

# **ColoradoFIRST Robotics Competition and Organizational Impact Evaluation**

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## **Summary**

In 2011, ColoradoFIRST partnered with the University of Denver to conduct an exploratory needs assessment of the FIRST Robotics Competition. The goal was to consider and address the following questions:

- *What is the impact of the ColoradoFIRST Robotics Competition (FRC) on program participants in terms of academics and career trajectories?*
- *What can we learn about the implementation of ColoradoFIRST in schools, both in terms of better understanding program impact and identifying “best practices”?*
- *What kinds of impact has participation in ColoradoFIRST had on participating schools and partnering organizations?*
- *What are the strengths and potential improvement opportunities that are presented and what is the impact to participating students?*

An additional goal of this study was to understand the involvement of low income and minority students from the participating schools. One of the goals of FIRST has been to expand the involvement of low income and minority youth in *FRC*, and the needs-based assessment was seen as an opportunity to determine if this program goal was being fulfilled and to what extent.

To address these questions, the University of Denver conducted a survey-based and action research study during the Colorado *FRC* in April 2011. 202 unique responses were recorded in the survey and 3,672 unique data points were collected. Key demographics identified were gender, race, ethnicity, and participant role.

The purpose of this report is to convey the final results from the study. It should be noted that all questions were not answered by all participants who completed the survey.

## **Findings**

Findings from the study include the following:

- Of the 202 unique responses, 98% of the respondents indicated that “yes” they intended to attend college and of those planning to attend college, 43% indicated an interest in studying engineering as a college major. 9% declared an interest in computer science, and 8% were undecided but had an interest in the science or math field.

- The mean age of all participants was 20.09 with a median age of 15. Approximately, 65% of those who provided an age in their response fell between the ages of 12 and 18 with the largest age range being 12 (12.2%) and 13 (11.5%).
- Males represented 75% and females represented 25% of the total participants. 6.4% of the survey participants did not provide a gender in their response. Action research interviews with participants indicated for female participants, the presence of a female team leader was influential on their feelings of belongingness to the team.
- Whites (44%) were more represented compared to all other races.

### **Participant Assessment of Colorado*FIRST***

Based on the survey responses and the action research interviews, Colorado*FIRST* provided a positive experience that gave participants an opportunity to be involved in a challenging team activity, build relationships, learn new skills, and gain a new understanding of an interest in science, technology, engineering, or math.

- Most of the participants reported a positive impact their attitudes towards teamwork, interest in science and technology, and how they saw themselves. Participants reported:
  - Ninety-four percent of the respondents felt Colorado*FIRST* contributed significantly to their improved understanding of how math, science, and technology are used to solve real-world problems.
  - Ninety percent of the respondents felt Colorado*FIRST* increased their self-confidence.
  - Ninety percent of the respondents expressed that their participation in Colorado*FIRST* increased their interest in science and technology.
  - Eighty-nine percent of the respondents felt that their participation in Colorado*FIRST* helped them understand the role of “gracious professionalism” in everyday life.
- Colorado*FIRST* also helped increase participants’ interest in serving others: 82% of the respondents reported that, as a result of Colorado*FIRST*, they wanted to help younger students learn about math and science; 60% reported that they had become more active in their community.
  - More than 90% reported learning important communication skills, such as how to listen and respond to other people’s suggestions (95%) how to talk with people to get information (97%). Fifty-eight percent reported learning how to make a presentation in front of people they did not know.

- Students learned teamwork and interpersonal skills. Ninety-three percent reported learning how to get along with other students, co-workers, teachers and supervisors; 91% learned to work within the rules of a new organization or team; 92% reported learning new ways of thinking and acting from others; and 85% learned ways to stop or decrease conflicts between people.
- Students learned problem-solving and time management skills: how to solve unexpected problems (98%); how to manage their time under pressure (86%); how to weigh issues and options before making decisions (96%); and how to gather and analyze information from different sources (89%).
- Students also learned to apply traditional academic skills in a real-world setting: 77% reported learning how to use computers to analyze data, and 76% reported learning about using practical math skills such as using graphs and tables or estimating costs.
- Overall satisfaction with the program was high. Ninety-eight percent of the respondents rated their experience as “good” (24%) or “excellent” (74%).
- Finally, responses to open-ended questions on the survey and answers provided during action research, tended to reinforce these findings. Respondents and participants cited the team experience as particularly influential and cited team skills, new relationships, and an increased focus on science, technology, engineering, and mathematics, increased self-confidence, motivation in school and within the community, among others, as long-term impacts from the program.

### **Recommendations**

The principal findings of this study provide strong support for the continued growth and expansion of the Colorado*FIRST* robotics programs, particularly into communities serving low incoming and minority youth.

Findings also revealed a need for streamlining communications with all participants as well as expanding communications to include the siblings of current participants and Colorado*FIRST* alumni. Parents of participants seek more logistics communications, particularly around parking at the competition.

Recommendations are to continue to document the effectiveness of the program and to build a broader base of evidence for the program’s impacts through two mechanisms: a larger-scale longitudinal study that would allow for more comprehensive analysis of participant impacts, and the development of a participant registration process that would make it easier to keep in touch with Colorado*FIRST* alumni and to track the longer-term career trajectories of former participants.