product of the Gates Foundation, has similarly been criticized.

Since KA initially gained popularity, many educators have warned that it may not live up to *60 Minutes'* 2012 reference to Khan as a "teacher of the world" or provide a "glimpse of the future of education." Many popular mathematics teacher bloggers argued that the video sit-and-get instructional strategy is no different from the traditional teacher lecture. KA has been described as a collection of decontextualized mathematics problems that focus on procedural rather than conceptual fluency.

KA has also been criticized for the quality of its videos. Khan himself creates the videos, which might be described as rudimentary. The video backgrounds are usually black. Khan's handwriting appears in bright colors as he solves example problems and provides voiced-over explanations. The mathematical soundness of the videos is another source of contention. Karim Kai Ani, the founder of *Mathalicious*, described the KA videos as lacking "pedagogical intentionality" as a result of Khan's step-by-step problem solving. In a letter to the *Washington Post* (Strauss 2012), Ani wrote, "The videos aren't very good" and contested Khan's definition of slope. In a rebuttal letter, Khan invited teachers to contribute constructive feedback to the program. The slope video has since been revised. Several additional video corrections and edits have been made through the years.

The KA program underwent a major update and added a collection of exemplar videos and best practices documents.

Much of the criticism occurred in KA's initial rise in popularity in 2011 and 2012. Khan's 2012 book dispelled the idea that KA was ever intended to be a stand-alone product or that it should replace a human teacher. Khan also confirmed the criticism that KA focuses on foundational learning and highlighted KA's role as a support for Bloom's mastery learning and activity based instruction. "My hope was to make education more efficient, to help kids master basic concepts in fewer hours so that more time would be left for *other* kinds of learning. Learning by doing. Learning by having productive, mind-expanding fun" (Khan 2012, pp. 149–50).

FUTURE USE OF KA

In July 2013, the KA program underwent a major update. The data dashboard was made more user friendly, and a teacher resource module was added (https://www.khanacademy.org/partner-content/ssf-cci/sscc-teaching-blended-learning). The module includes a collection of exemplar videos and best practices documents. Teachers now have the ability to participate in free, online, self-paced professional development—an opportunity not available to the pioneering teachers who began to use the program with little or no training. Blending instruction has also become a prevalent topic at professional conferences, making training on the pedagogically appropriate uses of Web-based intelligent tutors more accessible.

Using KA as recommended by Sal Khan may not be its only appropriate use, but it is supported by decades of educational research on mastery learning. My hope is that these tenets serve as a quick and easy guide for teachers who strive to improve their craft and who want to blend instruction effectively.

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