In this issue:

We have bundled together a number of papers on the general theme of information systems program offerings, including a look at autonomous vehicles in IS education, micro-credentials, user experience design in community projects, first-year experience courses, exam complexity, and IS2020 across the curriculum.

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Implementing a First-Year Experience Course for IT Majors

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Abstract

Schools have implemented the high-impact practice of first-year experience (FYE) courses to assist students with the transition to college. These courses help connect new students to the school with the goal of improving retention. While students in computing majors face the same challenges as other new college students, they also face some challenges specific to computing fields. Additionally, computing fields face ongoing concerns about enrollment and diversity. This work discusses the implementation of an information technology (IT) specific FYE course combining content from a university-wide FYE course with content focused on helping students gain a better understanding of the IT curriculum and IT career paths.

Keywords: First-year experience, student success, pedagogy.

1. INTRODUCTION

The transition to college, whether it be from high school, military service, or work, is a challenging time for students. Successful transition into college requires students to build connections to the college, their chosen major, and their peers. Students also need to develop a clear goal for why they are attending college to motivate the effort required to succeed in college. The first-year experience (FYE) course has been identified as a high-impact learning practice that can support the transition to college (Kuh, 2008).

While a successful transition to college is essential for all students, several factors can make this more challenging for computing students. High school students will have taken several years of science, math, social studies, and English but have had fewer or possibly no opportunities to take computing courses. This may make students hesitate to choose a computing major or give them a limited view of what computing involves. This limited exposure to computing and the rapidly changing nature of technology can make it hard for students to develop a clear career goal.

The fortunate coincidence of the introduction of a new university-wide first-year experience (FYE) course at the university at the same time as a redesign of the introductory Information Technology (IT) course sequence in the Computer and Information Technology (CIT) department provided an opportunity to consider how to combine these efforts into a focused approach to helping students successfully transition into college and the CIT program.

2. BACKGROUND

There is extensive research on first-year experience courses in general and efforts to improve the enrollment and retention of computing students through focused efforts in first-year courses.

First-Year Experience Courses
Courses designed to help address the challenges new students face when entering college have a long history (Ryan & Glenn, 2004) and many names. These courses are part of a larger effort designed to transition students to a successful college career. Other parts of this effort include

new student orientation programs, academic advising, and all of a university's student engagement and support services.

There are three main formats used for FYE courses (Ryan & Glenn, 2004). The extended-orientation model (also referred to as academic socialization) focuses on integrating the students into the university community. This format focuses on the history of the college, available services, and engaging with other students. This model is traced to an effort introduced at the University of South Carolina in 1972 as part of a response to campus riots in 1970 (History, n.d.).

A variation on the socialization approach is a course organized around an academic theme. This format was supported by the Boyer Report (Kenny & Boyer, 1998), which suggested that the "first year of a university experience needs to provide new stimulation for intellectual growth" (p. 19).

A final FYE course format focuses on preparing students for success by teaching study skills and learning strategies. In addition to the value of these skills, teaching these skills also offers an opportunity to promote metacognition (Hattie, Biggs, & Purdie, 1996).

In reality, the FYE program at any school will be a unique mix of the different approaches. FYE programs at different schools will have different goals based on the demographics and needs of the school's student population, the credit hours allocated to the course, and many other factors. For example, open enrollment institutions and institutions with a larger population of students returning to education may focus more on study skills and learning strategies (Mayo, 2013).

Several authors have looked at the impact of FYE programs, including the impact on retention, academic performance, and graduation rates. The impact on retention is particularly relevant since 30% of dropouts occur in the first year (Hanson, 2021). Research finds positive impacts on retention, student performance, and other factors (Lang, 2007; Erickson & Stone, 2012; Bers & Younger, 2014; Howard & Jones, 2000). Ryan and Glenn (2004) report on a comparison of the academic socialization and learning strategy formats and find that the learning strategy format had a positive impact on retention while the academic socialization format had no impact on retention.

Discipline-Specific FYE Courses
In addition to the extensive discussion of university-level FYE programs, there is also research on discipline-specific FYE efforts. Computing disciplines face specific challenges in retaining students and promoting diversity that could be addressed in an FYE course.

While recent enrollment in computing fields shows continued growth, future trends are unclear (National Academies, 2018). In addition, while computing enrollments have grown, the field remains "one of the least diverse disciplines in terms of the representation of women and underrepresented minorities, both in higher education and in the workforce." (National Academies, 2018, p 4). A recent ACM work on retention reinforces this with the observation that "the demographics of the students involved in computing remain stubbornly consistent" (Stephenson et al., 2018, p i). This work provides a lengthy set of recommendations, including overcoming misconceptions about computing fields and researching new interventions.

Several studies of computing-specific FYE efforts have found positive impacts on retention (Ott, 2014; Mathis, 2008; Reese et al., 2013; Albarakati, DiPippo, & Fay-Wolfe, 2021) through a variety of approaches. Many of these efforts combined computing content with practices suggested for general FYE courses. For example, Albarakati et al. (2021) added course activities designed to help students develop a sense of belonging and promote social engagement. DeClue et al. (2011) report on similar activities, including service projects to promote a sense of community.

To address diversity concerns, it is helpful to look at why students choose computing majors in the first place. Compared to other majors, computing fields face many challenges in attracting students. While most high school students will take multiple courses in math, science, history, and other long-established fields, the percentage of high school students taking computing courses is in the single digits in many states (Guzdial, 2019).

Another issue is limited awareness of what computing professionals actually do. When Carter (2006) surveyed high school students, the top reason for not choosing a computing major was not wanting to sit in front of a computer all day. The top reason for selecting a computer major was also illustrative. For men, the top reason was an interest in computer games, while for women, it was "their desire to use it in another field" (Carter, 2006, p. 29). Related to this is the issue of understanding the different computing fields.

Connolly et al. (2016) examine this topic and provide suggestions about advising students in selecting the computing field that best matches their interests.

There have been several efforts to help first-year computing students better understand the wide range of computing careers and improve retention. In one approach, an "Explorations in Computing" course was revised to combine faculty and industry presentations on different facets of computing, one-on-one student-alumni interaction, and the development of professional skills such as resume writing (Ott, 2014). After the revision, the authors found that students were more engaged in the class, with more students completing assignments, higher grades, and fewer students dropping the course. They also found more engagement with a mid-semester career fair.

In another effort, a computing fundamentals course was revised to address the characteristics of current Gen Z students (Robertson, 2011). The breadth of course topics was reduced to allow time to provide more context to connect the remaining topics to real-world examples, and a lecture-based class format was replaced with a discussion-based format. In addition, career discussions were added, and a discussion of related careers was part of each topic module. These changes resulted in more engaged students, improved attendance, better grades, and increased retention.

Another interesting approach combines the FYE approach based on study skills and learning strategies with technical content as part of a plan to promote the development of non-technical skills to support the achievement of technical learning outcomes (Humpherys, Babb, & Abdullat, 2015). Initial efforts in a first-year programming course have led to a 10 % increase in student persistence.

3. COURSE DESIGN

Design Considerations
Prior to the redesign discussed in this work, the introductory IT course sequence consisted of two three-credit courses designed to be taken during a student's first year in the program. Both courses covered various technical topics designed to provide a general introduction to IT and foundational material for later courses in the curriculum. Over time, the two courses had evolved as individual instructors added or changed content, leading to overlaps and gaps due to the failure to coordinate the changes to the

two courses. In addition to supporting associate's and bachelor's degrees in IT and a bachelor's degree in Health Information Technology (HIT), these courses were also part of an IT minor and an IT concentration that students from other majors could complete to satisfy part of the university's general education requirement.

Discussions about redesigning the courses had started before the university-wide FYE course requirement was adopted. The primary considerations for redesigning the courses were to update the content to remove older technologies and add newer technologies such as cloud computing, while improving the alignment with later courses in the curriculum. There was also interest in adding content to help students learn more about IT majors and careers early in their academic careers to allow students to consider a change of major before investing a lot of time and effort in a major that doesn't match their interests. A final motivation was to work on developing non-technical skills to address the concerns identified by Carter (2006) and Humpherys (2015) early in the curriculum. Additional considerations included reducing the two courses into a single course to accommodate a state-mandated reduction in the total credits for a bachelor's degree and simplifying the processing of credits for transfer students entering the program.

When the university announced that all incoming students would be required to take a 1-credit UNV 101 course, the CIT department saw an opportunity to expand this to include computing-specific content, including exploration of computing careers and academic advising specific to the CIT program requirements. In addition, the department felt that a computing-specific FYE course would allow the introduction of IT-specific content for the study skills content. For example, introducing Agile practices and tools for time management. Also, the one-credit UNV 101 course plan included having faculty from all departments teach sections of the course. Since most courses in the CIT department are three-credit courses, this would have complicated assembling a full 12-credit teaching load for faculty.

The solution developed included a two-credit computing-specific version of the UNV 101 course and a four-credit course that would introduce students to various technical topics. Ideally, the same faculty member would teach both courses to simplify faculty scheduling and provide students with a connection between the two courses. The two courses also form the basis for

a campus-level "course-in-common" effort based on research suggesting that learning communities can increase student motivation and retention (Cabo & Satyanarayana, 2018; Saulnier, Brooks, Ceccucci, & White, 2007).

An additional goal of the introductory course sequence was to ensure that students were in the correct major. The university asks incoming students to declare a major during new-student orientation, and experience has shown that these are not well-informed decisions in some cases. As discussed earlier, students may not have a good understanding of computing careers (Carter, 2006), or the choice of major may be made by a parent. The department felt that advising students to take the two courses simultaneously would allow them to gain experience with their major early in their college experience. Academic advising content in the FYE course could help students with concerns explore other majors. While this might lead to students leaving the IT major, it was expected that this early focus on ensuring students were in the right major would help retain the student at the university and limit potential delays in their path to graduation.

All students working towards an associate's or bachelor's degree in IT are required to take both courses. Given the content of the computing-specific FYE course, the department initially chose to avoid offering the course in an online format. The CIT department's Health Information Technology (HIT) program is only offered in a fully online format, so these students are not required to take the IT-specific FYE course. However, HIT students are made aware of the FYE course, and HIT students from the local area often enroll in the course.

Course Details
The IT-specific FYE course is titled "IT People and Practices." This course builds on the university-wide UNV 101 FYE course's goal of connecting new students to the university with the additional goals of connecting students to their chosen major and connecting students to their future careers.

The learning outcomes for the IT-specific FYE course can be found in Appendix A. These build on the university-level course by adding outcomes designed to help students learn about IT careers and the knowledge and skills needed to be a successful IT professional.

The design of the IT-specific FYE course is based on the design of the university-wide UNV 101 with two main changes, the addition of IT-specific

content and modifications to reflect a different student population. The CIT department is located on the university's regional campuses, not the main campus. The main campus is a selective admission, residential campus, while the regional campuses are open-enrollment, commuter campuses. These differences mean that regional campus students are more likely to be first-generation college students, include more non-traditional age students, are commuter students, and often mix work and school.

The four-credit technical introduction course titled "IT Tools and Techniques" is broken into four three-week-long content modules and a short introductory module. The four major topic areas covered include:
- Hardware infrastructure, operating systems, and cloud computing.
- Web programming – HTML, CSS, and JavaScript.
- Networking
- Data and Databases

These four topics were selected to provide a broad overview of fundamental IT topics and for their support for later courses in the IT curriculum. The introductory module provided an introduction to the course. The introductory module also covered foundational topics used in the other modules, including binary, data representations, and digital logic.

Following suggestions from the literature (Roberson, 2011), each of the four major topic areas included context to help students understand how the topic was present in their daily, technology-enabled life and concluded with a discussion of IT careers that would use the skills students learned in the module.

4. COURSE IMPLEMENTATION

Course Content
The starting point for content in the IT-specific FYE course is the content from the university-wide UNV 101 course. The UNV 101 course uses a mix of the extended orientation and study skills approaches discussed previously. The content contains material to help students transition from high school to college, along with content to build skills for success at the college level.

The content to support the transition from high school to college includes a discussion of the differences and an activity to develop a personal vision for what they hope to achieve by attending college. This content contains introductions to campus support services, including the tutoring center, library services, and student

organizations. Given the student population of the regional campuses, this content is expanded to consider students who are not coming directly from high school.

The content to build college success skills covers many areas, including time management, developing a growth mindset, critical thinking, financial literacy, and personal care – both physical and mental. For the regional campus student population, suggestions from student affairs staff have led to expanded content on financial literacy and personal care. In the IT-specific FYE course, this area provides an opportunity to introduce skills seen in the IT environment. For example, the discussion of time management offers the opportunity to introduce several Agile practices.

The IT-specific FYE course extends the UNV 101 course into a two-credit course that is typically offered in a hybrid format with one fifty (50) minute class meeting per week, along with additional online reading and video content. During the COVID pandemic, the course was taught in an online synchronous format, and currently, the course is offered in both formats. Typically, there is demand for two or three sections of the course, with fifteen (15) to twenty-five (25) students in a section.

The IT-specific FYE course adds content in two additional and related areas. Appendix B contains a table showing the content and assignments from a recent section of the course. Content on computing professions helps students develop initial career plans, and content on the CIT curriculum helps students match their career plans to select the appropriate path through the department's curriculum. This content is introduced on the first day of class with a discussion of "What is IT?" and "What do IT professionals do?" Throughout the semester, several recent graduates return to speak on their current jobs, tips for success in college and the IT program, how they found their first IT job, and other topics. Students also research current Bureau of Labor Statistics (BLS) data (Bureau of Labor Statistics, n.d.) and explore local job postings to learn more about the wide range of career opportunities in IT. The concept of professional networking is also introduced, and students set up a LinkedIn profile and make connections with fellow students, department faculty, and guest speakers in the course.

To help students connect with the CIT program curriculum, an entire class period is spent reviewing the available CIT degrees and discussing the detailed requirements for each degree. University-level graduation requirements are also discussed. Students use a degree-specific template to start developing a graduation plan during this class. The department's chief advisor joins this class session to help students understand the degree requirements and work with students who have existing credits from previous college courses or military credits to ensure that these credits are correctly applied. This class session is timed to coincide with the beginning of the registration cycle for the following semester. Students build on this session by completing an assignment where they meet with their assigned departmental advisor to plan their courses for the next semester.

Course Pedagogy
In the IT-specific FYE course, course content is organized into weekly modules. Each week, students were provided an online agenda that outlined the topics for the upcoming week, any activities students needed to complete before class, resources related to the week's content, and all assignments that students needed to complete before the next class. To promote student reflection and develop time management skills, students must complete a weekly reflection assignment. Each week students write at least two paragraphs. First, students discuss the current week – what they learned in class, what went well for them, what didn't go as well, etc. In the second paragraph, students discuss what they hoped to learn in the following week and what they needed to be working on. The weekly agenda page was designed to be an easy source of information to support both aspects of the weekly reflection assignment.

Promoting exploration and reflection are key pedagogical practices throughout the course. Most course assignments ask students to explore a new concept that has been introduced in class and then reflect on how they can make use of the concept in the future. For example, after a class discussion about time management where students engage in the Agile-based personal Kanban process and discuss the Eisenhower decision matrix, they complete an assignment where the students identify ten tasks they need to complete in the next week and use a time management practice to organize the tasks. At the end of the week, students submit a document listing the ten tasks, a discussion of the tool they used, a reflection on how well the tool worked, and a discussion of their plans for improving their time management practices.

Another pedagogical practice used in the class

was offering students choices to make the course more learner-centered (Becker 2006). This was done by setting up three "you choose" groups of assignments on student success, career planning, and information literacy. The assignments offered ways for students to learn about different campus services. For example, setting up a meeting with a peer tutor, having their resume reviewed by the career services office, or learning about library resources through a virtual escape room activity. Each group contained six or seven assignments with different values depending on the expected difficulty. Students could choose which assignments they completed, with a maximum point value that could be earned in each group. Depending on which assignments the student chose, a student needed to complete three to five of the assignments to earn the maximum possible points.

5. DISCUSSION

The IT-specific FYE course has now been taught every semester for five years. Most students in the fall semester offering are newly enrolled students. The spring semester has a mix of newly enrolled students, transfer students, and students who did not follow the advice to take the course in the fall semester. Discussions with upper-level and graduating students show that they saw a clear value from this course and also provided ideas for improving the course.

Efforts are underway to explore how the IT-specific FYE course has affected retention. The ongoing COVID-19 pandemic is affecting retention, so it is a challenge to measure the impact of the IT-specific FYE course. Additionally, since one goal of the course is to ensure that students are in the correct major, rather than retaining them in a CIT major, this will require access to a broader set of data. While analysis of this data is ongoing, it is possible to consider how students have done in the course and evaluate the course content.

Students
Looking at student engagement and success in the IT-specific FYE course, students fall into several groups. The largest group contains students who fully engage in the content and consider how to use what they learn to plan their future studies and career. Some students in this group were on this path at the start of the class due to good preparation in high school or knowledge shared by family members. Others in this group entered the class unsure of whether they belonged in college or were concerned about whether they could succeed in college. It is

rewarding to see these students engage with the FYE class and build their confidence in their ability to succeed in college and their future IT career.

Another group of successful students is those who determine that an IT major is not for them. These students are successful with the non-IT content in the course but can struggle with the discussions about IT careers and the IT curriculum. Efforts are made to connect these students with campus resources that can help them explore other majors. Where possible, they are allowed to modify IT-specific assignments to fit their new major and career interests.

The less successful students fall into one of two groups. The first contains students who are partially or fully engaged in the class meetings but struggle to complete course assignments. These are students who are struggling to adapt to college. These students may struggle with the lack of structure in college classes compared to high school classes, poor time management, lack of study skills, lack of motivation, or issues including financial strain, mental health, and family issues. As soon as instructors notice students are struggling, the university's Academic Early Alert system is used to engage student support services to work with the students. In some cases, the additional support allows a student to complete the course successfully. Unfortunately, other students are less successful in dealing with their challenges during the short duration of the course. While students in this group may not successfully complete the course, they learn about the personal challenges they face and make valuable connections to campus support services.

The other group of less successful students contains students who choose not to engage in the class. Generally, these students don't see the value of the course. They think they already know how to be successful in class, dismiss the content since it is not what they consider a "real IT" class, or feel that courses not directly connected to their (often vague or impractical) career plans are a waste of time. Instructors make an effort to find a way to engage these students, and some choose to engage, but some continue in the class with limited engagement.

A final group of students should be mentioned. These are IT majors in their second and later years. When students cannot take the class in their first semester, advisors will find an alternative, but some students self-advise and take the course since it is listed as a requirement in the university bulletin. Some of these students

are fully engaged and are great additions to the class, while others are minimally involved.

Content

Student feedback from an end-of-semester reflection assignment and discussions with individual students shows that students are engaged with all of the course content, but some content areas clearly work better than others.

The guest speakers are always the most popular aspect of the course. Instructors seek to schedule a diverse set of speakers, ideally allowing every student to find a speaker they relate to. Students find encouragement in seeing that the guest speakers also had concerns about succeeding in college and are receptive to the speakers' suggestions about study skills, the value of group work, how to find an internship, and many other topics.

Students also find value in the discussions of time management and personal wellness, and the students' weekly reflections regularly mention how they are using content from these areas. The content on financial literacy also gets a lot of positive comments. Students complete a basic budgeting activity and regularly mention being surprised at how much money they spend and set goals to increase their savings or reduce spending in specific areas.

Two areas of the course have mixed results. Students are very engaged in the content, but the submitted work needs improvement. One area is the discussion of jobs. In searching for job postings, they have trouble identifying jobs that match their interests or are entry-level positions. Part of the challenge here is that many job postings are hard to decipher. The other area with mixed results is an end-of-semester assignment where students record a 30-second elevator pitch. Students are enthusiastic about the activity, but their videos suffer from a lack of professionalism.

A couple of aspects of the class need improvement. One is the discussion about the CIT curriculum and the assignment to develop an initial graduation plan. This topic has several external problems, including a complex process and poor tools to support planning. It is also a challenge to get students to take ownership of this process since many high school students have limited choices for courses and may be used to others making decisions for them. Improving this aspect of the course is an ongoing effort.

Another challenge is some of the content from the university-level UNV 101 course. Staffing changes have led to gaps in communication and loss of knowledge about external tools used to support topics like diversity, equity, and inclusion that are not discovered until students report problems.

6. CONCLUSIONS

The IT-specific FYE course has been a positive addition to the CIT curriculum. Helping students identify their career goals and understand the department curriculum is an ongoing effort, but having a dedicated effort to address these during a student's first semester in college builds a good foundation that later courses in the curriculum can build on.

Additionally, identifying students who are in the wrong major allows these students to find the right major and reduces the number of students who struggle in later CIT courses due to a lack of motivation or feeling disconnected from the course content. A similar benefit is seen from efforts to help students identify problems outside of the classroom that will limit their ability to succeed in college. By connecting them with the appropriate support resources, they will hopefully resume their college efforts when they are better positioned for success.

Finally, the IT-specific FYE course allows the department to set the expectation that IT is about more than technical skills. Prompting students to build their study skills, time management practices, reflective practices, and other skills promotes lifelong learning and allows later courses in the curriculum to build on these skills.

This course will continue to develop and evolve, with current efforts focusing on improving the main content around graduation planning and adapting to the changing needs of incoming students. Efforts to assess the course using retention data will continue, and in the meantime, an exit survey is being considered to gather data on student perspectives about the course.

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Editor's Note:

This paper was selected for inclusion in the journal as an EDSIGCON 2022 Distinguished Paper. The acceptance rate is typically 7% for this category of paper based on blind reviews from six or more peers including three or more former best papers authors who did not submit a paper in 2022.

Appendix A

Learning outcomes for IT-specific FYE course.

1. Understand what a liberal arts education is and its role in their academic experience and success.
2. Demonstrate active participation and engaged learning in class discussions and activities.
3. Integrate their personal, academic, and career goals in relation to their values, interests, and skills.
4. Utilize campus resources and e-tools in pursuit of academic and co-curricular goals.
5. Demonstrate an awareness of the relationship between culture and identity within themselves and others.
6. Examine how their behavior and decisions have an impact on their personal well-being and on their communities.
7. Outline an intentional, integrated plan of curricular and co-curricular learning.
8. Describe the goals and activities of IT professionals across a variety of domains and organizations.
9. Describe the roles and responsibilities of various stakeholders within IT organizations.
10. Identify technological problems and seek solutions collaboratively.
11. Discuss various ways in which to communicate technological information to a variety of stakeholders.

Learning outcomes 1 – 7 are from the university-level UNV 101 FYE course. Learning outcomes 8 – 11 are additional outcomes for the IT-specific FYE course.

Appendix B

List of topics and assignments from a recent section of the IT-specific FYE course.

Week	Topics	Assignments
1	Course Introduction The transition from HS to college What is IT? discussion	Link LMS calendar to Google calendar Develop questions for speakers
2	Mindset • College Mindset • Growth/Fixed Mindset	Mindset reflection Personal vision for college and future
3	Time Management SMART goals	Set a SMART goal Try a new time management practice and reflect on it
4	Critical Thinking Fake News	Spotting Fake News
5	Guest Speaker Professional Networking	Reflection on guest speaker Create LinkedIn profile and make connections Danger of a Single Story (critical thinking)
6	Personal Wellness Taking Care of Others Overview of Jobs in IT	Personal wellness assessment Find an IT job posting. Post in LMS discussion and discuss postings from other students
7	No class - Fall Break	
8	Guest Speaker Introduce graduation planning resources	Reflection on guest speaker Find graduation planning resources for student's specific course of student Online discussion about stress and technology
9	Graduation Planning – led by chief department advisor Academic standing, probation, etc.	Develop graduation plan and meet with assigned advisor SMART goal update
10	Guest speaker Discussion of IT job descriptions	Reflection on guest speaker Online courses with quizzes on financial literacy topics
11	No class	
12	Agile activity	Review and online discussion of BLS data on computing fields
13	Financial Literacy	Complete budget spreadsheet (template provided). Submit reflection on budgeting process.
14	No class - Thanksgiving	
15	In small groups each student is interviewed on their career and education goals.	Submit recorded interviews. Record elevator pitch Final reflection on course.