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Teaching Management Concepts to Engineering Students in a Unique Motorsports Environment

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Teaching Management Concepts to Engineering Students in a Unique Motorsports Environment

Abstract
Indiana University Purdue University Indianapolis has a unique engineering program specializing in training graduates for the motorsports industry. As part of this program, a number of new classes have been designed and implemented. This paper examines the latest of these, in which motorsports engineering students explore motorsports management concepts and lead the way in organizing an entire race series.

Keywords
Race Series, Race Management, Motorsports Engineering

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Introduction

Only recently have universities begun to recognize that motorsports is a specialization worthy of its own educational curriculum (Hylton, 2009) and that it is capable of drawing significant student interest (Teague & Hedrick, 2007). Indiana University Purdue University Indianapolis (IUPUI) is home to the first Motorsports Engineering Bachelor of Science (BS) degree in the United States (Tussing, 2009). As students in an engineering program, one might expect that participants in this specialty would steer clear of business and management related courses. Such is not the case, however, with the students in the IUPUI motorsports engineering program. When the initiative was begun (Hylton, 2007), a motorsports industry advisory board was given the opportunity to review the proposal and the plan of study. In addition to the normal engineering foundational courses, and motorsports specialties such as vehicle dynamics, data acquisition, aerodynamic modeling, and a mandatory motorsports internship, the advisory board insisted on the creation of two classes on the business of motorsports. The logic behind these classes is that no other industry operates with the same pace and pressures as motorsports. From the beginning, students in this program are told that more motorsports teams fail from bad management than from bad race cars, and thus training on the management side of the business was one key to their success (Teague & Hand, 2007).

This summer the students in the motorsports engineering program had a truly unusual opportunity to see motorsports operations from the inside. IUPUI and the United States Auto Club (USAC) partnered to stage an eight event midget racing series at a historic race track on Indianapolis’ near east side. The Bryant Heating and Cooling Systems Indianapolis Speedrome is a one-quarter mile track that has been home to racing since 1941. The Elite 8 Midget Series
was planned as a Wednesday night series throughout the summer featuring midget race cars, like those shown in Figure 1.

Figure 1: Midget race cars are small, single-seat, purpose built, oval-track racecars with very powerful engines generating up to 350 horsepower. (Dwight Brown Photo)

Figure 2: An IUPUI student dons a race-official headset before assuming his position in the pits as a series technical inspector. (IUPUI Media Gallery)

This one-of-a-kind project was configured as an interdisciplinary experimental learning opportunity in which students worked alongside USAC officials and IUPUI faculty to participate in every aspect of the events ranging from pre-season organization and promotion to actual operation of the events. Such experiential learning courses have become a major part of IUPUI’s motorsports curriculum (Hylton, 2008) and outreach (Hylton, 2010). The result has been the construction of several very successful competition vehicles and industry initiatives (“DSR and IUPUI,” 2010) that have led to some impressive research studies (Borme, Hylton, Barber, Lucas & Beard, 2011) and some record-breaking successes (Burgess, 2010).

Course Concept

Students participating in this summer race series began their immersion in motorsports well before the start of the race season. In February, the class was broken into four teams, focused on sponsorship, public relations, race program, and technical details. The Sponsorship Team took on the task of creating a sponsorship kit with the intent of attracting businesses to
partner with the series. Students were urged to reach out to potential new race fans. So in conjunction with the Public Relations (PR) Team, it was decided to also tackle one of the stated goals of the IUPUI motorsports program, which is to add relevancy to the sport of auto racing. Thus, the students reached out to community groups offering to partner on theme nights with organizations such as Gleaners Food Bank for Fight Hunger Night at one race. Other examples were Special Olympics Night, where handicapped athletes were invited to meet the drivers, visit the cars in the pits, and watch the races with their families. On Laps for Literacy Night, any youth signed up for one of the local summer reading programs received free admission and family members received a significant discount. Each of the eight races in the series had a similar theme. The Sponsorship and PR teams then proceeded to promote the series through local media outlets. Meanwhile, during the pre-season, the Tech Team began training to understand the technical aspects of the cars and the Program Team began compiling material for the programs that would be handed out to spectators at the events.

When the race season actually began, students were in charge of compiling the material and producing the event programs each week. Some also served as event officials on both the operational and technical side of things, as shown in Figure 2. Another contingent was assigned to help Toby Alfrey, one of the racers, who not only drives his own car but also makes cars available for rental through the USAC office at all the events. These students served as crew and assisted in preparation of the cars, as shown in Figures 3 and 4. All students served in at least two capacities throughout the series.
Figures 5 and 6 show examples of some of the student designed products. Figure 5 is the cover of the sponsorship kit which was produced by the students. The cover graphics were produced by combining campus and USAC photos to create a distinctive image for the partnership. It included information on all the theme nights and community partners, the history of USAC and the IUPUI motorsports program as well as an explanation of how the two came to partner on this series, an explanation of the cars and drivers competing, the demographics of both participants and spectators, the opportunities for sponsorship and or partnership in the series, and the benefits to potential sponsors and partners. The kit received solid reviews from marketing industry professionals who reviewed its content. Figure 6 shows the cover of the race program which was used for the third and fourth weeks of the series. The cover was a photo (by a student) of the previous week’s feature winner. Inside there was a description of the three different classes of midget cars competing in the series, an explanation of the evening’s events, features on the theme night participating organizations, the current series point standings, a profile on a selected driver, and an article recapping the previous week’s races. As a cost savings, the same program was planned for use in two consecutive weeks, with an
Learning Objectives and Assessment

As with any class, it was necessary to establish the course learning objectives and an assessment of student performance was required. This class was so far outside the realm of the normal classroom experience that determination of appropriate assessments was quite a challenge. The IUPUI Center for Teaching and Learning (CTL) provided assistance in this by supplying funding for faculty to work on the project over the summer and also by assisting with expertise on the creation of assessment tools. The course objectives were defined as indicated in Table 1 and these were linked both to the university’s Principles of Undergraduate Learning (PULs) which are a list of overall objectives for all IUPUI courses, and also to the engineering course standards of the Accreditation Board for Engineering and Technology (ABET), which is
the accrediting agency for engineering and technology collegiate programs. Associated class activities were delineated as indicated in Table 2. Assessments for each of these course learning activities were also established. As an example, the assessment matrix for Learning Activity 1 and Assessments 1a and 1b is given in Table 3. The learning outcomes are assessed using a rubric outlining all the items in which students are to be proficient within their primary (1a) and secondary (1b) assigned roles. Similar rubrics were created for all the learning activities in Table 2. USAC staff and IUPUI faculty completed the rubrics, which determined if students are working at a low, moderate, high, or excellent level, as defined by the rubric. Additionally, a student portfolio or journal was required and the Learning Outcomes listed in Table 4 were applicable to this activity. The Portfolio Rubric shown in Table 5 was used to assess these outcomes.

Table 1: Course Objectives

| A. Demonstrate excellent technical capabilities in motorsports engineering and related fields. |
| B. Apply attributes of responsible citizenship. |
| C. Demonstrate effective oral and written communication skills. |
| D. Recognize and relate the environmental, ethical, diversity, cultural, and contemporary aspects of their work. |
| E. Create collaborative teams and apply skills appropriate to the motorsports industry. |
| F. Demonstrate appropriate business and operational skills relative to the motorsports industry. |

Beyond these student assessments, it was important to determine whether the students added benefit to the series through their participation and whether they gained from their experiential learning opportunity. These parameters were evaluated using a student feedback survey, feedback from the theme night partners, USAC officials and the rental car race team that the students worked on, as well as participants and spectators in the series.
Table 2: Course Learning Activities

1. Students train and work alongside USAC technical inspection staff.
2. Students train and work alongside USAC operations staff and IUPUI faculty.
3. Students train and work alongside USAC car preparation personnel.
4. Students develop communication skills using state of the art tools.
5. Under faculty supervision, students work in teams, assuming responsibilities and distributing work assignments.
6. Under faculty supervision, examine and evaluate staff-customer interactions and assess proper behaviors and approaches.
7. Observe and determine appropriate societal behaviors for those affected by project activities.
8. Faculty work with students individually and collectively to expand communication skills.
9. Students directed to examine and evaluate the societal impacts of the project activity as seen from the inside using multiple perspectives.

Table 3: Assessments 1a and 1b for Learning Activity 1

<table>
<thead>
<tr>
<th>EXCELLENT</th>
<th>HIGH</th>
<th>MODERATE</th>
<th>LOW</th>
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<td>Demonstrate knowledge of all Technical Inspection items and the ability to operate independently in their application.</td>
<td>Demonstrate knowledge of at least the critical, safety related items of Technical Inspection and the ability to operate independently in their application.</td>
<td>Demonstrate knowledge of 50% of all Technical Inspection items and the ability to operate independently in the application of them.</td>
<td>Demonstrate knowledge of less than 50% of all Technical Inspection items and inability to operate independently in their application.</td>
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Table 4: Learning Outcomes Demonstrated in Portfolio/Journal

1. Demonstration of understanding of the objectives of the course overall.
2. Demonstration of understanding of the objectives of specific course activities.
3. Demonstration of execution of specific tasks related to the course.
4. Demonstration of effective teamwork.
5. Demonstration of effective communications (Mechanical)
6. Demonstration of effective communications (Conceptual)
Table 5: Portfolio Assessment Rubric

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<th>Assessment Number</th>
<th>Excellent</th>
<th>High</th>
<th>Medium</th>
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<td>Demonstrate Strong Understanding or Execution</td>
<td>Demonstrate Good Understanding or Execution</td>
<td>Demonstrate Average Understanding or Execution</td>
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Results of Assessments

The evaluations returned by series officials, participants, spectators and faculty all confirmed that the students did add value to the events. Particularly high rankings (virtually all in the “excellent” range as scored by rubrics similar to Table 3 used for all the learning activities in Table 2) were returned relative to the technical assistance given to the rental car race team and relative to the high quality event programs which the students produced for the spectators and participants. “Good” ratings were common in all other learning activities. Across the board, positive student attitude and willingness to work was noted.

Aesthetically, the series was a success. And student feedback indicated that most felt they learned a great deal about the inner workings of a race organization. However, one of the primary measures of success in any sport is the number of spectators who come to watch. Figure 7 charts the attendance at the events in the student-run series relative to the average attendance for the entire series the previous year. As can be seen, the attendance was increased over the previous year at every event except one (and it was on an evening with severe storm warnings.
issued for the area by the National Weather Service) and additionally, the attendance trend was upward for the entire series except for the next to last race (which for scheduling reasons was the only event not run on a Wednesday which probably disrupted the fan attendance pattern).

Figure 7: Weekly attendance at series events, normalized against average attendance from the previous year. Note: Rained out events not included.

Another measure of the success of the program is the reaction of the partners for the theme nights which demonstrates whether or not the objective of adding relevancy to motorsports though community involvement was achieved. Response was extremely positive. As an example, the Gleaners Food Bank Special Events Officer responded, following Fight Hunger Night, by saying “Thank you so much. What a great response for your fight hunger night. Thank you again for thinking of Gleaners Food Bank and making a difference in the community.” On Special Olympics night, a number of the athletes were able to become involved in the races, even waving the green flag under supervision of USAC officials, and participating
in the victory lane presentations, as shown in Figures 8 and 9. The excited reaction of these handicapped athletes was a joy to everyone involved. Clearly, positive community outreach was achieved by the series, which accomplished one of the university’s goals.

![Figure 8: A Special Olympian waves the Green flag for the races under supervision of a USAC official. (Dwight Brown photo)](image1)

![Figure 9: The involvement of Special Olympics athletes added community relevancy to the race series. (Dwight Brown photo)](image2)

**Conclusions**

1. In an industry, such as motorsports, which requires real world experience in order to be effective, unique experiential learning opportunities can be specifically designed using collaboration between the university and industry so as to be highly effective.

2. A dedicated group of students, with sound guidance, can function effectively in a real world environment well beyond the realm of their classroom and textbook learning.

3. Motorsports Engineering students can, and will, operate effectively in the management and operations arena when they see the tasks as strongly connected to their careers.

4. Unusual classes with unique attributes can be effectively designed when faculty, support staff, and industry work together collaboratively.
Acknowledgements

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