

Role Modeling in Mathematics: The Case of Leonard Eugene Dickson (1874 – 1954)



Leonard Eugene Dickson was born on January 22, 1874, in Independence, Iowa to Campbell and Lucky Tracy Dickson. After a lifetime of mathematical contributions, Dickson died on January 17, 1954, in Harlingen, Texas.

Dickson attended public schools in his hometown for his early education and attended the University of Texas for his undergraduate and masters degrees. He then chose the University of Chicago (over Harvard) as the place for his doctorate studies. Dickson began his studies in 1894 and wrote his dissertation on group theory under E.H. Moore. He studied under Sophus Lie and Camille Jordan. Later he wrote *Linear Groups with an Exposition of the Galois Theory*, which was an expansion of his dissertation. In 1900, Dickson returned to Chicago and became a professor. His research included work in group theory, invariant theory, finite field theory, and algebra theory.

During his forty-year career at Chicago, Dickson published eighteen books, close to three-hundred research articles, served as an editor of the *American Journal of Mathematics* and the *Transactions of the AMS*, and also served as president of the AMS. Clearly, with his range of influence, Dickson was able to promulgate his ideals of rigorous mathematics.

Another way in which Dickson left his legacy was through his students. “He frequently assigned readings from a textbook (often one of his own), and he either called on students to present and analyze the material, or he lectured the entire hour [1, p. 13].” His demeanor in the classroom was somewhat harsh, but this encouraged students to always do well and work hard. Dickson was far from what one might call a “mentor”, but he “did successfully serve as a role model as he imparted algebra and number theory to the next generation of American mathematicians [1, p. 14].”

Dickson advised sixty-seven Ph. D students at Chicago, eighteen of which were women. These women were over 8% of all women who had received a Ph.D. in mathematics between 1900 and 1939 in America. In contrast, the other principal adviser of mathematics Ph.D.’s at Chicago only oversaw forty-six doctoral students. Dickson’s students spread his doctrine to forty-five academic institutions in twenty-two states and three foreign countries. Several of his students that had key influences in mathematics research include Olive Hazlett, Mayme Logsdon, Mina Rees, and A.A. Albert. Their contributions are outlined in the following sections.

OLIVE HAZLETT (Ph.D. 1915)

- Studied nilpotent algebras, division algebras, and modular invariants
- Presented an extension of Dickson’s arithmetic of rational algebras to algebras over an arbitrary field at the 1924 International Congress of Mathematicians in Toronto (Dickson presented the same topic at the congress).
- Wrote more papers than any other pre-1940 American woman mathematician
- Cooperating editor of the *Transactions of the American Mathematical Society* for 12 years

- Served on the AMS Council
- Starred in *American Men of Science*

MAYME LOGSDON (Ph.D. 1921)

- Served on University of Chicago faculty for 25 years.
- Studied and researched algebraic geometry in Italy (1925-1926).
- Oversaw work of four Ph. D. students

MINA REES (Ph.D. 1931)

- Shared Dickson's vision of American mathematics
- Secured federal funds for the field of mathematics
- Recognized importance of computers
- Addressed the need for a change in mathematics education

A.A. ALBERT (a.k.a. "A-cubed") (Ph.D. 1928)

- In his dissertation entitled "Algebras and Their Radicals, and Division Algebras" he "determined all 2-, 3-, and 4-dimensional associative algebras over a non-modular field...[and] proved that every central division algebra of dimension 16 is not necessarily cyclic but is always a crossed product [1, p. 17]."
- Introduced the American school of non-associative algebras
- Chaired the mathematics department and served as the dean of the Division of Physical Sciences at University of Chicago.
- Editor of the *Bulletin* and *Transactions*
- Served as AMS president (1965-1966)
- Helped in launching government research grants for mathematics, helped set the National Science Foundation budget for mathematics and summer research programs
- Advised 30 Ph. D. students at Chicago
- Served as a "mentor" and a "role-model" for his students

As is evident from the outline of his students' successes, Dickson's role modeling greatly affected the development of American mathematics. "The processes of mentoring and role modeling...proved to be among the more successful avenues for the advancement of mathematics in the United States [1, p. 8]."

Sources:

1. Della D. Fenster, Role modeling in mathematics: The case of Leonard Eugene Dickson (1874-1954), *Historia Mathematica* **24** (1997), 7-24.
2. Leonard Eugene Dickson:
<http://www-gap.dcs.st-and.ac.uk/~history/Mathematicians/Dickson.html>

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