AC 2012-5183: EASING INTO ENGINEERING EDUCATION: AN ORIENTATION PROGRAM FOR GRADUATE STUDENTS

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Easing into Engineering Education: An orientation program for graduate students

Abstract Orientation programs are an important contributor to a student's transition into an academic program. Transitioning into a doctorate program can be difficult, as each program has a unique set of expectations and norms to which a student must acclimate. Transitioning into an engineering education doctoral program is no exception with the additional difficulty of shifting from a more technical background to an education-based program. While researchers have examined the orientation process in various environments, little, if any, research has examined an effective means of transitioning students from a traditional engineering program into an engineering education doctorate program. The purpose of this project is to ease this transition through the development of a formal orientation for an Engineering Education department; the ADDIE model for training design was used. The first step was a thorough analysis of the department, student requirements, tasks, personnel, and knowledge, skills & attitudes (KSA) required by a doctorate student in engineering education. Then, we developed learning objectives and a plan of instruction that would optimize the learning, retention, and transfer of the information introduced during the orientation. Next, we developed the physical elements of the orientation program, which was followed by implementation of the program prior to the Fall 2011 semester. Lastly, we assessed the effectiveness of the program through a post-survey, designed to capture the reaction of the participants shortly after orientation, and a focus group, designed to provide more reflective feedback after the students completed most of their first semester in the program. Eight students attended the orientation. This paper will discuss the (1) analysis, (2) design, (3) development, (4) implementation, and (5) evaluation of an orientation program designed by graduate students specifically for new graduate students entering an engineering education doctoral program. There is minimal research on the transition from a traditional engineering program to engineering education, specifically for graduate students, and our project will provide insight into this transition and a means by which to aid in the transition. The goal of this paper is to bring added attention to the experience of new engineering education students and provide existing and departments with a systematic process for developing an orientation program that will assist students as they make this transition.

I. Introduction

When entering any new program, graduate students can struggle with the transition from undergraduate to graduate education (more thoroughly discussed in [1-5]). These struggles include the transition from the formal (course-based) structure of undergraduate programs to the more independent (research) structure of graduate education [4, 5]; establishing a good relationship with their advisor [5]; and reconciling the potential mismatch of their expectations versus the realities of graduate education [3]. This transition can become more challenging when the students are transitioning between departments with different ways of thinking, including different methods and different ways of knowing. Due to the limited orientation experience previously provided, it was decided that new students could benefit from a formal orientation program. This article presents the orientation program developed to aid students in transitioning from traditional engineering programs to an education-focused program as well as the process used during development.

The process used during development of this orientation program was based on the ADDIE model for training and instructional design, and the paper will be organized following these steps:

- **A**nalysis
- **D**esign
- **D**evelopment
- **I**mplementation
- **E**valuation.

In the first three sections, the ADDIE elements of analyzing, designing and developing the orientation are described along with the specific development steps we followed. In the fourth section, we describe the implementation of the orientation model and then we describe the results from our evaluation in the fifth section. We conclude with a discussion of limitations of the study design and directions for future activities.

II. Developing a Graduate Orientation Program using the ADDIE Model

The five main elements of ADDIE are found in Instructional Systems Development (ISD) models for instructional design [6]. The ISD models, including ADDIE, were created to view training or instruction as a system in which the learners, instructors, materials, and environment are different system components [7]. The steps reflect the same systems approach that is used in product development [6] and engineering design. ADDIE has been used in multiple training and instructional design settings [8, 9]. An overview of each of these steps is described below. The stages of this process were adapted from Goldstein and Ford's model[10].

A. Analysis

The initial stage of the ADDIE model of design focuses on a thorough needs assessment. Since the motivation behind our project is to aid students in transitioning from traditional engineering programs to an education-focused program, the first step in the process is to verify the need for the orientation program as well as the level of organizational support. To begin the needs assessment, the organization is analyzed (in this case of academic orientation, the department is the organization). The developers should first determine the level of organizational support and then become familiar with the goals and mission of the organization; this will serve as a starting point for what the orientation will need to cover. Departmental support needs to be established to ensure that implementation will occur upon successful execution of the design & development phase; this also helps verify that required resources will be provided. Additionally, it is important to understand what material the department wants to be covered during orientation.

The second step for the needs assessment analysis is the requirement analysis. This step works to establish the knowledge, skills, and abilities (KSAs) that will need to be covered in the orientation. This can be done by talking to multiple stakeholders who have insight into what is needed from an orientation program. Examples for an academic orientation may include faculty members and current students. Once the stakeholders have been consulted, their input and comments will need to be reviewed to create a more compact and accomplishable list of KSAs for the orientation.

The final phase of the needs assessment analysis is the person analysis. It is important to know who will be attending the orientation and what past experiences they may bring to the table that will need to be considered when designing the orientation. For example, if many of the new students in the department are returning from industry, professionalism may not need to be covered in as much detail as it would if all the students were coming directly from undergraduate programs.

All together, the analysis phase includes the following components:

- Identification of organizational support
- Organizational analysis
- Requirement analysis
- Task & KSA analysis
- Person analysis.

Each element is elaborated in the following sections in relation to the orientation program developed in this study.

Identification of Organizational Support: To ensure that the department was supportive of the development of an orientation program, the faculty member currently responsible for new student training was consulted in the initial stage of the design. The department was willing to support the implementation of the completed system and offered to provide the necessary resources for implementation. The graduate director suggested that the graduate coordinator handle the logistics of the orientation; the graduate director and current students should be involved as well. Graduate students were also consulted to ensure their support for the new orientation program. Since both members of the design team are members of the department and the graduate community, gaining the trust and support of the participants had already begun before the initiation of the project. The thorough integration of the design team members allowed for a direct contact with the stakeholders and the organization in place of a liaison team.

Organizational Analysis: The goals and mission of the department provided a starting point for what the orientation would cover. The department's mission is to be "inventive, inclusive, interdisciplinary, and international as we conduct cutting-edge research and scholarship, primarily in the emerging discipline… simultaneously developing and delivering meaningful and memorable learning experiences for future engineers and educators" (departmental website). To achieve this mission, the learning objectives for each graduate of the program are that students will be able: to conduct research; develop, review and critique research designs; teach engineering subjects; design and assess courses; and address issues that are critical to the field. The goals of the graduate program are clear; however, the current orientation does not focus on these goals and the KSAs needed to achieve them. To meet the needs of the department, a new training program was needed.

Due to the departmental level of the orientation, the university was not involved in this process. The design of the orientation is not restricted by external constraints due to the individual nature of the department. However, other resources on campus may be involved in the implementation of the orientation, such as a speaker from the Graduate Student Assembly (GSA).

Due to the small size of the department and the strong sense of graduate community, the new student orientation is not the only component of integrating students into the department. Current students will continue assisting new students as they integrate into the department, faculty will interact with students in classes, the graduate coordinator helps students create plans of study, and the graduate director serves as a preliminary advisor before a permanent advisor is selected. This creates a positive training climate throughout the department, giving trainees the reassurance of continued support by allowing trainees with additional questions or concerns to ask other graduate students, the graduate coordinator and director, or faculty members for assistance.

Requirement Analysis: Ultimately, the desired result of the training system is to produce graduate students who are able to successfully navigate the department with minimal difficulty. A qualitative approach was used to obtain information regarding the tasks and necessary KSAs for these students. Semi-structured face-to-face interviews were conducted with the current graduate director and graduate students. The interviews were not recorded; instead, a member of the project team took field notes on the responses. This allowed for general themes to be captured, but limited the number of exact, direct responses recorded. These general themes are translated into the KSAs in the next section. The graduate coordinator, due to her limited experience in the department (at the time, less than six months), was not included in the requirement analysis.

Task & KSA analysis: From the interviews with current graduate students, a list was compiled of common KSAs that are needed to be successful during a student's first year in the program as well as throughout their overall journey through the program. The KSAs have been mapped to the overall program goals to support their inclusion in the orientation, which can be seen in Table 1. Each KSA is followed by a K for knowledge, S for skill (or ability), or an A for attitude. Bolded KSAs represent KSAs that are applicable to multiple organizational goals; these appear on the table more than once.

Assessing and designing coursework was not included in the table because the KSAs needed to achieve that goal will not be developed in the orientation, but rather throughout the core courses within the department. An additional goal of *involvement and inclusion into the larger research community*, both within the department and the community as a whole, was included from the constant emphasis in the interviews.

Many of the KSAs in Table 1 were modeled from what current students stated that they wished they had known when they finished orientation and started the program. One major target mentioned by nearly all the students interviewed and the graduate director was a more thorough presentation of procedures and requirements. This refers to the major milestones that are needed to graduate from the program, such as taking the qualifier, completing a plan of study, and writing a proposal. The current students seemed to believe that this knowledge was not presented to them and is necessary to be successful in the program.

Table 1: Department Goals linked to KSAs (19 KSAs total)

Conduct research	Finding and using resources (S)
	Independent attitude (A)
	Time management (S)
	Ability to shift from engineering to education mindset (S)
	Problem solving (S)
	Intellectual curiosity (A)
Critique Research	**Ability to shift from engineering to education mindset (S)**
	Ability to Reflect on experiences (S)
	Respectful attitude towards others (A)
	Professional courtesy (S)
Teach	**Time management (S)**
	Communication skills (writing, talking, listening) (S)
	Ability to Reflect on experiences (S)
	Problem solving (S)
	Conflict management (S)
Address current issues	Knowledge of larger community (K)
	Ability to shift from engineering to education mindset (S)
	Professional courtesy (S)
Community	Finding advisor/knowledge of faculty (K)
	Knowledge of procedures and requirements (K)
	Knowledge of departmental expectations (K)
	Knowledge of university (K)
	Positive attitude towards department (A)
	Desire to be socially involved (A)
	Ability to shift from engineering to education mindset (S)
	Teamwork (S)
	Conflict management (S)
	Respectful attitude towards others (A)

Person Analysis: This training and orientation program is targeted at students who are entering the PhD program. Considerations will be made for the need of a separate orientation at the beginning of the spring semester versus at the beginning of the fall semester. Based on the interview with the graduate director, students are thought to be entering the program with an interest in teaching and research as well as a positive attitude based on their personal statements.

B. Design & Development

The second stage of designing an orientation program is to develop specific, measurable learning objectives. These should be based on the needs assessment analysis and should be clear as to how the students will prove they have achieved them. From these objectives, a plan of instruction should be developed to give the students the necessary knowledge, skills and abilities to achieve the learning objectives. The plan of instruction should be based on the needs assessment analysis and should focus on achieving the learning objectives. During this stage of design, the schedule for the day(s) and the activities that will be completed are developed.

The learning objectives for this project will be discussed in the following section and a direct mapping of each to the department goals and associated KSAs is also provided. Lastly, the initial plan of instruction, which is intended to address each of the KSAs previously mentioned through several training modules, is outlined.

Learning Objectives: To more specifically identify the goals of the orientation program, five learning objectives were developed based on the needs assessment. Upon completion of orientation, students should be able to:

1. Discuss the importance of research and teaching through a preliminary input or reflection to their individual departmental ePortfolio.
2. Communicate the expectations of the department according to the graduate manual utilizing a personal timeline-to-degree including major milestones.
3. Distinguish departmental faculty, staff, and students by areas of interest, title, and appearance to better establish departmental community and student knowledge of potential advisors through their performance on informal questioning to identify departmental community members.
4. Complete basic graduate student tasks (i.e. finding journal articles, travel approval forms, and the Student Services office, etc.) by navigating appropriate university and department resources.
5. Conceptualize the larger research community through the production of an individual concept map of their current view of the community highlighting key areas of research and practice.

After drafting the objectives above, we evaluated them to ensure that each was specific, measurable, active, relevant and able to be accomplished in during the duration of the training program (SMART). Each of the objectives entails a specific action that can be demonstrated by a trainee and measured for evaluative purposes at the conclusion of the process. To ensure each objective was relevant, each was mapped back to both the KSAs from the needs assessment and the learning outcomes outlined by the department as shown in Table 2.

Table 2: Mapping of KSAs to Department Goals and Learning Objectives

Knowledge, Skills, and Attitudes	Learning Outcomes (Department Level)	Learning Objective (#)
1. Ability to shift from engineering to education mindset (S)	Conduct and direct research Develop, review, and critique research Address critical issues Community	1, 3, 4, 5
2. Communication skills (Writing, talking, listening)	Conduct and direct research Develop, review, and critique research Address critical issues Community Effectively teach	1, 2, 4, 5
3. Conflict management	Effectively teach Community	4
4. Knowledge of faculty (finding advisor)	Community	3
5. Finding and using resources	Conduct and direct research	4
6. Independent attitude - find for yourself	Conduct and direct research	4
7. Intellectual curiosity	Conduct and direct research	-
8. Knowledge of current students and faculty	Community	3
9. Knowledge of departmental expectations	Community	2
10. Knowledge of larger community	Community	5
11. Knowledge of procedures and requirements	Community	2
12. Knowledge of university	Community	4
13. Positive attitude towards department	Community	All
14. Problem solving	Conduct and direct research Effectively teach	4
15. Professional courtesy (particularly in seminar)	Develop, review, and critique research Address critical issues	-
16. Reflection	Develop, review, and critique research Effectively Teach	1, 2, 5
17. Respectful attitude towards both teaching and research oriented students	Develop, review, and critique research Community	1, 3
18. Social involvement	Community	3
19. Teamwork	Community	4
20. Time management	Conduct and direct research Effectively teach	2, 4

Plan of Instruction: Once the learning objectives were developed, conditions were identified that would optimize the learning, retention and transfer of the information introduced during the orientation. The plan of instruction (POI) was designed in a manner that would allow students to be engaged and interactive. The learning objectives provided a road map for the development of the POI and the basis for assessing student achievement. It was important that the orientation consist of activities that would allow the trainees to develop and demonstrate competence related to each KSA as well as the learning objectives [10]. The POI will be implemented through the following training modules:

I. Welcome: led by Project Team (PT) and lasts approximately 30 minutes
    A. Introduction of the following people
        1. New students/trainees (NS)
        2. Graduate Director (GD)
        3. Graduate Coordinator (GC)
    B. Icebreaker Activity – to be determined
    C. Overview of the learning objectives -"Why am I at Orientation?"
    D. Overview of Orientation – "What will we be doing today?"
        - Material: printed schedules
II. Introduction to the department: will last approximately an hour
    A. GD – What students need to accomplish (i.e. department learning objectives)
    B. GC and Current Students (CS) – discuss the major milestones
        - Material: printed handout
    C. Activity: Build you timeline
        - Material: paper, markers, etc.
III. Overview of research Community and Professionalism: will last approximately an hour
    A. Professionalism Expectations (PT)
        - "Faculty and Grad Students Behaving Badly" – skits and videos of poor professionalism
    B. Departmental Community – overview of conferences and seminar (Seminar Faculty)
        - NS will discuss their research areas of interest
    C. Discipline Concept Map
        - NS will make their concept maps
            - Materials: papers, writing utensils
        - CS will show their concept maps and explain them
IV. Scavenger Hunt and Lunch: will last approximately 2 hours
    A. Give list of activities and locations for students to visit/complete as group
    B. NS will take pictures at each location
        a. Material: camera, which will be returned after the activity is completed
    C. Include CS in group
    D. Lunch
    E. Allow students to ask an questions that result from the scavenger hunt
V. Round Table discussion with CS: will last approximately 45 minutes
    A. Professional Organization presentation
    B. NS questions
    C. Questions concerning working with a specific faculty member/advisor

D. Offices and keys distributed and discussed

VI. Faculty Speed Dating: will last approximately an hour
   A. Each faculty will meet with each new student for about 4 minutes
   B. Each faculty will have a "baseball card" that will give to new student at the end of each meeting
      a. Material: printed baseball cards

VII. ePortfolio: will last approximately 30 minutes
   A. Overview of ePortfolio
   B. Teaching and Research Reflection – discussed periodically throughout orientation to think about this

VIII. Wrap-Up: will last approximately 10 minutes

C. Implementation

The third stage of designing an orientation program is the actual implementation. Implementation is the act of delivering the orientation, which includes the logistics of scheduling a room, gathering necessary resources, and ensuring the participants are informed of when and where they need to be. The implementation stage should take place the summer prior to students beginning the program (assuming the orientation is to be implemented during a fall semester) to ensure that ample time is provided to arrange each of the activities included in the POI. During this stage of design, the appropriate information needs to be shared with everyone who will be involved during orientation.

Overview: The orientation program was implemented in August 2011 before the fall semester. Due to scheduling conflicts, it was divided into two separate days. Eight students attended Day 1 and 7 students were able to return for Day 2 (5 students began the program in Fall 2011 and 3 students began in Spring 2011).

During orientation, students were provided an orientation packet that included a pack of baseball cards with information about graduate students and faculty members in the department. The packet also included orientation materials such as the schedule (see Table 3 below) and a visual aid of the faculty, staff, and graduate students in the department as well as university information such as a campus map. Each item on the schedule is discussed below:

Table 3: Orientation Schedule

Day 1	1:00 - 1:30	Welcome to Orientation
	1:30 - 2:30	Introduction to Department
	2:30 - 3:15	Overview of Research Community & Professionalism
	3:15 - 4:00	Round Table Discussion w/ Current Students
	4:00 – 4:15	Graduate Student Assembly (GSA) Presentation
	4:15 – 5:00	ePortfolio Introduction
Day 2	2:00 – 3:00	Faculty Speed Dating
	3:00 – 4:45	Scavenger Hunt
	4:45 – 5:00	Wrap Up

Day 1: During *Welcome to Orientation*, orientation coordinators explained the agenda and led the group in an icebreaker activity where they would get to know one another, i.e. name, past education, why he or she decided to attend graduate school, etc. Students were then asked to participate in a think-pair-share activity where they tried to answer the questions "What is this discipline?" Next, the objectives for the department were discussed. Lastly, the orientation learning objectives were discussed to allow students to directly connect orientation and department objectives.

Next, the assistant department head for graduate programs for the department introduced students to the department. She provided a brief overview of the department as well as the faculty, staff, and current graduate students. Additionally, the requirements for degree completion were covered, highlighting each of the major milestones, i.e. qualifier exam, composing a committee, submitting a plan of study, etc. Next, each student was provided with coloring utensils and a large sheet of paper so they could develop a personal timeline that included each of the degree requirements.

Students were introduced to the larger research community and the department's expectations regarding professionalism during the next section of orientation. We discussed conferences and what poor professional conduct could mean for a graduate student in such a small community; this was facilitated the orientation coordinators and the senior faculty member responsible for the department seminar course. A short video clip of unacceptable behavior was shown to generate discussion about how to behave at a conference. The clip was from a popular television program and found through Youtube.com.

Four students were recruited from the current graduate program to participate in the round table discussion. Students were recruited based on their progress within the department as well as their previous experiences that lead them to the program. These students discussed their experiences and answered any questions the new students had. Next, a representative from the GSA briefly spoke to the new students and new students were briefly introduced to the department's ePortfolio requirement, which concluded Day 1 of orientation.

Day 2: Faculty and staff were invited to participate in orientation, which resulted in sufficient volunteers for speed dating. Each student was allotted approximately 3 minutes to engage with each of the present faculty and staff members in a speed-date-like fashion. Since the students participating in orientation were out-numbered, current students were asked to participate in this portion of orientation as well to ensure each faculty and staff member would have a student to talk to during each 3 minute session.

At the conclusion of speed dating, students were divided into two groups and given instructions for completing a scavenger hunt. Each group consisted of at least one member who had been a student at the institution for at least one semester but had not received orientation through the department. This enabled the scavenger hunt to go quicker than expected and assisted the students through the process. When the students returned with the task completed, the orientation concluded with a wrap-up discussion about what took place over the two days.

D. Evaluation

The evaluation of the orientation should include assuring that the students met the learning objectives, but should also collect data for continual improvement and reform of the orientation program. Subsequent orientations should integrate the results of the previous orientation's evaluation. For this orientation program, the evaluation was submitted and reviewed by the Institutional Review Board.

The evaluation consisted primarily of a focus group conducted by a third-party at the end of the new graduate students' first semester. The focus group consisted of six questions. Of the eight orientation participants, five students participated in the focus group. The questions used to evaluate the objectives of the orientation included:

1. What was most memorable about orientation?
2. Think back to the beginning of the semester.
    a. How confident were you about joining the department?
    b. Did orientation help this element of your transition?
3. What was the most useful part of orientation?
4. What, if any, impact did orientation have on your first semester?
5. What social or academic challenges did you face during your first semester?
6. Based on your first semester, what would you change about orientation?

A summary of responses to each question is provided in the following sections.

1. What was most memorable?

Responses to this question varied, and most students named more than one memorable thing. Students named the scavenger hunt, the baseball cards and the faculty speed-dating as most memorable. The three students who named the scavenger hunt described it with mixed opinions. All agreed that it was "fun" and "hot" (it took place outside in late summer), and one student noted that s/he liked it even though "it was the last scheduled event and the participants (including myself) were eager to leave." All students but one agreed that it was useful and informative—even two students who were on campus before said that they learned things about campus that they did not know. One student said that s/he would have preferred a simple tour, and another student commented that many of the sites visited during the hunt seemed geared toward the undergraduate experience. However, another student countered that it was a general campus culture introduction and that the visits included many graduate-centered sites, such as the grad section of the library, student services, and the graduate learning center. Students also commended the activity because it was a casual way to get to know the other students.

Three students cited the baseball cards as memorable. The cards, according to students, helped because they provided pictures and "you didn't have to try to memorize." The "synopsis" was useful because you could "place people as you met them." The baseball cards also helped the new students to be aware of the interest areas of both students and faculty.

One student mentioned that the academic planning activity was also memorable because it "really hit on the core of why we're here." However, hearing this comment, another student joked, "I vaguely remember that." Later, s/he said that it did help to plan out and identify which

course they could take in collaboration with requirements and interests. It was also useful for them to talk to current graduate students about their impressions of specific courses.

One student remembered the speed-dating with faculty. S/he commented that "it would have been prudent to make sure we all knew the dynamics of our department," and added that some conversations were a little uncomfortable due to not knowing the background of everyone. Another student commented, "I used this time as the first 'awkward encounter' with the faculty members. The second time I met them it was much easier to start a conversation." Another student agreed and suggested that the different types of faculty (primarily first-year/teaching and primarily research) be distinguished. Both students agreed that everyone should participate, including the staff.

2. Confidence

Students who started in the "off" semester commented that they would have been more confident if they had joined the department in the regular Fall semester and that the orientation would have helped. Students joked that many of the issues were practical—"how to find my classes, my parking lot, lunch…" and that information on these issues was helpful.

Students were generally confident about their decisions to attend graduate school but enjoyed the opportunity to meet people before classes started. As one student commented:

> S: I was fairly confident about my decision to join the department but was nervous about meeting all of the existing graduate students and the faculty members. I had just moved to the area and so everything was so new. It was a bit intimidating.
>
> F: Did orientation help this element of your transition?
>
> S: Orientation was a huge help in my transition to Blacksburg and to the department. Not only did I get to meet the students in my cohort, but I got to meet existing graduate students, faculty and staff.

In general, most students were confident and excited to get started, especially after orientation.

3. Usefulness

Several students cited the baseball cards and the academic planning as the most useful activities in orientation and there was extensive discussion about ways to extend the planning activity throughout the first semester. The baseball cards were useful because the students could keep them and use them as references later.

Two students agreed that meeting other students was most useful. One student stated:

> The most useful part of the orientation was the overview presented by [the orientation leaders] and ***any and all*** time we were able to spend with the more experienced students in the department, asking them questions and hearing about their experiences. For me so much of feeling comfortable and welcomed is knowing people around me.

Another student agreed with this and added that it was a very important outcome that s/he knew the people in their cohort well.

4. Impact on first semester

This question elicited repetition of points addressed by the other questions. Students explained that the planning session was helpful: "One impact the orientation had was the introduction and discussion of the process and steps to attain the degree. This was very helpful and made the process clear to me."

Students agreed that the social aspect of the orientation was also beneficial: "I think the biggest impact was getting to meet and spend time with people in my cohort. It was great for that small group of students to get together and ask questions and talk. It made starting the semester much smoother."

Notably, one student summed up an intangible result that one might think central to the objectives of any orientation: "It helped welcome me and let me know that the department cared about me."

5. Challenges faced during the first semester

Students identified two main challenges during their first semester: figuring out workloads and choosing an advisor. The workload issue ranged from adapting to a graduate academic schedule, to balancing GTA/GRA work with courses and personal life. The coursework was more time-consuming than many of the students had expected, and the same was true of time spent grading if they worked as GTAs. They also talked about including social time and family time in their demanding schedules. Basically, the students found it challenging "to make it all work."

The challenge of choosing an advisor was also more complex than expected. One student summed up the process as an overwhelming task to accomplish in one semester:

> I need to [find a faculty member that I will] be able to work well with and they should have similar research interests to me. I need to figure out who this person is, what I'd like to research, and talk to them about performing this research during my graduate lifetime.

One student agreed, saying that it's "extremely tough" to identify the right advisor and that "you're not sure if you're still in the 'dating' phase and everyone's happy, or if there is a potential explosion later on. You don't know because you just got here." Another student was concerned that s/he didn't want to work on someone else's research, but still wanted a Graduate Research Assistantship at some point and didn't know how to approach faculty. In terms of orientation, students wanted more clarification on the process of identifying an advisor.

6. Improvements

Most students thought that the week of orientation was too intense, with not only this orientation but other meetings required by the TA program and the Graduate School: "It made for very long days on what was already a fairly overwhelmingly start to a new school."

Students also suggested that the planning activity be stretched over the semester, perhaps at critical times such as when students are registering for courses. Another student echoed the idea of needing more time for planning:

> Almost a dedicated timeline work session, where experienced students could talk to us about typical first semester courses and how the timeline really plays out. The current model exposed me to completing a timeline, but I had no idea what I was doing or what was realistic for graduate study.

Another student also mentioned that s/he would appreciate information about courses that have limited enrollment or are offered only during certain semesters. Some students are on a very focused track and others have more time to explore options in their degree plan, and these differences could be addressed.

Two students suggested that "words from previous cohorts would be useful—like FAQs, lessons learned, most valuable courses in other departments."

Other students suggested removing unnecessary information during the orientation, such as the department's ePortfolio program and having a campus tour rather than a scavenger hunt. One student said that it was "too much info to digest: I needed to know who I was comfortable taking my questions to, so when I needed something explained again, I knew who to go to."

III. Discussion/Conclusion: Strengths and Weaknesses of using ADDIE

In following the steps of the ADDIE model, several challenges arose and resulted in changes to the program between the design and implementation phase. First, because of scheduling conflicts with involved faculty and the participating students, the decision was made to divide orientation into two days. Second, the teams completed the scavenger hunt faster than anticipated and Day 2 did not last as long as we expected. Students were unable to create visualizations of the larger community as initially planned due to several activities taking longer than scheduled. Lastly, the department head addressed the students at a time different than initially scheduled due to conflicts that presented themselves after orientation was scheduled; the schedule was altered slightly but this did not prove to be a problem.

While working with the ADDIE model to design the orientation program, several strengths and weaknesses were discovered. One of the major strengths of using the model was that it provides clear distinct steps that are easy to follow. The analysis stage of the model provided guidelines and opportunity to complete a thorough needs assessment before attempting to design the orientation program, without which the program design may have been based on preconceived notions regarding what should be included instead of what was needed by the department. The model also held us accountable for evaluating the program, without which we may not have taken the time to complete. Another advantage of using the model is the iterative nature, which allowed us to constantly reference and revisit the previous steps as we moved forward. This was especially important when the program needed to be divided into two days due to logistical changes.

One of the weaknesses of using this model is that each of the steps can take a considerable amount of time to complete successfully. Since we began this project more than six months before the orientation program would be implemented, this did not prove to be a problem for us. However, for those considering this approach, the time requirement must be considered. It is the belief of the research team that the time commitment is necessary to fully investigate and develop the orientation that will best address the need of the new students and the department. Furthermore, once an effective orientation program is developed, the process can be more easily implemented each year and continual improvements identified in a cyclic fashion.

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References:

1. V. L. Baker and M. J. Pifer, Studies in Continuing Education **33** (1), 5-17 (2011).
2. D. D. Chapman, C. A. Wiessner, J. Morton, N. Fire, L. S. Jones and D. Majekodunmi, New Horizons in Adult Education & Human Resource Development **23** (1), 6-24 (2009).
3. S. K. Gardner, ASHE Higher Education Report **34** (6), 41-60 (2009).
4. B. E. Lovitts, Studies in Higher Education **30** (2), 137-154 (2005).
5. S. Sambrook, J. Stewart and C. Roberts, Journal of Further & Higher Education **32** (1), 71-84 (2008).
6. M. Molenda, J. A. Pershing and C. M. Reigeluth, *Chapter 13: Designing Instructional Systems*, 4th ed. (McGraw-Hill, New York, 1996).
7. W. Dick, L. Carey and J. O. Carey, *The Systematic Design of Instruction*, 6th ed. (Pearson, Boston, 2005).
8. I. Shibley, K. E. Amaral, J. D. Shank and L. R. Shibley, Journal of College Science Teaching **40** (6), 80 (2011).
9. W. C. Allen, Advances in Developing Human Resources **8** (4), 430-441 (2006).
10. I. L. Goldstein and J. K. Ford, *Training in organizations: Needs assessment, developoment, and evaluation*, 4 ed. (Cengage Learning, 2002).