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## Frank Klassner Receives NSF Grant

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Dr. Frank Klassner was awarded a \$490,000 grant from the National Science Foundation (NSF) to direct a three-year study of LEGO MindStorms' efficacy in computing curricula across the country. This project represents a significant extension of the work begun under a \$73,000 proof-of-concept grant awarded by NSF in 2001.

The LEGO Mindstorms robotic system allows a student to use traditional LEGO bricks and additional components to construct a working robot. The core element is a programmable CPU in a centralized brick around which the rest of the robot is constructed. Other components include sensors for detecting obstacles and color, and gears for turning treads and moving robotic arms.



The goal of the project is to find effective ways to incorporate the use of LEGO Mindstorms robots throughout a higher education computing curricula. The LEGO systems were originally designed for use in middle and high schools. Dr. Klassner and his colleagues are modifying the programming of the robots to address advanced computing problem areas, and testing the use of the robots in various classes.



As part of the project, Villanova computer science undergraduate and graduate students create new MindStorms software packages as well as new hardware components. The software is developed in Java, C/C++, and Common Lisp.

Dr. Klassner has been using LEGO robots in the department's Artificial Intelligence class (**CSC 4500**) for several years. The students learn basic robotic concepts and build their own robots to demonstrate those concepts. The course usually includes a contest toward the end of the semester in which students' robots are pitted against each other to capture colored ping pong balls and defend their home base.

Part of the project mandate is to incorporate advanced graduate level research in areas such as navigation, real time systems, and wireless networking.

In addition to the development effort, the project supports faculty training. Faculty from across the country will participate in four-day training seminars at Villanova and collaborating institutions to learn how to use the MindStorms system to enhance computing education. Villanova will be collaborating with faculty members at the [University of Mississippi](#) and [Alma College](#) in Michigan.