

GROWING WiSER WITH TIME: THE WOMEN IN SCIENCE AND ENGINEERING LIVING AND LEARNING COMMUNITY AT IOWA STATE UNIVERSITY

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Abstract - *The Program for Women in Science and Engineering offers the WiSE Living and Learning Community (WiSE LLC) designed to reduce the isolation for women in underrepresented STEM majors at Iowa State University (ISU). The challenge of continuing to provide a positive experience for 180 first-year freshmen while meeting intended learning outcomes is made possible through collaborations with academic departments and student support services. These collaborations have been aided by the institutionalization of learning communities at ISU, a nationally recognized campus for its efforts in learning communities. By sharing the evolution of the WiSE LLC, its successes and challenges, from a single-community living option to a multiple living and learning community we hope to provide other institutions with a model of how to maintain and expand a successful large-scale learning community for women in STEM majors.*

Index terms – learning community, recruitment, residence, retention

The Women in Science and Engineering Living and Learning Community (WiSE LLC) at Iowa State University (ISU) has grown from 45 students in 1995 to over 165 first-year women on nine different floors in five residence halls with seven course-clustered learning teams in 2002. The WiSE community is recognized as a leader in learning communities on the ISU campus, a campus nationally recognized for efforts in learning community.

THE WiSE LIVING OPTION

Created in 1995, the WiSE Living Option clustered first-year women majoring in science, technology, engineering and math (STEM) majors onto four floors in two residence halls on the ISU campus. The program was designed to help decrease the social isolation first-year women experience in under-represented majors at ISU. Fifty-eight women applied for the forty-five residence hall spaces the first year, however, thirteen were denied due to insufficient space. The interest was evident and the WiSE Living Option was set in motion.

THE WiSE LIVING & LEARNING COMMUNITY

The WiSE program has grown from simple being a residence hall living option choice, to a more comprehensive WiSE Living and Learning Community. The WiSE LLC has grown in number of participants (from 45 first year students to 165 first year students per year) and in program offerings (now including clustered courses, service learning, leadership development, academic support services, and professional development). To date, over 600 first-year women have participated in the WiSE LLC at Iowa State University. The WiSE LLC has one primary goal and two secondary goals. The primary goal is to eliminate or reduce the isolation students in underrepresented STEM majors often feel. By achieving this goal, the WiSE learning community also hopes also to increase the retention of women within STEM fields and the number of women entering STEM fields at Iowa State.

Living

Today, the WiSE LLC includes 165 first-year students housed on nine floors across five dormitories on the Iowa State campus. Due to the nature of Iowa State, students in engineering prefer one specific area of campus while other majors vary depending on the type of living space. Between 15 and 20 spaces are reserved on each floor for WiSE students. Students are placed onto specific floors based on their housing preferences (e.g. air conditioned or not, etc.) and potential learning team membership. For the 2002-03 academic year one-half of the first-year women in the College of Engineering made the choice to live on a WiSE floor. Students on the floor are encouraged to take part in interventions offered by PWSE including assorted out-of-class social and academic programming, opportunities for career exploration, mentoring, community service, and leadership through self-governance.

Learning Teams

Embedded within the structure of the WiSE LLC are seven course-clustered WiSE Learning Teams. These teams are made up of 15 to 18 students who live on one residence hall

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floor and take two courses in common. In the 2002-03 academic year WiSE offered the following seven course-clustered learning teams

- Two (2) Biology I and General Chemistry I teams
- Two (2) Calculus I and General Chemistry I teams
- One (1) Calculus II and General Chemistry I team
- One (1) Calculus I and General Chemistry for Engineering Students team
- One (1) Calculus II and General Chemistry for Engineering Students team

Learning team students are led by upper-division students called, "peer mentors" who meet with their team on a weekly basis during the fall semester for social and/or academic programming. Each student on a team meets individually with their peer mentor every two weeks to talk about their social and academic adjustment to the university and identify any individual needs or programs. As a part of their responsibilities, peer mentors arrange and participate in social gatherings, meet weekly with the WiSE program coordinator, assist with assessment distribution and keep a journal of their team and personal development.

Leadership

There are several opportunities to participate in leadership positions through the WiSE LLC. First, many upper-division students participate as informal leaders on their residence hall floors to the incoming freshmen. By simply helping with homework or selecting classes and professors, upper-division students on the floors offer leadership and hope to first-year students. More formal leadership is available through PWSE opportunities such as peer mentor positions or through participation in the WiSE Student Organization (WiSE SO). Originally set up as an advisory board, each floor of the residence hall had a representative along with a four executive positions (President, Vice-president, Treasurer and Secretary) that assist PWSE staff with designing and executing campus-wide programming. Recently the students became a formal campus organization and today the WiSE SO has twenty-two executive positions plus representatives from each of the residential floors. With over forty students participating on the planning committee and a membership of over 60 students, the WiSE SO offers various opportunities for leadership as well as opportunities for outreach, recruitment and service learning.

COLLABORATIONS

The WiSE LLC is made possible by collaborating with various departments; however, among the most critical are the relationships with the Department of Residence, the Registrar's office, academic departments/colleges, Admissions, and the Learning Communities Initiative at ISU.

Department of Residence

The Department of Residence at ISU has assigned several staff members to coordinate the residential component for learning communities. Together with the Residence liaison a projected number of spaces is held for incoming students on nine floors across 5 residence halls to accommodate the different residential preferences for incoming first-year students. Students have the option of selection housing in either co-ed or all-female residence halls. With an increased demand for WiSE housing and the introduction of learning teams the placement of students has become increasingly complex. In the past, due to large numbers of returning students we have not had consistent WiSE LLC floors from year to year, however with the changing departmental policies we expect WiSE LLC floors to become somewhat stable in subsequent years.

Academic Departments/Colleges

The academic departments and colleges are critical partners in helping to enroll women into the WiSE LLC. Departments use the WiSE LLC as an important part of their recruitment process for incoming students, by highlighting the success women students have experienced in the community and encouraging new students to participate. Many departments/colleges have changed their recruitment material for women to highlight the WiSE LLC.

In addition to assisting in recruiting students, the academic colleges, help in identifying students for the various WiSE Learning Teams. Each student who applies to be a part of the WiSE LLC has the option of participating on a WiSE course clustered learning team. Names of students interested in living on a WiSE floor are given to academic advisors in the College of Engineering and the College of Liberal Arts and Sciences who then make a recommendation on team placement. This process is done on a first-come, first-serve basis and students are extended an invitation to the appropriate learning team based on the courses they will be taking their first year. The academic advisors are a critical piece to the success of WiSE because they must help students enroll in the appropriate courses during summer orientation. Further, advisors oftentimes recruit students to the WiSE LLC during orientation and help students enroll into learning community courses.

The partnerships with the academic units are also important in the development of programming to assist with the academic success of the WiSE LLC students.

Registrar's Office

In order to offer clustered courses for students living on a WiSE floor, the Office of the Registrar reserves spaces in specific sections of classes and labs. During summer orientation advisors help students register for the appropriate section of their chemistry and calculus or chemistry and

biology courses. Each WiSE Learning Team student is given an access number that must be entered in order to give students access to those courses. The student is also coded in the Registrar's records as a "learning community student" to aid in tracking student success and retention as part of the evaluation of the learning community.

Admissions

The Office of Admissions collaborates with PWSE to encourage students to attend ISU and participate in the WiSE LLC. All women students that are interested in science or engineering are given the opportunity to meet with PWSE staff to discuss the WiSE LLC opportunities. Admissions arranges on average 5 individual student visits a week, in addition to hosting 30 major group visits each year for PWSE. Admissions also has incorporated information about PWSE and the WiSE LLC into the standard recruitment mail stream that all potential female STEM students receive. Admissions also provides access to lists of students (including names and emails) to allow PWSE staff and students to have current prospective student information from which to recruit participants.

Learning Community Initiative

The institutionalization of learning communities at ISU has been an important part of the success of the WiSE LLC. Today, with nearly 40% of all first year students being involved with learning communities, the institutional support for the programs is enormous. Through a learning community infrastructure that has become more centralized over the past eight years, the Learning Community Advisory Committee is able to fund salaries for peer mentors, facilitate connections with the Department of Residence and colleges, offer an annual Institute to renew energy and encourage collaboration, and provide monthly luncheons to bring faculty and staff together encouraging "best practices" in individual learning communities.

OUTCOMES

The WiSE LLC is making significant progress related to the three initial goals.

Reduce Isolation

A three-year longitudinal study, completed on 149 participants of the WiSE LLC and 207 non-participants by Christina O. M. Gandhi, included surveys and interviews throughout a three-year period. Although multi-item scales used to assess variables relating to adjustment, self-efficacy, and support were mixed, single-item scales measuring campus involvement indicated that WiSE Living Option participants felt more at ease in their surroundings and expressed higher academic confidence, and perceived

greater support from others in pursuing nontraditional majors

When non-participants were compared to all members of the LLC across cohorts, members

- reported significantly less difficulty getting to know their residence hall floormates
- felt more strongly than non-participants that they shared commonalities with their residence hall floormates
- affirmed they would choose to live on the same residence hall floor again
- reported that they intend to join or have already joined campus organizations related to women in science or engineering.

Although, Gandhi found mixed results related to adjustment, self-efficacy, and support, "the significant findings indicating greater adjustment within the LLC residence hall floors suggest high levels of congeniality and peer support for the women in the program. The current intervention was designed to decrease social isolation within its participants and these results suggest that this primary objective was achieved." [1]

Increase Retention within STEM

The longitudinal study also showed that there is a significant difference in the retention of women within STEM majors between WiSE LLC students and students not selecting to participate in the WiSE LLC. As shown in Table 1, participation in the WiSE LLC is correlated with significant "retention in major" differences through the critical first two years of college. Also, when controlling for a wide variety of demographic variables, participation in the WiSE learning community is a significant predictor ($p < 0.001$) of retention within an engineering/science major. [2]

TABLE 1
LEARNING COMMUNITY RETENTION IN STEM MAJORS

Retention in STEM major	Learning community	Non-Learning Community
After one year	85%	69%
After two years	81%	62%

Increased Number of Women Enrolling in STEM Majors

Since the creation of the WiSE LLC, the undergraduate female engineering enrollment has increased from 686 students in 1995 to 791 women in 2002, a growth of 15.3%. Although no formal qualitative study has been complete to show a causal relationship, there have been several changes in the recruitment processes both within the Office of Admissions and the academic colleges to "sell" the WiSE LLC as part of the recruitment process. Also, several recruitment oriented programs, such as the weekend WiSE Getaway for high school seniors have yielded a very high percentage of students enrolling in STEM majors. Ninety-

one percent of the students who have attended the WiSE Getaway in the past two years have attended ISU. The following feedback was received from students who learned about the WiSE LLC as part of visits arranged by Admissions:

Rebecca, ISU engineering student enrolled for fall 2003: "The info you presented to me about your women in engineering (WiSE LLC) program has really helped me feel comfortable at Iowa State."

Lauren, Fall 2004 prospective student: "The information that you presented really excited me about the opportunities available through WiSE, especially its nurturing environment... I have placed ISU high on my list."

Success of the WiSE LLC

According to the 2001-02 ISU Undergraduate Education Survey students who participated in WiSE had a significantly higher level of satisfaction when asked about their overall experience at ISU. And when compared to other learning communities at Iowa State, WiSE LLC students' level of satisfaction with their peer mentor was significantly higher. When asked, "What was the most satisfying part of your learning community experience?" of the students who responded all indicated either their peer mentor or clustered living arrangements. In the open-ended responses of the fall 2002 ISU Undergraduate Education Survey when asked "what was the most satisfying aspect of your learning community?" Students wrote

The living option for WiSE. For my first year, living with other women in Engineering has been a great way to adjust and meet new people. It is nice to be able to walk across the hall when I need help with homework.

I not only have the support and understanding of the girls in my learning community, but they are my friends. My peer mentor has been the biggest influence on me this semester and I hope that I could help someone as much as she has helped me.

Just being constantly, physically reminded that I am not alone – we are not alone- and I don't have to carry the weight of my studies, stress and struggles on my shoulders only.

The WiSE community is also a recognized leader in learning communities on the ISU campus. Our program is used as a model by other communities on a campus that was recently ranked as one of the top programs in the nation. Our peer mentors are also recognized as campus leaders and this spring two WiSE LLC peer mentors will be recognized as exemplary from over 150 other peer mentors in a spring ceremony to honor their commitment to learning at ISU.

THE CHALLENGES OF A COMPLEX SYSTEM

In 1995 only 12 learning communities existed at ISU and in the fall of 2002 those numbers soared to almost fifty. Although ISU has developed a strong infrastructure and supportive environment, which originally fostered learning communities, it has given way to a challenging system that grows more complex as new learning communities are introduced each year. The challenge of recruiting students to the WiSE LLC, which is compounded by its cross-disciplinary nature, grows more complex with each year and as numbers within the WiSE LLC increase.

The WiSE LLC supports 165 first-year women in nearly 50 STEM related majors and recruiting is done directly through various invitations, informational mailings, campus visits, and PWSE programs and indirectly through the individual academic departments. Although recruiting is challenging, receiving an application to the WiSE LLC is only the first step in the very complicated process of offering the WiSE LLC while making the system appear simple to students.

Once an application is received students taking calculus must take a math placement exam during summer orientation to determine placement on a WiSE course clustered learning team. However, while orientation takes place in June, all housing placements must be completed in May prior to the math placement examination. PWSE staff works with departmental advisors, to identify candidates for each learning team. A recommendation is made and then the student is contacted directly with additional questions to check their math placement and to offer them a place on a learning team. Oftentimes placement on a learning team will affect their housing preference, however, in most cases students choose the learning team as their highest priority. During orientation advisors must register students in the appropriate learning community before entering a student's schedule. If not done correctly students must start over and rebuild their schedule, a chance many are not willing to take late in registration. Once a student is enrolled their peer mentor contacts individual team members during the summer in order to establish a connection. On the Sunday before classes commence a welcome picnic is held and students are introduced to the overall program before breaking up into individual teams.

Any interruption in the system has proven to have an impact on the overall success of the WiSE LLC, whether it is simply the introduction of a new learning community or a change in a departmental policy. As the system becomes increasingly complex with each passing year the WiSE LLC must react to changes in the system it helped create.

Increased Collaborations

As more learning communities are integrated into the system, the number collaborations has also increased to include other learning communities. Because of the interdisciplinary aspect of the WiSE LLC women may not only be eligible for WiSE but are eligible for a myriad of different learning communities based on their major, ethnic background or academic performance. Due to the increased numbers of learning communities many students are bombarded with information about learning community choices and are often confused by all of the choices. For example, a minority female in engineering is typically eligible for at least four different residential learning communities. In order to offer that student the maximum level of support we work closely with other learning communities by combining living arrangements and programs in order to reduce the number of choices a student must make while increasing the support.

Department of Residence

As learning communities have grown at ISU the Department of Residence has been forced to become more rigid about the kind of support and space provided to learning communities. Coordinators must adhere to specific timelines and procedures in order to control housing requests. As a result, the demand for space from new residential learning communities and new students has required the Department of Residence to change some key departmental policies and introduce new facilities reflecting student demands.

The first of three new policies implemented by the Department of Residence gives first-year students priority housing at ISU. In the past, students who wanted to return to their WiSE LLC floors were given first choice as to their housing arrangements. However, in order to make space for incoming freshmen in specific residence halls, which are traditionally popular with STEM majors and at ISU, a new departmental policy limiting the number of students returning to any given floor for fall 2003 will be held to 25%. As a result current WiSE LLC students may be forced to live off campus or in less desirable residence halls. When first and second year WiSE LLC students were surveyed, 99% indicated they would either live off campus or join a sorority if they could not return to their WiSE floor or current residence hall.

A second new policy requires all students in the residence halls to participate in "Fresh Start," a program which requires students to participate in a campus organization, community service project, personal development activity, assessment projects and adhere to stricter visitation policies. Further returning students are expected to serve as informal and/or formal mentors on their floors and residence halls, serve as leaders to first-year students, plan and execute community service projects and

overall be good role models both academically and personally.

The third new policy changed the procedures regarding housing contracts. Until recently, students were sent housing contracts based on a fixed date and learning communities timed their mailings to coincide with Department of Residence deadlines. Students simply filled out the application of their desired learning community and returned the application with their housing contract. Students were motivated to return the applications in a timely fashion in order to receive the highest priority. For the fall of 2003, housing contracts were sent with when a student accepted an offer of admission. Many students, confused when they received an additional application for housing, have simply discarded the information because they believe it is too late to apply. Through extra personal phone calls, made by several WiSE students, it appears that the WiSE LLC for fall 2003 will be close to having 180 new incoming students. However, due to the changes in the residence procedures, PWSE had to make hundreds of extra phone calls this spring.

While the changes in Department of Residence policies are predicted to have an impact on the number of students returning in the fall of 2003 the long-term effects remain to be seen. Not all of the changes may have a negative long-term impact. Although the number of upper-division students may be lower, for the first time the WiSE LLC will retain all nine-residence hall floors from one year to the next, which will provide a more stable system for tracking students who choose to return to a WiSE floor. Also, by requiring students to be more involved on-campus, the "Fresh Start" program will compel students to engage in learning outside the classroom and more students may take advantage of programs already offered by the Program for Women in Science and Engineering within a system which can enforce a required policy. Finally, by increasing the amount of space held for all first-years students to 75% will allow the Department of Residence to be more flexible in holding space for all residential learning communities at ISU.

Registrar's Office

As the number of WiSE LLC course clustered learning teams has increased, many lessons have been learned. Two specific challenges have presented themselves with the increasing number of learning communities at ISU. First, in order to hold space in courses, each learning community is required to obtain departmental support. Each request must be justified and any request to hold over 50% of any one section requires the signature of the department chair before a request may be granted. In order to support for WiSE LLC clusters, we have had to be flexible in the sections held. In the past we have received classes that are held late in the day and were puzzled when WiSE LLC learning team courses were not full but the correct number of students had

registered as a part of the learning teams. Many students could not register in courses late in the day due to scheduling conflicts with athletics and marching band. Although not every student will be able to participate, an effort is being made to reduce the number of scheduling conflicts which requires another special request and justification to the Registrar.

Fixed Funding

Finally, funding for learning communities has remained static over the past five years while the numbers of learning communities has increased to almost fifty. Originally funding for both peer mentors and programming was available and a relatively easy process to obtain. However, five years later, programs must be able to justify the use of peer mentors in their program and provide assessment plans and feedback in their annual learning community proposals. The growth is also forcing PWSE to look at other external donors to assist in funding the program to meet the level of student demand.

CONCLUSIONS

One of the positive, but unexpected, outcomes of the WiSE LLC has been the desire of students to continue their experience beyond the first-year. Many of the students have remained on WiSE floors to act as informal mentors or more formally as peer mentors. In order to remain connected with the program, students involved have initiated a WiSE student organization offering programs to encourage girls K-12 to enjoy math and science and by supporting PWSE by volunteering and participating in its outreach and recruitment programs.

By sharing some of the structure, success and challenges of the WiSE LLC at ISU we hope to provide some insights for other institutions. One of the striking aspects of ISU learning communities is that no two are identical. From experience we have learned that by offering several options more students have been served by taking advantage of what appeals to the individual. Portions of the WiSE LLC may be adapted to many types of residential options and by providing course clustering of introductory course like Calculus and General Chemistry students are provided with a support network, not only in the residence halls, but also within their academic courses.

REFERENCES

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