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# Broadening the Concept of 'Just What They Need' in Mathematics Education

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## Broadening the Concept of “Just What They Need” in Mathematics Education

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Debates about the high school mathematics curriculum are ongoing. There is a push to make the curriculum more rigorous for more students, amidst complaints that the curriculum is not interesting or relevant. This debate overlaps with that of the push for more liberal arts versus the call for more career-specific curricula. The lines between these positions are not clearly-defined, sometimes sharing goals but differing in approach (or vice-versa). In previous work I have analyzed the proposal of Paul Ernest, who argues that democratic principles require a differentiated high school mathematics curriculum based on student choice and career goals, with a common core based on mathematics appreciation and critical social awareness. In my analysis, I argue that Ernest’s democratic aims for this curriculum are threatened by mathematical elitism and social power structures.<sup>1</sup> In *The Challenge to Care in Schools*, Nel Noddings also calls for a differentiated curriculum, but one that de-emphasizes currently privileged mathematical disciplines. Both Ernest and Noddings argue that students should not all be required to complete the traditional high school mathematics sequence. They agree that this compulsory curriculum can be both irrelevant and demoralizing for students who are not mathematically inclined. However, where Ernest envisions a curriculum designed around the “big ideas” of mathematics and its place in human culture, Noddings suggests that mathematics be embedded in other courses where it is directly relevant to a student’s abilities and interests. The lines between Ernest’s and Noddings’ views are blurred in many ways, but their curricular recommendations illustrate two sides of a fairly contentious debate: should mathematics education incorporate a liberal arts element to expose students to the intrinsic beauty and power of mathematics, or should it be streamlined to include “just what students need”? Noddings’

care theory provides a framework to deepen my critique of Ernest's differentiated mathematics curriculum, offering a more nurturing approach that redefines students needs and the role of liberal arts.

### Mathematics Appreciation

While Ernest argues that students in secondary school should be given a choice about whether to continue their mathematics education, he hopes that all students will encounter a core curriculum that emphasizes mathematics appreciation and critical mathematical awareness. Ernest believes that most specialized mathematics skills needed for non-mathematics careers are better taught in context, by people in each field.<sup>2</sup> This means that mathematics courses can focus less on these computational skills, leaving room for more interesting topics. Ernest proposes that mathematics instead be presented in a more liberal arts fashion, emphasizing its beauty and power as an integral part of human culture.<sup>3</sup> As I argue elsewhere, this core curriculum reveals a mathematical elitism that emphasizes the ubiquity of mathematics. Noddings, concerned about this type of elitism, calls us to eliminate the social hierarchy that elevates mathematical ability above other skills and talents.

Noddings' recommendations for secondary mathematics education are embedded in a larger framework of care theory. She argues that first and foremost, the goal of schooling "should be to promote the growth of students as healthy, competent, moral people."<sup>4</sup> Intellectual development, while important, comes second. She sees it as the duty of educators to support all students in their endeavors, regardless of their talents and career goals. One of her concerns with a liberal education model is that this "hegemony of the disciplines"<sup>5</sup> nurtures only a small set of very particular talents, leaving out a wide range of human capacities. Not only does this fail to serve students with other interests, such as the performing arts, but it has created an educational

system that marginalizes students who are not college-bound. In order to support all students, she calls for schools that are committed “to care for children so that they, too, will be prepared to care.”<sup>6</sup> Noddings envisions an entire school curriculum built around interdisciplinary themes of care: for the self and for others, for animals and the natural world, for the human-made world, and for the world of ideas. Intertwined with these themes are values such as self-care, global citizenship, conservation and stewardship, and respect for learning.<sup>7</sup> Noddings believes that part of our responsibility is to give all students an opportunity to study something they can become passionate about. For some, this may be practical-oriented areas, and for others it may be the traditional disciplines. All paths should be valued equally.

Within a care-centered curriculum, Noddings envisions rich, interesting mathematics courses for students who are passionate about the subject. For all other students, she believes that mathematics should be taught within the context of their areas of interest, by people who use it in those fields.<sup>8</sup> Ernest agrees with Noddings on this point, but there is a tension between that belief and his desire to have all students exposed to his liberal arts mathematics curriculum. He argues that the need for abstract, “academic” mathematics has been overstated, and that most people do not need this type of mathematical understanding.<sup>9</sup> On the other hand, he believes that all students would benefit from a mathematics curriculum that immerses them in its powerful ideas. In Noddings’ view, this would provide a much-needed, enjoyable mathematical experience for students who are intrigued by such explorations.<sup>10</sup> However, it would be an exercise in drudgery for those who are not. Noddings seems to suggest that if a liberal arts education is meant to awaken students’ interests in a variety of subjects, requiring these subjects may do the opposite.

Another common argument for the liberal arts is that a well-rounded, educated person should have certain core disciplinary knowledge. Noddings has deep concerns about a liberal arts curriculum that holds up mathematics and other disciplines as all-important. She is concerned that the traditional liberal arts curriculum is outdated, based on an ideal of the educated man that reinforces domination through social class and gender roles.<sup>11</sup> It also privileges certain academic areas, leaving out many other capacities and talents that children may have.<sup>12</sup> Who are we to define for a student which subjects are necessary to be a whole person, or to have a fulfilling life? Noddings calls for an overturn of this hierarchy of privileged status, and for teachers in the disciplines to stop insisting that such studies are relevant and crucial for all students. She summarizes her sentiments:

If it also adds to my spiritual and emotional life, if it somehow serves to integrate my life and make me more nearly whole, then I am fortunate indeed. But to achieve and accept such blessings, I do not have to claim that all people will be similarly blessed by touching the hem of my garment or struggling with the elements of my beloved discipline.<sup>13</sup>

Instead, Noddings hopes that each student will find their own area of study to be passionate about and explore at depth. Whether that area is mathematics or not, the student's interests should be nurtured through a meaningful, enriching curriculum.

Proponents of liberal arts often argue against a vision of career-specific education that eliminates the traditional disciplines, but this is not what Noddings wants. Instead, Noddings seems to envision the education of well-rounded specialists. If a student is studying to be an architect or a carpenter, help them to be a well-rounded architect or carpenter. Humans search for meaning and connections. They want to understand how information relates to other things in which they are interested. Does it not make sense, then, to teach mathematics in a way that is meaningful and relevant to a student's interests and goals? Where Ernest seems to give this lip service, Noddings seems to truly incorporate it into her educational vision.

## Democratic Citizenship

The ideal of the well-rounded, educated person often includes a description of the common knowledge needed to operate in a democracy.<sup>14</sup> Ernest and Noddings both have a vision of a well-rounded democratic citizen who can contribute to and participate fully in democratic society. However, they differ in the ways in which they envision this education and the obligations of the educational system.

Ernest describes his philosophy as based in the general aims of democracy and social equity, to be achieved through the development of critical thinking. The goal is not just to create citizens who can participate in a democratic society, but to empower learners and encourage autonomy.<sup>15</sup> Thus Ernest calls for a mathematics curriculum that fosters critical democratic citizenship. He believes that students need to become empowered, autonomous citizens who examine sociopolitical contexts and work for change. They must develop the awareness and ability to think critically about mathematics in society. Democratic citizens should feel empowered to question and critique the “mathematical underpinnings of crucial social and political decision-making” and advertising.<sup>16</sup> To help foster this independent thinking, Ernest encourages teachers to use a social constructivist pedagogy in which students pose and investigate relevant mathematical questions in social context.

Ernest and Noddings agree on the importance of empowerment. Noddings believes that students should learn to be more politically-minded, and praises Freirian programs that encourage students to generate their own topics of study around social issues.<sup>17</sup> But Ernest sees a democratic citizen as a mathematically literate citizen, portraying mathematics as the key to critical awareness and social empowerment: “Once mathematics becomes a ‘thinking tool’ for viewing the world critically, it will be contributing to both the political and social empowerment

of the learner, and hopefully to the promotion of social justice and a better life for all.”<sup>18</sup> His vision does seem to coincide with that of Noddings in some ways: students generate topics to investigate, analyzing and critiquing mathematical contexts in society. But Noddings would ask, why is mathematics class so special that this can only be achieved there? Instead, care theory integrates these themes throughout the curriculum. The abuse of statistics and its impact on social groups can easily be studied in a course on sociology or social history. Mathematics students should, indeed, have these conversations in the classroom, but students do not need to rely on the mathematics teacher to help them overcome the oppressive uses of mathematics in society.

Noddings argues that there are more important aspects to a democratic education than a survey of particular subjects. For her, a well-rounded democratic citizen is one who is able to function in society. This means being able to reason, assess, and argue a point. But it also requires attention to interpersonal skills, like “living together nonviolently and supportively even in the face of disagreement.”<sup>19</sup> It is not about the facts we know, but how we interact with each other. Students must learn to treat others fairly, compromise, and consider how their actions impact others. This requires civil communication:

Democracy is not the outcome of a common set of words and customs. Rather, it is an achievement—one that depends on the desire to communicate and the goodwill to persist in collaborative inquiry. Common language, customs, and values are the marks of achievement in the effort at building a democracy, not its prerequisites.<sup>20</sup>

Again, Noddings agrees with Ernest on a fundamental level, but turns the argument toward a care-oriented approach. Using her framework, we would still focus on empowering students to be active democratic citizens. We would also still expose students to academic and social materials that reveal bias and domination. But rather than empowering victims to rise up against

an adversary, a care approach would encourage students to openly discuss these issues and work together to find solutions and effect change.

### Obligations and Needs

While Ernest and Noddings both argue against requiring the traditional mathematics curriculum, they disagree on what they hope for instead. Ernest wants students to take enriching mathematics courses, while Noddings hopes they will take enriching courses in their own area of interest. As we dig deeper, we find more significant differences between their perspectives. These differentiations illustrate an underlying difference in how they conceive of our obligations to students and their curricular needs.

The perspectives of Ernest and Noddings reveal two very different sets of assumptions about the obligations of the educational system in a democratic society. Where Ernest comes at the issue from the perspective of our democratic obligations to students, Noddings views it in terms of our moral obligations. Ernest believes that in a democracy, students are entitled to relevant, meaningful mathematical experiences that foster critical citizenship. Noddings feels that morally, we must provide students with “educational opportunities that credit and enhance their talents.”<sup>21</sup> Students with a passionate interest in disciplines such as mathematics should be engaged in study to nurture that interest, while other students should be allowed to apply their time and efforts elsewhere. Those who are not good at mathematics should not have to take it, and should not be judged inferior because of it. Where Ernest seems to believe that students should have the freedom to choose, regardless of what that choice may be, Noddings wants to help students make choices that will be nurturing and fulfilling.

One might argue that students should be taught not to run from a challenge, to embrace subjects that do not come easily and to learn to persevere. A common concern is that students



will shortchange themselves, choosing to avoid mathematics courses in favor of something easier. In this current climate that sees math as the path to success, it is feared that students will close doors to future opportunities. Ernest would assert that in a democracy, students must be allowed to make that choice. Noddings argues that the educational system should open numerous opportunities for every set of talents, eliminating the hierarchy that values math-related careers over all others.<sup>22</sup> She believes that students will choose rigorous and challenging programs if they are made to feel that their interests are valuable.<sup>23</sup> If all programs were rigorous and valuable, then every path would open doors rather than close them. Only then will the democratic obligations of the educational system be fulfilled.

In addition to changing the view of our obligations, Noddings' care theory also brings a change to the conversation about what students need. Her framework leads to a broader definition that addresses both curricular and developmental aspects missing in Ernest's proposal. In terms of school curriculum, Noddings' framework encourages us to redefine what it means to teach students "just what they need." This phrase is often criticized as proposing a watered-down version of liberal arts courses designed to only include those topics relevant to certain careers. In an apparent attempt to improve on this, Ernest suggests that career-relevant skills be taught within the career program, leaving courses in mathematics to discuss topics of general interest. Unfortunately, these topics will not be as interesting to many students as they are to the teacher. Instead, Noddings suggests that we encourage students to choose other courses that they find interesting. In this way, she pushes us to expand the definition of "what they need" to include rigorous coursework in their field, as well as courses that fuel the soul. Her call for challenging programs that provide many different options indicates that what students need for their career path is an enriching, broad curriculum. Nothing need be watered-down; students are

just trading one challenging course for another. By encouraging them to take electives they find interesting, we expand their horizons and nurture their intellectual curiosity. We need not outline exactly what those electives must be. In fact, I would add that in this information age, knowledge is growing at such an exponential rate that it is impractical to define one set of courses for all students. There is so much out there to learn about, that it would be better to allow students to diversify from each other. Allow them to specialize and learn one area well, while choosing elective courses that complement that work and broaden their studies.

A care theory framework also helps us to critique Ernest's lack of attention to students' developmental needs. Ernest bases his curriculum recommendations on the general democratic principles of equity, diversity, social empowerment, and social justice. His view is combative in a sense—we must teach students to value diversity so they will fight for equity, and we must promote their social empowerment so they will fight for social justice. In terms of the developmental needs of students, he focuses on the confidence and skills they will need to fight for this equity in their adult lives. Noddings would agree with the importance of Ernest's principles, but her support comes from what she sees as the more feminine perspective of nurture and care. She strives for equity, diversity, and empowerment by making students feel valued and cared for, so that they will grow to be citizens who value and care for others. Where Ernest focuses on empowering the disenfranchised, Noddings encourages us to fight oppression by educating both sides, employing a pedagogy of the oppressed alongside a pedagogy of the oppressor.<sup>24</sup> Through caring conversations about issues of social justice, all students should be taught to value themselves and care for others.

Ernest seems to define student needs very narrowly: curricular needs include only those courses that specifically pertain to a chosen career path, supplemented with a liberal arts

mathematics course. Developmental needs focus only on social empowerment. Care theory allows us to develop a richer definition of what students need that includes preparation for a meaningful career, stimulation of intellectual curiosity, and experiences that make them feel valued and cared for. Ernest intends for his differentiated mathematics curriculum to provide empowering opportunities for students who do not need the traditional mathematics curriculum. However, his focus on democratic empowerment and the tacit elitism in his perspective fail to consider the needs and voices of individual students with particular interests. Ernest's framework is based in the desire to promote social justice by empowering a portion of the population without mathematical privilege, but it forgets the needs of the individuals. Noddings reminds us that in order to be empowered, students need to experience care. Mathematics teachers should show students that they find their interests to be worthwhile, regardless of what area those interests are in. "They must be *educators* first and mathematics teachers second."<sup>25</sup>

Ernest's goals are important ones: to make the mathematics curriculum more relevant, interesting, and empowering. But the lens of care theory asserts that we cannot fulfill our democratic obligation to empower students while ignoring our moral obligation to care about students and their well-being. Fostering social justice and the development of critically literate democratic citizens is imperative, but our consideration of these things should include the values and needs of the students themselves. A care theory perspective provides a way to foster discussion of social issues while supporting individual student voices and being flexible to changing educational needs. In this way, teachers can encourage students to pursue the liberal arts by developing passion, curiosity, and a desire for lifelong learning.

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<sup>1</sup> Erin Wilding-Martin, "Is Democratic Mathematics Tracking Possible? Paul Ernest's Differentiated Curriculum," in *Philosophy of Education 2011*, ed. Robert Kunzman (Urbana, IL: Philosophy of Education Society, 2011).

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<sup>2</sup> Paul Ernest, "Why Teach Mathematics?" in *Why Learn Maths?* ed. Steve Bramall and John White (London: Institute of Education, University of London, 2000), 3.

<sup>3</sup> Ibid.

<sup>4</sup> Nel Noddings, *The Challenge to Care in Schools: An Alternative Approach to Education*, 2nd ed. (New York: Teacher's College Press, 2005), 10.

<sup>5</sup> Ibid., 150.

<sup>6</sup> Ibid., 64.

<sup>7</sup> Ibid., 59.

<sup>8</sup> Ibid., 151.

<sup>9</sup> Ernest, "Why Teach Mathematics?" 3-5.

<sup>10</sup> Noddings, *Challenge to Care*, 60.

<sup>11</sup> Ibid., 33 and 37.

<sup>12</sup> Ibid., 31.

<sup>13</sup> Ibid., 38.

<sup>14</sup> See E. D. Hirsch, Jr., *Cultural Literacy: What Every American Needs to Know* (New York: Random House, 1988).

<sup>15</sup> Paul Ernest, *The Philosophy of Mathematics Education* (London: Falmer Press, 1991), 206.

<sup>16</sup> Paul Ernest, "Empowerment in Mathematics Education," *Philosophy of Mathematics Education Journal*, no. 15 (2002), under "Social Empowerment," <http://www.people.ex.ac.uk/PErnest/pome15/empowerment.htm>.

<sup>17</sup> Noddings, *Challenge to Care*, 137.

<sup>18</sup> Ernest, "Empowerment in Mathematics Education," under "Social Empowerment."

<sup>19</sup> Noddings, *Challenge to Care*, 101.

<sup>20</sup> Ibid., 164.

<sup>21</sup> Ibid., 29.

<sup>22</sup> Ibid., 72.

<sup>23</sup> Ibid., 153.

<sup>24</sup> Ibid., 137.

<sup>25</sup> Ibid., 69.