Practical Solution to Assuring Student Preparedness for Advanced Information Science Courses

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Abstract

For the problem of students not having had the opportunity to take prerequisite courses before enrolling in more advanced studies, this paper proposes a solution that will specifically enable students to acquire the needed skills. The proposed solution addresses a method in which such students will be required to complete a minimum amount of independent introductory coursework before being admitted to the advanced level.

Keywords: student preparedness, curriculum requirements, students' lacking prerequisites, courses out-of-sequence

1. INTRODUCTION

Every fall semester I face a dilemma. What do I do with students who are enrolled in my advanced Information Science courses who have not yet taken the prerequisites? Because of the size of my institution and the numbers of majors in my department, we can only offer many of our upper-level courses biyearly. Often we find ourselves in an out-of-sequence situation because students have decided to major in Information Science late in their college careers or have put off taking classes due to scheduling problems and therefore have missed the opportunity to take various introductory courses. It sometimes becomes necessary to allow a student to enroll in an upper-level course before (s)he has taken its prerequisite(s). This usually occurs because the required advanced course will not be offered again before the student is scheduled to graduate.

2. JUSTIFICATION

At the core of our Information Science major are four basic requirements:

1. Introduction to Programming in Java
2. Visual Basic .NET Programming
3. Advanced Programming Techniques in Java
4. Database Management

We expect our students to follow this sequence, one course per semester, so that by the end of their second year they are fully prepared to move into more advanced coursework. These courses provide students the basic knowledge they will need to complete our program: programming in two languages, utilization of an Integrated Development Environment and data management techniques. Our upper level course content is based on the expectation that students are knowledgeable in these core topics. Errol Thompson concludes that programmers develop a base of knowledge as apprentices which they can draw from and apply to future programming challenges (2003). Just as Introduction to Programming is the prerequisite for all further programming classes,

Visual Basic .NET Programming and Database Management are prerequisites for our advanced Web Development class.

3. POSSIBLE SOLUTIONS

Sometimes students fulfill their prerequisite requirements outside of our college by enrolling in equivalent classes at another institution or online. Or, conversely, they can take the advanced course elsewhere after having studied the basic core with us in order to alleviate the shortage of time they are dealing with. When this is not the case, however, we have several choices when deciding how to handle this circumstance.

- Require the student to wait out the cycle and take the courses in the proper order
- Offer the student the opportunity to take the prerequisite course(s) as independent or directed studies while simultaneously taking the advanced course
- Allow the student to take the advanced course without the basics hoping they will be able to make the adjustment
- Have the student wait, take the prerequisite(s) when next offered and then allow them to take the advanced course as an independent or directed study

I have utilized each of these solutions in the past and found that none of them have worked effectively.

4. HISTORICAL EXPERIENCE

Requiring the student to wait until the courses are offered again so (s)he can take them in the correct order often means that the student will have to extend his/her college career to five or even six years depending on how long (s)he has to wait. It is usually not in the student's best interest to do this. Spending two years waiting for two or three courses is really just not practical.

Allowing the students to take their prerequisites as independent or directed studies while simultaneously taking the advanced course has not solved our problem in the past. The student will not have learned enough of the information early enough in the semester to put him/her on an equal footing with those in the class who have completed the prerequisite(s) in advance. This also puts undue pressure on the facilitator of the independent/directed study to get the student "caught up" quickly.

The third alternative, allowing the student to take the advanced course without any prerequisite work has been, in my experience, the worst possible solution. The student is at a distinct disadvantage and is poorly equipped to do the work that the course demands. During the 2005 – 2006 school year I had just such an instance. I allowed a student (James – see Table 1) to take my Systems Analysis and Design class without knowing how to program in Visual Basic (VB) although it is required since the students must produce a prototype in that language. This student assured me that he would learn VB on his own while the course was in progress. Since he did not need the VB skills until near the end of the semester I felt confident that he would be able to learn enough VB (he already knew how to program in Java) to suffice. He put off learning to program in VB until the very end of the semester and was not able to produce a prototype which severely impacted his grade.

Additionally, in the past I have asked students to wait a year, take the prerequisite(s) and then facilitated the advanced course as an independent or directed study. The results of this combination have also been less than satisfactory. The students did not learn nearly as much in this format as the students who participated in the regular class. Their motivation levels were much lower and they missed out on interesting discussions of the advanced material. These students were much less engaged with the information and suffered because of the lack of classroom setting.

5. PRACTICAL SOLUTION

This fall I will be teaching our advanced Web Development course in ASP.NET which has several prerequisites. Most important of the prerequisites are Visual Basic .NET Programming and Database Management. It is possible to teach this course at a lower level

but it has been designed as a 300-level course with the expectation that students have the background to "develop more complex ASP.NET Web applications than a beginner" (Kalata, 2005). Billy Lim notes that information science departments need to provide courses "where all the major components of the web with respect to development are studied extensively" (2002). Our goal is to build on our students' core of knowledge in Visual Basic .NET programming and the utilization of relational databases so that they can advance to the stage where they produce fully functional interactive data driven web sites.

Fully half of the students enrolled for the fall course have not yet taken one of these two classes and two students have taken neither (see Table 1). This seemed to be an impossible situation. I thought about putting off the Web Development class but that puts those students who are ready at a disadvantage. With the approval of my department chair I decided to require the unprepared students to take a "mini" course this summer which will cover the first four weeks of the class they are missing. It is my thought that this will give them enough information to enable them to comfortably move forward with the advanced material. These are not "official" classes. They will receive no credit, will not be graded and are not charged a fee. They are still required to take the courses they are missing when offered again.

The students should be self-motivated to do the readings and assignments since if they do not complete the assigned work they will not be permitted to take the Web Development course in the fall. With the support of the other members of the department and the approval of the department chair, I am sure that this will become accepted by our students as a requirement that they must fulfill if their coursework is out of sequence. In addition, since they must take these missing courses at a later date, when they do take them they will have an advantage because they will have already covered some of the material.

6. IMPLEMENTATION

During the last four weeks of the spring semester, following pre-registration for the fall, I contacted each student who had not previously taken the prerequisites for fall's advanced Web Development class and informed them that they were required to engage in an independent mini course over the summer to help them get prepared. I met with each student to make sure that they had the necessary software installed on their computers before they left for the summer. I set up an online BlackBoard site for each course and made sure they were enrolled before leaving for home. I created and uploaded to BlackBoard a syllabus for each course covering textbook information, chapters to read and assignments to be completed. I informed the students that they had until the end of July to complete the assignments and upload them for my approval. The mini courses were essentially a condensed version of the first four weeks of a normal full-semester course.

Visual Basic .Net

Required Text:

Microsoft Visual Basic .NET Programming Essentials, McGraw Hill, O'Brian and Seaver, ISBN: 0-07-225621-4

Concepts covered:

- Introduction to Visual Basic .Net Programming
  - An overview of Object Oriented programming
  - The utilization of the Visual Studio IDE
  - A first application – the Hello World Solution
- Developing a Visual Basic .Net Application
  - The development cycle
  - Flowcharts and Pseudocode
  - Designing the Graphical User Interface
  - Interacting with the user
- Using Forms and Controls
  - Practice with various controls and properties
- Writing Visual Basic .Net code
  - Use of Modules, Procedures and Methods
  - Variables and Operators
  - Scope

- Conditional Structure
  - If … Then … Else Statements
  - Conditional Expressions

- Repetition Structure
  - For … Next Loops
  - While Loops

Database management

Required Text:

Databases - Design, Development & Deployment using Microsoft Access, 2nd edition, McGraw Hill, Rob and Semann, ISBN: 0-07-288630-7

Concepts covered:

- Database vocabulary, concepts and design tools
  - Entities, entity sets and attributes
  - Database tables and components
  - Entity integrity
  - Referential integrity
  - Relationship types
  - Entity Relationship Diagrams

- Normalizing the database table structures
  - Data redundancy
  - Normal forms

- Implementing the database design
  - Creating a new database
  - Creating tables
  - Creating relationships between tables
  - Data entry

7. RESULTS

By the end of the second week in June I contacted each student to assess their progress and encouraged them to get started if they had not yet begun. I continued to initiate communication with them at least weekly throughout the summer. I was available for help via email (checked daily) and offered to hold live chats with each group in order to answer questions and encourage a classroom atmosphere. I supplied suggestions when their work needed improvement and required them to recreate some work if necessary.

The students' involvement in the mini courses was varied as were their results (see Table 2). All but one did the work required in the timeframe provided. This student has since left the major. The fall semester is currently underway and the advanced Web Development class is moving at a good pace. The students who had fulfilled their prerequisite requirements are not being held back by those who did not. And those who took the Visual Basic .Net mini course over the summer have shown no indication that they are unable to keep up with the rest of the class. I am aware of what has and what has not been covered and can take extra time if necessary to help them in areas where they might need additional support.

Three weeks into the fall semester I polled the students who took the Visual Basic mini course – their response was overwhelmingly positive. They confirmed that taking the Web Development course at the 300 level would have been difficult to impossible if they had no background whatsoever in Visual Basic .Net programming. One of these students, James, nearly failed the Systems Analysis and Design sequence last year due to his lack of Visual Basic .Net programming skills. He is now easily keeping up with the rest of the class and told me that he wished we had done this sooner. At the time that this paper was submitted in its final format the class had not yet reached the database programming unit. However, judging by the results I have seen so far, I am sure that these students will have a similar experience.

8. CONCLUSION

With a strong start to this fall semester's Advanced Web Development class I remain optimistic that the requirement of summer mini courses for students who are lacking prerequisites will be the answer to a problem that has plagued my department for many years. The assignments I have been receiving and the level of understanding that is evidenced therein shows me that the students gained enough knowledge over the summer to allow them to be able to tackle more advanced implementations of their

skills. This is the most proactive approach that we have ever taken to solving the problem of how to most effectively teach students at an advanced level who are missing some of the basic information they need. These students are certainly better prepared and are having a more positive classroom experience than any of the students I have worked with who have been in this situation in the past. The other members of my department and I plan to utilize this mini course solution again in the future.

9. REFERENCES

Kalata, Kathleen, 2005, Introduction to ASP.NET, 2nd edition, Thompson Course Technology, Boston, MA.

Lim, Billy (2002). "Teaching Web Development Technologies: Past, Present, and (Near) Future." Journal of Information Systems Educaton, 13 (2), pp. 117 – 123.

Thompson, Errol (2003). "Teaching to Foster Implicit Knowledge." Information Systems Education Journal, 1 (2). http://isedj.org/1/2/. ISSN: 1545-679X.

10. APPENDIX

Table 1 – Students Enrolled in Advanced Web Development who are missing various prerequisites

Student	Missing Prerequisite(s)		Summer Study	
	Database	VB.NET	Database	VB.NET
James		✓		Mini course
Joe	✓	✓	Mini course	Mini course
Lauren	✓	✓	Mini course	Online course
Monica	✓		Mini course	
Rachel	✓		Mini course	

Table 2 – Mini course results

Student	Completed Summer mini course(s)		Current student status
	Database	VB.NET	
James		✓	These two students have indicated to me that they could not have managed the pace of the Web Development class had they not done the mini course in preparation
Joe	✓	✓	
Lauren			Changed majors
Monica	✓		At the time of final submission for this paper the class had not yet begun to study data driven web sites.
Rachel	✓		