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# Democracy & Education

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## Considering the Rights of Learners in Classrooms The Importance of Mistakes and Growth Assessment Practices

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### Abstract

In this response, we consider the Rights of Learners, in particular considering the ways “assessment for learners” policies and practices may be woven into the rights. We also consider findings from neuroscience on the positive role played by mistakes and suggest adding such findings to the messages given in classrooms.

### This article is in response to

Kalinec-Craig, C. A. (2017). The Rights of the Learner: A Framework for Promoting Equity through Formative Assessment in Mathematics Education. *Democracy and Education*, 25(2), Article 5.  
Available at: <https://democracyeducationjournal.org/home/vol25/iss2/5>

**I**NEQUITIES PREVAIL IN the education system, and they are particularly evident in mathematics achievement (Kozol, 2012; Rousseau & Tate, 2003). The Rights of the Learner outlined by Kalinec-Craig (2017) not only speaks to those inequities but works to tackle them in classrooms. In this response to Kalinec-Craig’s paper, we offer ways to support some of the “rights” outlined, drawing from recent brain science, and suggest ways of expanding upon the rights. One of the key myths that hold students back is the idea that only some people are “math people” and that struggle is a sign that you are not a “math person.” Dweck (2006) has pioneered research showing that some people have a “fixed mindset” and believe that their intelligence is limited while others have a “growth mindset” and believe they can learn anything. When students change from a fixed to a growth mindset, their learning pathways change and their mathematics achievement increases (Blackwell, Trzesniewski, & Dweck, 2007; Good, Aronson, & Inzlicht, 2003). Students with a growth mindset typically display a desire for challenge and show resilience in the face of failure. Such behaviors encourage greater mathematical persistence, engagement, and high achievement. In her article, Kalinec-Craig formalized a framework by Olga Torres, an elementary teacher and teacher educator, that promotes an equitable classroom through establishing five rights of students. These rights

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are: (1) the right to be confused; (2) the right to make a mistake; (3) the right to speak, listen, and be heard; (4) the right to write, do, and represent only what makes sense; and (5) the right to feel safe and have their ideas respected. These rights—particularly the first two—speak directly to the mindset culture of the classroom. Recent work in education has revealed that students often under-achieve in school due to myths and inaccurate beliefs that are held by teachers and students. Through this response, we argue an expansion of Kalinec-Craig's rights, first by proposing new ways to support the existing first and second rights and then by adding a sixth right focused on the student's right to be properly assessed.

### **Supporting the Right to Be Confused and to Make a Mistake**

Based on recent evidence from neuroscience, we find it important to add to Kalinec-Craig's (2017) interpretation of rights one and two. In Kalinec-Craig's interpretation of Torres's rights, she talked about the importance of mistakes to the learning process. Our recent work with neuroscientists has enabled us to gather important knowledge on the impact of mistakes and confusion on the brain, and our recent work disseminating this information to students, in a teaching example (Boaler, in press), and through our website reveals that different information could be shared with students that could aid the establishment of these two important rights. Good teachers such as Torres have shared for many years that mistakes are an important part of learning, but this has not stopped students from feeling bad about making mistakes and developing the belief that they are not "math people." With the commitment that Torres has shown to counter these ideas, the new understanding provided by neuroscience would help Torres's students and many more who are in less well-developed classroom cultures.

The important knowledge that neuroscience has developed is on the benefits of mistakes and challenge to the brain. Moser, Schroder, Heeter, Moran, and Lee (2011) studied adults working on tests and found that each time they made a mistake, a synapse fired in the brain. A synapse is an electrical signal that moves between parts of the brain. As synaptic activity increases in the brain, new pathways between parts of the brain are created or old pathways are strengthened. Moser et al. found that when people make a mistake, the brain has two potential responses. The first, called an ERN response, is increased electrical activity that is thought to occur when the brain experiences conflict between a correct response and an error. Interestingly, this brain activity occurs whether or not the person making the response knows they have made an error. The second response, called a Pe, is a brain signal thought to reflect conscious attention to mistakes. This happens when there is awareness that an error has been made and conscious attention is paid to the error.

What is so important about Moser's team's (2011) study is that it showed that there is more brain growth when people make mistakes than when they get questions correct. Moser and his team also found that there is greater brain activity and growth when people have a growth mindset than when people have a fixed mindset. This highly significant finding—that the development of a growth mindset causes greater brain growth to occur when

mistakes are made—helps us understand why growth mindsets is associated with higher achievement. People with a growth mindset have greater brain activity when they make mistakes, although caution must be given when interpreting studies conducted with adults. Other neuroscientists and learning scientists are now describing the positive impact of learning environment that encourage struggle and mistakes for positive brain activity for younger students (Coyle, 2009; Soderstrom, & Bjork, 2015).

In our work with students and teachers, we have found that the positive message—mistakes help your learning—is nowhere near as powerful for students as the message that mistakes and struggle cause brain growth. When students know that mistakes and struggle are important times for the brain, they become much more willing to struggle and try harder in mathematics and keep going. Steuer and Dresel (2013) looked at the climate of math classrooms to consider the impact of "mistakes-friendly" or "mistakes-unfriendly" environments on students' reactions to errors and the amount of effort they would put into classes. They found that when students perceive their classroom as mistakes friendly—above and beyond other aspects of their classrooms environment—they increase their effort in their work.

In an 18-day intervention conducted through the youcubed center at Stanford University, 81 students came to campus, each believing that they were not a "math person." The teachers of four classes all encouraged struggle and mistakes and valued all of the students' thinking (not just the thinking of some students). The mistakes encouragement and messages had a huge impact on the students who were freed to contribute ideas in the camp without the fear of being wrong. At the end of the camp, students had increased their achievement on standardized tests by an average of 50%, the equivalent of 2.4 years of school. One of the most important shifts for the students was the realization that mistakes and struggle are beneficial for their brains. This three-minute film shows the ways students changed as a result of the youcubed mathematics camp: <https://www.youcubed.org/resources/solving-math-problem/>.

Kalinec-Craig (2017) highlighted the importance of productive struggle within mathematics classrooms. While struggle provides space in a classroom for student interaction, as outlined by Kalinec-Craig, it is also an important component of a classroom's culture. Students should know the value of struggle and that it is necessary and important. Lin-Siegler, Ahn, Chen, Fang, & Luna-Lucero (2016) found that exposing students to stories of struggle among famous scientists increased science learning. Within their experiment, students were exposed to one of three types of stories: stories about intellectual struggle, stories about personal struggle, or stories about making great scientific discoveries. Students who were exposed to either the intellectual or the personal struggle stories showed increased performance compared to students within the control group. Students who read about the great scientific discoveries did not increase their performance. The effects were even greater among students who were labeled as low-performing. The incorporation of these stories of struggle helped break the myth that being successful in a subject comes naturally, easily, and quickly to a select few. These stories

highlighted that famous scientists, while on the path to successful scientific discovery, struggle and make mistakes from which they learn and grow. The use of struggle stories can be another way to create a classroom culture that values confusion and mistakes.

In the second part of our response, we focus on adding a right to those originally developed by Olga Torres.

### Extending the Rights Framework

In proposing the importance of the Rights of Learners framework, Kalinec-Craig (2017) raised the issue of assessment—in particular, the role of formative assessment—in pursuing equitable classrooms. We are in complete agreement that the ways in which students are assessed play a large part in both the type of classroom environment that is developed and the possibilities for equitable outcomes. In proposing that formative assessment is important, Kalinec-Craig outlined some ways in which teachers may assess formatively—by, for example, looking at student work as evidence of student learning—but we feel that a more fundamental consideration of formative assessment is helpful when considering the rights of students.

When Black and Wiliam (1998) conducted a meta-analysis of hundreds of research studies on assessment, they discovered something important. They found that if teachers changed their assessment practices—replacing summative with formative assessment—the impact would be so great that it would raise the achievement of a country in international studies from the middle of the pack to a place in the top five. The difference between formative and summative assessment is that formative assessment informs learning whereas summative assessment summarizes a student's learning, to give a final account of where a student has reached, as an end point. One of the problems in the United States is teachers use summative assessment formatively—that is, they give student's scores or grades, which summarize their learning, when students are in the middle of the learning processes. In mathematics classrooms, particularly in higher levels, the teachers often use summative tests weekly and grade even more frequently. One problem with the frequent use of summative assessment is that students feel they are performing in contrast to learning. In Boaler (2017), one high-achieving student described the feeling of being on a “hamster wheel,” and even though she was a high-achieving student, she did not enjoy her learning because of the constant pressure she was under—to perform. Formative assessment, particularly after the publication of the Black and Wiliam (1998) review, came to be called “assessment for learning” (A4L), as the point of the assessment is less to summarize a student's performance and instead to promote their learning. We propose that changing assessment practices, from a system that weights a student's performance on frequent high-stakes summative assessments to a continual formative assessment practice that provides frequent feedback to students, will help increase equity within schools (see also Boaler, Dance, & Woodbury, 2018).

Assessment for learning includes a range of strategies that can be used for formative assessment, such as reading students' writing, as Kalinec-Craig (2017) recommended. But the different frameworks can miss the point if they do not change something

extremely important in the assessment process: the locus of responsibility. The central tenet of assessment for learning is that students should learn three things: where they are now, where they need to be, and ways to close the gap between the two places (Black & Wiliam, 1998). Grades do not communicate any of these important understandings. When students receive a grade or a test score, it does not tell them what they know and don't know, it does not help students know how to learn more effectively, and it does not give them an idea of what they need to learn. A grade or test score simply communicates to students where they are in relation to other students. This is known as “ego feedback,” a form of feedback that has been found to be damaging for learning (Butler, 1988). This leads us to suggest a new Right of the Learner, to supplement the important ones that Torres has put forward. The right we suggest could prompt student self-awareness and different teaching strategies that support it and gets to the heart of assessment for learning: the right to know where I am in my learning, where I should be, and ways to close the gap.

One of the most important principles of A4L is that it teaches students responsibility for their own learning. At its core, A4L is about empowering students to become autonomous learners who can self-regulate, know what they most need to learn, and know ways to improve their learning. The approach is called assessment *for* learning rather than assessment *of* learning because it promotes learning, and the information teachers and students get from A4L helps teachers make their instruction more effective and helps students learn to the greatest extent possible. Teachers who use A4L spend less time telling students their achievement and more time empowering students to take control of their learning pathways. A teacher Boaler worked with in England who shifted to A4L practices reflected that it: “made me focus less on myself but more on the children”—he developed confidence as a teacher to empower his students to take their own learning forward.

While A4L in the United Kingdom, its country of origin, is focused on ways of shifting responsibility to learners and creating self-aware students, we have found that A4L is more often presented in the United States as a set of strategies that do not include the central principle of shifting responsibility (Boaler, 2015). Kalinec-Craig (2017) promoted using “snapshots” of students' work to assess formatively, and we agree that this is an important approach for teachers that will bring important changes in classrooms, but it falls short of the responsibility and awareness change that we believe to be critically important.

As the approach of A4L is to give students awareness of where they are in their learning, where they need to be, and how to close the gap, two important strategies are the use of teacher diagnostic comments and student self-assessment. When teachers give diagnostic comments, they provide valuable expertise about and insight into the ways students may improve their work. The feedback is more than just “correct” or “wrong”—it highlights ways students can build on their current understandings. Comments can be specific for individual parts of an assignment or broad comments to address conceptual issues; either way, students are receiving an explicit feedback to help them close the gap in understanding and improve. Studies of teachers who have replaced

grading with diagnostic comments show a clear impact on achievement. Elawar and Corno (1985), for example, contrasted the ways teachers responded to math homework in sixth grade, with half of the students receiving grades and the other half receiving diagnostic comments without a grade. The students receiving comments learned twice as fast as the control group, the achievement gap between male and female students disappeared, and student attitudes improved. Further examples and research evidence are given in Boaler et al. (2018).

Butler also contrasted students who were given grades for classwork with those who were given diagnostic feedback and no grades (Butler, 1987, 1988). Similar to the students in the studies of Corno and Elawar (1985), the students who received diagnostic comments achieved at significantly higher levels. What was fascinating in Butler's studies was that she then added a third condition, which gave students grades and comments—as this could be thought of as the best of both worlds. This showed that the students who received grades only and those who received grades and comments scored equally badly, and the group that achieved at significantly higher levels was the comment-only group—when students received a grade and a comment, they only cared about and focused upon the grade. Butler found that both high-achieving (the top 25% GPA) and low-achieving (the bottom 25% GPA) fifth- and sixth-graders suffered deficits in performance and motivation in both graded conditions, compared with the students who received diagnostic comments.

Pulfrey, Buchs, and Butera (2011) followed up on Butler's study, replicating her finding—showing again that students who received grades as well as students who received grades and comments both underperformed and developed less motivation than students who received only comments. They also found that students only needed *to think* they were working for a grade to lose motivation, resulting in lower levels of achievement.

The move from grades to diagnostic comments is an important one and is a move that allows teachers to give students an amazing gift—the gift of their knowledge and insights about ways to improve. Teachers, quite rightly, worry about the extra time this can take, as good teachers already work well beyond the hours they are paid for. We recommend that teachers assess less—if teachers replaced grading weekly with diagnostic comments given occasionally, they could spend the same amount of time, remove the fixed-mindset messages of a grade, and provide students with insights that would propel them on to more positive learning pathways.

Studies have also shown the importance of student self-reflection and its link to equitable outcomes. In one important study conducted by White and Frederiksen (1998), the researchers studied twelve classes of seventh-grade students learning physics. The researchers divided the students into experimental and control groups. All groups were taught a unit on force and motion. The control groups then spent some of each lesson discussing the work, whereas the experimental groups spent some of each lesson engaging in self- and peer assessment, considering criteria for the science they were learning. The results of the study were dramatic. The experimental groups outperformed the control groups on

three different assessments. The previously low-achieving students made the greatest gains. After they spent time considering the science criteria and assessing themselves against them, they began to achieve at the same levels as the highest achievers. The middle school students even scored at higher levels than AP physics students on tests of high school physics. The researchers concluded that a large part of the students' previous low achievement came not from the fact that they lacked ability but that they had not previously known what they should really be focusing upon.

The White and Frederiksen (1998) study is important in showing the link between students understanding what is valued in classrooms and reflecting upon criteria and the reduction in achievement gaps between students. Their conclusion—that students often underachieve because they do not know what they are meant to be focusing on—is an important one for teachers working to promote equity.

More information on ways to integrate assessment for learning teaching practices into classrooms is given in Boaler (2016) and Boaler et al. (2018).

## Conclusion

The Rights of the Learner is an important framework for teachers who are promoting positive environments, and we believe that it can help other teachers and students immeasurably. Kalinec-Craig's (2017) initial interpretation and our refinement help build a better understanding of what teachers can do to provide students time, space, and knowledge to learn and grow. With a focus on assessment for learning, we introduced a sixth right. The right would support student self-awareness and teaching strategies to support it, which originate from the heart of assessment for learning. Our proposed sixth right, "the right to know where I am in my learning, where I should be, and ways to close the gap," puts the students at the center of their learning where there are no longer mysteries in their learning process. Along with the addition of a right to the framework, we also propose to expand the understanding of the right to be confused and the right to make mistakes, using evidence from neuroscience. The neuroscientific evidence we add reveals the importance of mistakes, struggle, and growth-mindset messaging and has been transformative for students we have worked with. It is our hope that teachers will find the framework and our addition useful in debunking the myths of selective mathematics ability. As the myth of the "math person" dissolves, teachers will find it more possible to unleash students' potential. In addition, the Rights of the Learner framework can help teachers to value students where they are and provide assessment strategies that prompt the self-awareness and responsibility that will guide and encourage students towards more enriched and fulfilling mathematical journeys. We applaud both Kalinec-Craig (2017) and Torres in bringing to the field a greater awareness of effective teaching strategies and the ways they may be supported by a framework for teachers and students and hope that our suggestions for improvements are generative in their important quest to share good practice.

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