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## **AC 2012-4976: SELF-MOTIVATED LEARNING FOR PROFESSIONAL-ISM IN AN IMMERSIVE LEARNING (ILRN) MODEL**

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Emily Jane Kilpatrick is currently attending Iron Range Engineering as an undergraduate student. She will be in her senior year this coming fall.

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Emmy Stage is attending Iron Range Engineering in Virginia, Minn., and entering into her senior year as a chemical engineering student.

## Teaching Engineering in an Immersive Learning (iLRN) Environment

*Iron Range Engineering (IRE) is a two-year upper level engineering program through Mankato State University located in Virginia MN. Students attending IRE experience an immersive learning style (iLRN). iLRN is a model in which students are surrounded by engineering in all aspects of their education. Students' work closely with each other, faculty, and industry to practice design and gain technical and professional skills. This allows students to practice engineering by doing engineering. IRE's style of learning is self-motivated learning where students design their own paths for gaining technical knowledge. Each student works with a faculty guide to develop his or her own methods for learning. By not having the external constraint of lecture style teaching, students become self-motivated learners.*

*Being in a self-motivated learning atmosphere enables students to develop strong professional skills. Ways in which the IRE model promotes professionalism are: practicing professionalism, practicing teamwork, and working along side peers and superiors.*

*Practicing everyday professionalism that one would experience in the work place. Including social aspects, 40-hour workweeks, business attire, and every day ethics.*

*Practicing teamwork on teams of multi-disciplined engineering students. This allows students to gain different perspectives of a shared focus*

*Working along side peers and superiors. Students are members of semester long project teams that are led by faculty mentors.*

*Freedom within this program creates a personal accountability and responsibly for how students act and how they conduct themselves.*

Iron Range Engineering (IRE) is an engineering program through Mankato State University located in Virginia Minnesota. IRE is a 100% project based learning program. IRE took its first generation of students for enrollment in the spring of 2010. This is a two-year upper level engineering program where students transfer from a two-year community college and enter IRE as juniors.<sup>1</sup> IRE students take part in a different style of learning than traditional students. This new style of learning is known as immersive learning (iLRN). iLRN is a model in which students are surrounded by engineering in all aspects of their education. The students work closely with each other, faculty, and industry to practice design and gain technical and professional skills. Immersive learning describes being continually surrounded by an engineering project. Every activity performed by students contains some connection to the engineering project and continually reinforces the learning aspect.

The degree earned at Iron Range Engineering is a Bachelors of Science in Engineering through Minnesota State University, Mankato. Each degree earned has the same sixteen mechanical and electrical cores credits and a sixteen-credit emphasis in an area of engineering

study chosen by the student. The most common emphases are Mechanical or Electrical with opportunities for Chemical, Bio-Medical, and Mechantronics (Mechanical and Electrical).

IRE students spend a minimum of 40 hours a week on campus working on technical competencies, design work, and professionalism. Technical competencies are one credit subjects chosen to study by the students on an individual basis relating to their project. Each course looks different for each student and the syllabus for the subjects are developed between student and instructor. Every semester includes three credits each of design and professionalism work. The deliverables for these six credits include, but are not limited to, the semester project, papers, presentations, and the final technical document. Every semester all students are required to take a one-credit class known as Seminar, this is the one scheduled time every week where all students gather for information distribution and guidance.

In addition to the individual technical learning, students work in project groups from two to seven students in size on a sixteen-week engineering project. Students work through the engineering design process to develop lifelong problem solving skills. Each group is assigned one faculty mentor and each week they conduct a design/learning review meeting in order to monitor the group's progress, make sure the group is staying in contact with their client and updating them on the project as it develops, and help with answering any questions they may have.

The third major part of an IRE students' semester is learning about and practicing professionalism. There are many different objectives that the students complete throughout the semester to obtain professionalism. Professionalism is an important aspect of an average day as an IRE student whether for their three credits or how to present themselves as a person. Through IRE's industry partners it has been found that having professionally developed graduates applying for jobs is a sought after attribute to a new employee. This reason, among others, is why IRE graduates stand out from traditional students when entering the work force

Students have many opportunities to practice presentation skills on a weekly basis. There is two types of presenting the students do: in-class presentations and formal presentations. Both of these types of presentations help students to develop communication skills on a conversational level and to a wide range of audiences.

In-class presentations are given in small groups and individually in Seminar. The project group in front of IRE students, faculty, and staff gives formal presentations. These presentations are also given to the clients of that project group. By asking the students to present frequently to a variety of viewers it allows them to improve their ability to convey thoughts, experiences, and progress on projects.

The atmosphere of IRE is an office type setting where students work 40-hour workweek minimums and dress in business casual attire on a daily basis. Partnering with industry and working engineers is something IRE prides itself on. Because of this the students are held to the

same standard as working engineers in an engineering environment. This gives all students the chance to practice engineering.

Students at IRE are required to do the same type of writing as traditional students, but are also required, over the course of their four semesters, to write four technical documents, a business plan, and several personal improvement plans.

The final design deliverable for each project is a technical document that is written throughout a semester about the projects that students have been working on. Each member of the team collaborates their individual efforts into one document for the group.

Every student has at least one entrepreneurial project during his or her time at IRE and the business plan written coincides with this. This gives the students a chance to see engineering from a business point of view. If the entrepreneurial project is started by a student there is a chance to collaborate with Minnesota State Mankato business students and enter it into a state business competition.

As part of the three credits of professionalism each student take personal improvement plans are written for presentations, teamwork, writing, and how the student learns; this is getting students to practice metacognition.

Iron Range Engineering is continually improving with the help of the community and because of this IRE students volunteer and give back to the community that has helped make this innovative program succeed.

Teamwork is essential at IRE. Students have the opportunity to work on the same team for sixteen weeks, learn how to resolve conflicts, work on multidisciplinary teams, and have the opportunity to practice different group roles.

Each team develops a team contract where they address a plan for conflict resolution and many teams learn that this is valuable throughout the semester when a problem arises. Every group member must agree upon the steps created and sign the contract. This helps the students to practice resolving issues in real life situations as responsibly and professionally as possible.

Each project group can be comprised of different types of engineering majors. Everyone brings different visions, ideas, and personalities to the team. Having students with different emphases in the group allows the project to be worked on from different angles.

Having students work in project teams like working engineers do in industry allows them to learn to be more than students. There are many different roles within each team and every group has their own way of filling these roles. Written in the team contract is the process that each group chooses. There is an opportunity for every student to have a leadership role at least once each semester within the group as well as communication, presentation, and writing leads. There are also situations where students learn to carry out the tasks delegated to them.

IRE students work side-by-side with their faculty mentors and closely with their industry partners. The problems the students work on are open-ended and it is a collaborative effort between everyone involved to work towards an end goal. This gives them exposure to working with their superiors and the opportunity to vocalize their ideas and thoughts to people of a higher rank.

Everything stated previously are outward and visual representations of practicing and growth within professionalism. Along with the measurable professionalism is the personal growth of each individual. This growth comes from the freedom and responsibility each student is given as well as being held accountable for their actions. Examples of this freedom are project and task management, setting deadlines, and course management. Through these every day actions students build upon their personal accountability and hold themselves responsible for their actions.

## Bibliography

[1] Ronald R. Ulseth. "A New Model of Project-Based Learning in Engineering Education." American Society of Engineering Education, 2011.