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To meet the demand of online education, a significant portion of online courses are taught by tenured or tenure-track faculty members. Instructors like to use online materials developed by commercial publishers and other institutions, but they have many reasons to oppose the wholesale importing of materials from them (Hartnett, 2013). To make a positive transition from face-to-face to online courses, instructors need to invest significant additional intellectual work and course preparation time and to accept changes in their working conditions. While no single approach or model seems superior for all online learning courses, knowledge sharing among instructors who teach similar online courses would be useful to guide the design and development of online courses. This is the motivation for this action research study. The objective of this investigation is to report the experiences of transforming from a face-to-face course into its online course through an action project.

**LITERATURE REVIEW**

Online education is growing due to the recent technological advances of the internet (Donavant, 2009). According to the Sloan Consortium, a national consortium of organizations and institutions, online education has been a disruptive innovation that has profound impacts on the traditional education form by using information technology to deliver convenient educational products and services online (Christensen & Horn, 2013). Online education has its advantages as well as shortcomings (Dynarski, 2018); nevertheless, higher educational institutes are using online education as a strategic advantage.

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institutions committed to online learning, any course where at least 80% of the content is delivered through the internet is an online course (Allen & Seaman, 2014). The quality of online education is highly debatable (Chao et al., 2006). A recent national survey shows that the professors’ views on online education are still highly mixed even though about half of professors have taught online courses (Lederman, 2019).

Due to high demand, few higher education institutions can ignore the opportunity of online education. As a majority of professors oppose using external vendors to deliver online academic programs (Lederman, 2019), most online courses are developed by the current faculty members through transforming face-to-face courses into their online versions. Clearly, faculty engagement in online course development is necessary if universities are to meet the market demand. Faculty engagement of online education requires not only academic quality, creativity, and expertise to develop dynamic and rigorous online courses but also continued involvement and a strong faculty presence for student learning, motivation, and persistence in online programs (Norman, 2015).

There is no shortage of documented studies in the literature that investigate best practices for converting face-to-face courses into online courses (Baran, 2011; D’Agustino, 2012; Martin et al., 2019; Orellana et al., 2009; Redmond, 2011). The typical conceptual framework of a Design, Assessment, and Facilitation for an Effective Online Course for online course development (Martin et al., 2019) is not much different from many commonly used frameworks for face-to-face courses; however, the components of the framework for online courses can be different from that for face-to-face courses.

Course Design

The online course and its corresponding face-to-face course should have the same learning objectives and similar backward course design processes. However, the design of online course materials emphasizes more the student-course content interactions. Many higher education institutes, including my university, have formal online course design guidelines (Baldwin et al., 2018). Well organized and structured online course content plays a central role in engaging learners. A framework of online course design for an academic subject can be applied to structuring course contents and facilitating the design process (Norton & Hathaway, 2017).

Assessment of Learning

The design of assessment for online courses should emphasize student-student interactions by using more formative assessment instruments. In online courses, discussions, assignments, and projects can be more effective assessment tools than exams (Gaytan, 2005). To better avoid academic dishonesty in the online learning environment, online courses often use individualized assessment instruments (Mills, 2010).

Facilitation

Online courses emphasize instructor-student interactions, so timely feedback, individualization, and written communication are all critical in online courses. On the other hand, group activities are difficult to facilitate in online courses. Online courses are predominantly asynchronous (Stern, 2004). Fast-paced group workshops are difficult to apply in online courses.

METHODOLOGY: ACTION RESEARCH

Action research is an empirical inquiry process that includes a cycle of planning, action, and fact-finding about the result of the action (Elliott, 1991; Guy et al. 2020; Lewin, 1958). The major purpose of action research is to solve a particular problem and produce guidelines for effective practices (Stringer, 2014). In action research, the researcher takes actions, collects data, and generates theories beyond the reflective knowledge created by outside experts.

An action research study can be conducted by individuals (Argyris et al., 1985) or a group (Heron, 1996). From a broad perspective of participatory action research (Freire 1970; Reason & Bradbury, 2008), action research is a self-investigation and self-learning process. Action research may not be a monolithic body of ideas and methods but rather a pluralistic orientation to knowledge making and social change (Camic & Joas, 2003).

Action research promotes a shared commitment to democratic practices, integrates theory and practice, and engages researchers as educators in social changes (Brydon-Miller et al., 2003). The education field calls for action research to investigate the challenges and opportunities in online education (McPherson & Nunes, 2004). The usefulness of action research for online education
lies in the empirical and research evidence that can support educators to better understand and learn from their own practice through investigating different perspectives.

In the context of educational research, action research is a disciplined process of inquiry conducted by and for those taking the action (Sagor, 2000). The primary motivation of action research is to assist the action-taker in improving and/or refining the actions and to share knowledge with others.

The present research project applies two models for action research of the transition from a face-to-face course to an online course: the ADDIE (Analysis, Design, Development, Implementation, and Evaluation) model (Morrison, 2010), which is a generic framework of instructional system design for course development, and the Elliott’s model (Elliott, 1991), which is an action research framework particularly relevant to education. This research project consists of three phases: design, implementation, and assessment of the transition. In the design phase, the actions include analyzing the differences between the face-to-face and the online learning environments of this programming course and the design of the online course pedagogy. In the implementation phase, the actions include preparing the online course materials and overseeing the operation of the online course. The assessment phase summarizes the experiences and reflects on the action study.

The data sources were my observations and the data forms were mainly daily journals and field notes. The narrative qualitative data were descriptions of plans, procedures, and reflections. The quantitative data were mainly the workload involved in the action research project and the students’ performance in the online course. During the analysis stage, data categories were created in accordance with the objectives of the project, and the data were sorted for each of the categories. The categorized data were then summarized, evaluated, and interpreted for this action research project. Figure 1 shows the action research phases used in the present action research project.

THE ACTION PROJECT

Overview of the Course

The course for the action project was the introductory computer programming course IS 2010.1 Foundations of Information Systems in the IS 2010 Curriculum Guidelines (Apigian & Gambill, 2019; Topi, 2019; Topi et al., 2010). It is a required course for Management Information Systems (MIS) majors at most MIS programs. This course introduces the computer languages used in business information systems. I have taught this face-to-face course at my current institution for more than twenty years, but I have not constructed the online version until this action study. The premise of this course includes the following arguments:

- MIS majors need to learn more than one computer languages to develop a broad vision of MIS.
- The selected computer languages are representative and cover essential concepts and features of all types of computer languages that are commonly used in MIS.
- The selected computer languages do not require additional computer resources at this university.
- The scope and workload of the course should be manageable.

During the past twenty years, the topics taught in this course have been adjusted to meet the needs of the job market in MIS. Recently, the topics of C, C++, HTML, JavaScript, and CSS have been included in the course. The major feature of this course includes the following characteristics:
• Students learn programming through practicing typical examples of programming and creating their own programs in the form of small-scale projects.
• Students learn key concepts of computer programming instead of algorithms.
• Students learn basic and commonly applied syntax of computer languages.

The learning objective includes the following outcomes:
• Be able to read simple programs in the computer languages.
• Be able to design simple programs in the computer languages for business applications.
• Be able to implement the designed computer programs for simple business applications.

According to the university Online Education Office, the online version of this course must meet the same requirements as the corresponding face-to-face course. Thus, the online course keeps the same topics and learning outcomes of the face-to-face course. The assessment method used in both forms includes three small-scale programming projects, each of which has three assignments.

I have taught this course as an online course after teaching the course face-to-face for many years, but I have not systematically elaborated the transition process through a mindful reflection until this study. This study applies the action research approach (Denscombe, 2010) to practice a reflective process of the transition from face-to-face to online teaching for the common business course through a case study. The objective of the study is to understand the problems faced by the instructor during the transition and their solutions.

Phase-1: Design
In the present study, the face-to-face course was well-established and had been taught for many years. As the online course is not supposed to alter the learning objectives, the pedagogy and course materials for the online version follow the structure of the face-to-face course. Forward design and backward design have been reviewed for the online course, but no repetition process was needed, assuming that the student bodies in the two forms are similar. Thus, the transition emphasized the tactical issues of developing course content to fit the online environment.

(1) Search for information on similar online courses
I searched the internet to learn more about best practices in similar online courses. Successful online programming courses have three common features: high-quality online tutorials and videos, several small projects for learning-by-doing, and instant feedback to ensure the students are learning in the right direction (Bailey, 2020; Borowski, 2017). The design of the online course must incorporate these features by developing quality online materials, constructing effective assessment instruments, and creating student-instructor, one-on-one online interaction channels.

(2) Develop the structure of an online course site on the Online Learning Management System (LMS)
In this case, the Blackboard platform was used to host the online course site. The navigation menu included several sections. Normally, the first section contains general information on the course and introduces the instructor. The second section of an online course site is the course content area that allows students to access course materials on a time sequence basis. Some instructors organize course contents in the order of chapters or units while others use weekly modules. The third section of an online course site is a student resources area that allows students to receive grades and feedback, check their calendar, access the discussion board, and use various tools for student-instructor and student-student interactions. The course site for the current course included an additional section, a so-called One-Stop-Entry, that allowed students to find a particular type of course resource without an intensive search of the course content section. The One-Stop-Entry section can save students’ time in finding needed resources that are used across the entire course. To not replicate course materials, the One-Stop-Entry used linkages to those materials presented in the second section, and to avoid confusion, the course site explained the proper use of One-Stop-Entry at the first class through a video.

(3) Development of online instruction materials
The online instruction materials in this course included three types of documents: PowerPoint (PPT) slides, Word/PDF documents, and videos.
This course did not use a specific textbook but relied on these online documents for students to learn key concepts as well as practical skills. Detailed explanations of typical programs and step-by-step tutorials for hands-on exercises were documented in PPT and Word/PDF documents. More than fifty documents organized in the order of topics have been developed. A few videos were used for overviews but were not the major presentation tool in this online course.

To meet the Americans with Disabilities Act (ADA) regulations and to make the online course materials accessible for everyone, the College requires that online course materials meet at least 80% on accessibility scores tested by the LMS. It takes considerable time to make a large volume of course materials more accessible for everyone, but the learning curve is not steep.

(4) Development of online assessment instruments

The online assessment instruments in this case was not much different from that used in the face-to-face course. The present computer programming course uses assignments and projects as formative assessment instruments. Students are encouraged to use the discussion board to exchange experiences, but discussions are not used for evaluation in this course. To maintain academic integrity, I designed the forms of assessment instruments in this course to be unique. No similar forms of assessment instruments can be found on the internet.

A summary of the tasks, major activities, considerations, and estimated workload in this phase is shown in Table 1.

**Phase-2: Implementation**

The second phase of the transition is implementing the design of the online course. Two teaching strategies were applied to this online course: learning-by-doing and student-instructor pair programming. The learning-by-doing teaching strategy drives students to learn programming skills by practicing programming examples and small-scale projects. Pair programming is an agile software development approach, and student-instructor pair programming in this case means that the instructor works with individual students for the student’s own project. The student writes code while the instructor is the observer or navigator and reviews the lines of code. The instructor considers the strategic direction of the student’s work and provides feedback for improvements until the project meets the course’s high standards.

The tactics used in this case included effective communication tools for interactions and timely responses. Special instructor-student, one-on-one interaction sites were created in the course sites. I checked the interaction sites as frequently as possible and responded as expected. The interaction sites keep all the records to trace issues, and real-time interactions through the LMS or other channels are used on some occasions but they were not deemed particularly useful in this case.

**Table 1. A Summary of the Design Phase of the Transition Process**

<table>
<thead>
<tr>
<th>Tasks</th>
<th>Major Activities</th>
<th>Assumptions and Considerations</th>
<th>Estimated Workload (Person-Hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preliminary search for information to learn more about the online version of similar courses</td>
<td>Search the internet and the academic literature related to teaching and the online development of programming courses for MIS majors</td>
<td>The availability of information highly depends on the course</td>
<td>10–30</td>
</tr>
<tr>
<td>Develop the structure of an online course site on the Online Learning Management System (LMS)</td>
<td>Design the course site on the LMS Organize all course contents on the LMS</td>
<td>The workload on this part depends on the adopter’s competence of the LMS</td>
<td>10–30</td>
</tr>
<tr>
<td>Development of the online instruction materials</td>
<td>Develop detailed self-explanatory PPT Develop online supplemental documents Develop video clips</td>
<td>The workload depends on the instructor’s competence in online development tools ADA requirements must be considered</td>
<td>50–80</td>
</tr>
<tr>
<td>Development of the online assessment instruments</td>
<td>Develop a set of assignments or projects Develop a set of rubrics</td>
<td>The design of assessment instruments minimizes plagiarism and academic dishonesty</td>
<td>30–60</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>100–200</strong></td>
</tr>
</tbody>
</table>
Phase-3: Assessment of the Transition

The assessment phase evaluates the effectiveness of the transition from the face-to-face course to the online course. The objective of assessing the transition is to identify opportunities to continuously improve the online course. The students’ teaching evaluations can provide evidence for the assessment of the transition, but the scope of assessment of the transition should be broader than students’ teaching evaluations. In the present study, three aspects were examined for the assessment of the transition.

(1) Students’ performance in the online course in comparison with the face-to-face course

I have taught the online course and its corresponding face-to-face course in the same semester. The students’ learning outcomes were evaluated by using the same assessment instruments that include assignments and programming projects. A comparison of students’ performance in the two teaching/learning forms is exhibited in Table 2. As shown in Table 2, the differences between students’ performance in the two classes are insignificant.

Table 2. Comparison of Students’ Performance in the Two Teaching/Learning Formats

<table>
<thead>
<tr>
<th>Instruments of Assessment of Learning</th>
<th>Online Class (n=5)</th>
<th>Face-to-Face Class (n=15)</th>
<th>t-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Four Assignments</td>
<td>M=5.86, SD=0.02</td>
<td>M=5.79, SD=0.06</td>
<td>t(18)=0.65, p=0.53</td>
</tr>
<tr>
<td>Three Projects</td>
<td>M=60.4, SD=11.3</td>
<td>M=59.5, SD=12.1</td>
<td>t(18)=0.52, p=0.61</td>
</tr>
</tbody>
</table>

(2) Effectiveness of teaching strategies and tactics

The teaching strategies and tactics used in this online course were assessed. The instructor-students interaction frequencies and reactions of students during the interactions were reviewed and analyzed. The use of instructor-student one-to-one help sites for individuals seemed to be a good method for engagement.

(3) Usability of the online course materials

The records of students’ access statistics tracking indicated that the online course materials were heavily used by students. The students’ comments indicated that connections between the relevant documents could be improved on so that students can easily move from one document to another document. I will take this issue into account for further improvement of the online course materials.

FINDINGS AND DISCUSSION

The following is a summary of the major findings of this study beyond the transition process.

(1) The design phase of the transition from face-to-face courses to online courses demands significant time and intellectual work on the instructor’s side

Usually, an instructor who has not developed an online course does not know how much work would be needed to transform their face-to-face course into its online equivalent. Generally, the design of online course materials demands significant time and intellectual work for the instructors. In the present case, the university online instruction team provided valuable help to develop the online course through an inspection process. Yet, the development of online courses in the current system relies on the faculty members’ own service.

(2) The implementation phase of the transition from face-to-face courses to online courses requires the instructor to adjust their teaching style and workload distribution

The teaching skill set and teaching style demanded in online courses could be significantly different from those in face-to-face courses. The “sage on the stage” approach is less relevant to online teaching, and the pedagogical shift from lectures to flipped classrooms requires the instructor to use innovative teaching materials as well as innovative teaching methods. In comparison with face-to-face courses, online courses require intensive preparation before the course starts and do not leave much room for spontaneous adjustments during the course. On the other hand, day-to-day operations in online courses are not lectures that are given at specified class times but involve one-to-one interactions and grading on a constant basis. Figure 2 illustrates the workload distribution in the

![Figure 2. Patterns of Workload Distribution in the Two Teaching Forms](image-url)
two teaching forms. Accordingly, in the current teaching environment of mixed teaching forms of face-to-face, blended, and online, instructors should possess multiple instructional skill sets and adapt to flexible work hours.

Clearly, the workload depends upon the enrollments. The above analysis does not take enrollment into account because the present investigation concentrated on workload patterns.

(3) The transition to online can be useful for teaching the face-to-face course

The transition from the face-to-face course to its online version can be beneficial to the face-to-face course because the online course materials can also be used for the face-to-face course. Students in the face-to-face course could use the online materials heavily in this case. In fact, the transition has demonstrated this advantage during the COVID-19 emergency when all face-to-face courses must be taught in the online mode. More importantly, the instructor is able to learn more about the students’ learning processes in the subject through online instructor-student, one-on-one interactions. The accumulated experiences would also be valuable for teaching the face-to-face course as well.

Online education is continuously growing, and many academic programs are developing online versions for all face-to-face courses. Many faculty members have already developed and taught online courses but have not systematically examined and summarized the transition process. This article describes a progressive and comprehensive process of transition from a face-to-face course to its online version. Clearly, the assumption made in this study is that the learning objectives of the course in the two teaching and learning forms are the same. In this case, the teaching pedagogies are similar, but the course materials and assessment instruments in the two forms have variations.

Educational changes are very personal experiences in a particular setting; however, personal experiences are a part of the causes of educational changes. I offer my personal experiences of learning action research in the context of moving face-to-face education to online education to aspire to becoming a better instructor. This action research project allows me to produce personal practical knowledge in the form of professional insights from perceptual learning and through narratives of critical actions. Although much knowledge remains implicit, this action research project makes implicit knowledge explicit to be able to share it with others. This is one of the major benefits of action research beyond personal renewal.

CONCLUSION

While individual instructors play key roles in online education, educational administrations develop their strategies and policies of online education for their institutions. There have been countless online research papers published in the literature; however, the transition from face-to-face courses to online courses is still a new topic for many instructors in higher education.

This article reports on an action research project and explains the structure of the actions involved in transiting from a face-to-face course to its online course. It demonstrates that a successful transition process to meet the learning objectives of the course can demand significant time and intellectual work on the instructors’ part. It also explains that in the current teaching environment of mixed teaching forms of face-to-face, blended, and online, instructors should possess multiple instructional skill sets and be able to adapt to flexible work hours.

In the belief that online education continues to grow and has profound impacts on education, this article contributes to higher education by presenting my first-hand experience of the comprehensive process of transiting from a face-to-face course to its online course and sharing my knowledge of the development of pedagogy and teaching materials for online courses.

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