

# Research in Service Learning: A Tricky Path but with Potential Windfall

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## Research Technologies in Service Learning

- Service learning has been used to great effect in engineering and technology disciplines
- These disciplines evolve rapidly
- Sometime we need to use research-oriented concepts in developing prototype or other deliverable for the service learning partner (SLP)
- Some characteristics of research-oriented service learning
  - Technologies being used are in development in research labs
  - Mature components for the project from established companies are not available; rather niche companies market the components in small quantities
  - Documentation and support for the components are spotty



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## Potential Pitfalls

- Students may get frustrated at the steep learning curve in learning the research-oriented concept and technology
  - Programming in a new language
  - Understanding the circuit and interfacing requirements for a novel piece of hardware
  - The available products to be used in the projects may be unpredictable
- The SLP may be frustrated by delays in the schedule for delivery
- The faculty members may be frustrated by the lack of concrete and rapid progress despite extended contact hours



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## Then Why Do It?

- The service learning students get a taste of research in an applied context
- The excitement generated by the novelty of the projects helps
  - In retention of the students
  - In firing their excitement in the discipline
  - In their job interviews
- For the SLPs
  - They get a deliverable which is not readily acquired from the marketplace
  - They have a unique competitive advantage at a relatively low or no direct cost
- For the faculty members
  - Helps in broadening the reach of their research
  - Leads to more sustainable involvement with service learning
  - Leverages their research expertise



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## My Experience

- I have been working with a team at EPICS-Purdue
- The team works for the Imagination Station, a local children's museum
- One research-focused project in the team is to embed wireless technology in the exhibits such that the visit patterns to these exhibits can be monitored
- The project has been going on for 3 years with 3-6 undergraduate students in the team each semester
  - These students have had varying levels of prior software and hardware experience
  - None of them had prior exposure to the research technology



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## Story of My Project

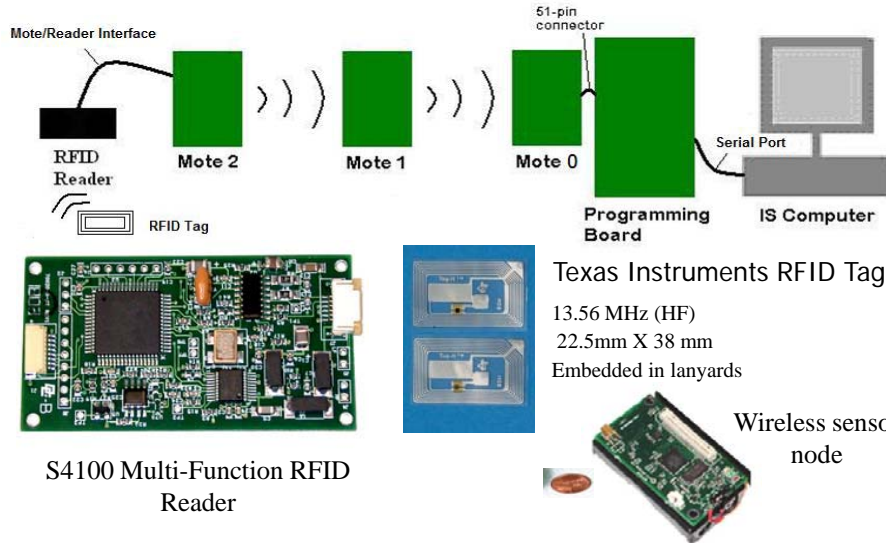
- The technology deploys sensor nodes and radio frequency identification (RFID) readers in the exhibits
  - Monitor them on a continuous basis, make sure they are still working
  - Find out which are most popular
  - Track the effectiveness of existing signage
  - Do not interfere with a visitor's activities while interacting with the exhibit
- The technology has been delivered to the SLP with a sample exhibit instrumented



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## The Gizmos and the Necessary Skills



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## Achievements of the Team



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## Survey for Evaluating Research in Service Learning

- Survey given out at the end of Fall 2007 and Spring 2008
- Students in teams involved in research-oriented service learning projects (experimental group) and those in regular service learning projects (control group)
- Questionnaire asked about the challenges and the advantages felt
- No statistically significant difference found in the level of challenge faced due to resource availability or technical background
- Control group students felt easier dealing with the SLPs



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## Lessons Learned: What Not To Do

- Expectations of rapid delivery of prototype
  - Build slack in deadlines due to unanticipated research roadblocks
  - Have concrete intermediate milestones to show to the SLP
- Let the students loose on the problem without training wheels
  - Do not simply point them to documentation and tutorial
  - Do not expect them to read them and come up to speed
- Take on a project in which you as the faculty member are not super excited about
  - You need to have the appetite for learning new stuff on the project as you go along
  - You need to have patience to try out approaches which will fail



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## Lessons Learned: What To Do

- **Have open discussions with SLP**
  - Are they willing to take the risk
  - What kind of research-based technology would give them the biggest bang for the buck
- **Be invested in the research technology being used**
  - It helps to be aligned with research projects that you are leading
  - Build up your own expertise in the research technology
  - Helps to have trained graduate students or TAs available who can hand-hold the students
- **Documentation and tutorials**
  - Pay attention to documentation and tutorials being created as part of the project
  - These help new students come up to speed without back-breaking re-learning of the research ropes



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## Lessons Learned: What To Do

- **Create a balanced team**
  - Some continuing students along with the fresh students
  - Students with interest in the research technology coming in, which may lead to a passion through the course of the project
  - Some leaders and some workers
- **Pay attention to the budget**
  - Carefully chalk out the expenses, including the possibility of price increases
  - Look for external funding opportunities to support equipment acquisition



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## Summary

- Research in service learning can be fruitful for all concerned – students, community partners, and faculty members
- This approach is likely to become more common, especially in the engineering and technology fields
- There is a long list of pitfalls one has to be aware of in incorporating research in service learning projects
- There is scope for rigorous pedagogical work in determining best practices in applying research in service learning

