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PEDAGOGICAL ENGINEERING AND ESP: THE ICD AND ACTIVE APPROACH

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Abstract. *Course design and lesson planning are constants in the professional life of all instructors. Since the lesson plan is the instructor's road map of what students need to learn and how it will be done effectively during class time, it should be the result of much contemplation and preparation. With regard to English for Specific Purposes (ESP) or English for Academic Purposes (EAP), creating quality and relevant syllabi can be even more challenging when the language Higher Education (HE) instructor in is not a specialist in the domain that they are teaching. However a practical solution may be to follow a detailed process and ask oneself the appropriate questions. This article aims to reflect on the process of integrated course design (ICD) and lesson planning with the objective of assisting language instructors to conceive didactic approaches which can be used to construct and redesign courses, lessons and language programs that not only engage students in creative and significant learning experiences but also assist them in communicating appropriately during and long after their higher education experience.*

Key words*: Pedagogical engineering, Integrated Course Design (ICD), Active Learning Classroom (ALC), English for Specific Purposes (ESP), Language Didactics*

1. INTRODUCTION

An instructional consultant for more than thirty years, L. Dee Fink has consulted on the topics of faculty development and Integrated Course Design (ICD) at accrediting associations worldwide. Fink (2005b) believes that "teaching is a complex human action," which requires knowledge of the subject matter; decisions about the purpose and nature of the learning experience; interactions with students (through lectures, discussions, etc.) and management of the entire instructional event. He explains that the quality of the students' learning experience is directly impacted by the degree to which teacher tasks are performed well. He posits that often times, faculty members are poorly trained for course design and management. It is his view that this supposition will inevitably have an influence on the overall quality of the educational experience and subsequently the students' learning experience.

In the context of pedagogical engineering and teaching English for Specific and Academic Purposes (ESP and EAP), this article proposes to reflect on the process of lesson planning while presenting Fink's model of ICD, as well as his taxonomy of *significant* learning. In many ways, the ICD approach parallels the Content and Language Integrated Learning (CLIL) approach. For this reason, this article will also crossover and allude to similarities

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between ICD and CLIL. The Active Learning Classroom environment will also be explained since it corresponds to the pedagogical implications of the ICD approach.

The objective of this article is therefore twofold: to encourage language instructors to first reflect on their own pedagogical engineering methodology while reading up on the ICD and ALC methods and second to take these approaches into consideration when creating or improving course design to ultimately design language programs that better respond to the needs and demands of students in terms of their metacognitive skills development and future professional needs.

1.1. Pedagogical engineering and the integrated course design

What is pedagogical engineering?

In order to better understand and appreciate the process of pedagogical engineering, it would be pertinent to first separate the term and provide a definition for both *pedagogical* and *engineering*.

Defining pedagogical

The term pedagogical is derived from the word pedagogy, which Walker (2006) simply defines as "teaching and who is being taught". This rather simplified definition does underscore the importance of a relational give and take between instructor and learner. According to Stierer and Antoniou (2004, p. 277) the definition of pedagogy also encompasses the "processes and relationships of learning and teaching". In Higher Education (HE), these processes and relationships must take into consideration all stakeholders not only the students and instructors, but also society at large in order to appropriately create syllabi that respond to and prepare for the needs and demands of the professional world.

For Lovat (2003, p.11) pedagogy symbolizes "a highly complex blend of theoretical understanding and practical skill". This perspective draws attention to the vast complexity of teaching as a profession. Furthermore, Lovat (2003, p.11) portrays the teacher as "a highly developed autonomous professional, with a requisite professional knowledge base and practitioner skills which could stand alongside the equivalent in medicine, law and engineering". Consequently, producing quality pedagogy requires a broad repertoire of strategies and a sustained level of attention to relevance when considering student learning in a specific domain. The process of planning and preparing a course outline commences long before the course begins.

Defining engineering

The term engineering is derived from the verb engineer, which according to the *Oxford English Dictionary* signifies to design, build and skillfully arrange for something to occur. This definition accentuates the significance and complexity attributed to the various steps and stages of creating a functioning syllabus model.

In a similar fashion, Lovat (2003) explains that successful teachers generally possess a rich understanding of the subjects they teach and appreciate how knowledge in their subject is created, organized, linked to other disciplines and applied to real-world settings. In addition, Lovat (2003, p.12) adds that "while faithfully representing the collective wisdom of our culture and upholding the value of disciplinary knowledge, they [the teachers] also develop the critical and analytical capacities of their students".

This critical and analytical dimension is of great significance to the instructor throughout the process of learning and teaching to acquire the feedback from the students. Well after the course is finished, it is essential for instructors to reflect on and evaluate the strengths and weaknesses of course design from all perspectives.

A Definition for Pedagogical Engineering

Pedagogical engineering is then a complex field of study or activity concerned with the conception, development and modification of syllabi relating to the processes of or relationships between learning and teaching. In the context of EAP language teaching and learning, it can also refer to the variety of theories, methods and strategies, teachers skillfully arrange for their students to acquire and develop language, cultural and intercultural skills. Pedagogical engineering is composed of a multifaceted process that entails several or all of the following: conception, (re)design, testing and evaluation.

1.2. A Model of Integrated Course Design (ICD)

In order to clearly explain ICD, it would perhaps be useful to explain what it is not. ICD is not merely based on a *content-centered approach* to teaching, which can be illustrated by the instructor who simply compiles a list of topics to be taught and builds a lesson plan by using one or more textbooks. Having done this, the instructor then decides on how much time will be allotted to each topic and how many tests or evaluations will be given. This approach to lesson planning may be relatively easy and simple; however there is one major disadvantage. Since content knowledge is the main focus, very little thought is given to what the students may learn beyond content.

An alternative to this *content-centered approach* is the *learning-centered approach* (Grunert O'Brien, Mills and Cohen, 2008), which is a much more detailed, methodical and organized approach to designing courses to assist instructors in providing detailed course objectives, while responding to specific requirements and expectations to encourage student success. This approach is at the very heart of ICD. In designing courses and lesson plans, instructors must first define what students can and should learn in relation to the subject being taught.

Next, they should then conceptualize methods to facilitate the learning experience, while integrating a metacognitive learning dimension at the HE level. In spite of the fact that Fink (2003) suggests that this approach requires more time and effort, he explains that it does present the best chance for guaranteeing that students are offered a *significant* and *relevant* learning experience that goes far beyond students merely memorizing content. The implications of a *significant* learning model will be explained later in section 2.

Fink (2005a) defends that the *learning-centered* approach can capture and retain student interest, since it incorporates pedagogical techniques which go beyond traditional classroom teaching methods. In this 'flipped' setting, the instructor is 'on the other side of the desk', so to speak. While assuming the role of observer, facilitator and moderator, the instructor circulates amongst the students who work autonomously in small groups. This is how the Active Learning Classroom (ALC) functions. ALC will be detailed later in section 3. This type of approach and method to teaching are a refreshing change for both the instructor and the students since it breaks with the more traditional classroom organization. At the same time, these methods take into consideration a variety of learning styles and strategies to offer students a gratifying and motivating experience in an accommodating atmosphere.

1.3. From integrated course to content and language integrated learning design

The ICD environment aims to provide students with much more than fundamental knowledge. ICD encourages critical thinking skills in a setting that fosters a caring and human dimension where they can learn to socialize and respect others, as well as go beyond their limits (Fink, 2003).

It is of interest to note here that in many ways, ICD is similar to the Content and Language Integrated Learning (CLIL) approach (Mehisto, Marsh and Frigols, 2008), since both approaches include methods or strategies to advance critical and creative thought, discussion and learner autonomy, while assisting students in recognizing the limitations of their current thinking and learning. In the same manner, they promote mutual understanding in social situations in order to contribute to joint problem-solving. In addition, ICD like CLIL is a means to build and reinforce the foundations of intercultural knowledge, skills and constructive attitudes in relation to diverse peoples and cultures (Mehisto, 2012).

2. An Overview of Integrated Course Design Theory

2.1. The key components of the ICD model

As stated by Fink (2005b), the basic components in the ICD Model are the same as those found in other models of instructional design:

- analysis of the situational factors;
- formulation of the learning goals;
- creation of the feedback and assessment procedures, and
- selection of the various teaching/learning activities.

One unique characteristic of this ICD model is that these components have been put together in a way that reveals and emphasizes the importance of their interdependence and inter-relatedness (See Figure 1).

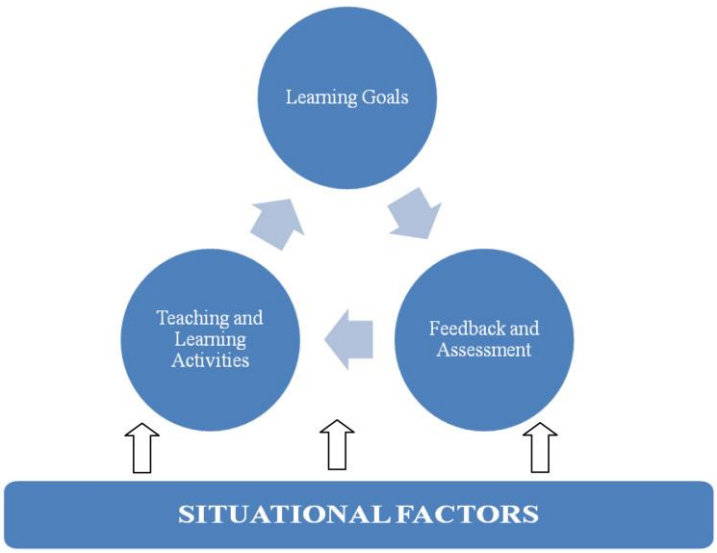

Fig. 1 The key components of the Integrated Course Design Model

In the above figure, the fundamental components of the ICD Model are mutually dependent. Based on the situational factors, the teaching and learning activities are only conceived after first having considered the learning objectives and assessment tools or methods. In addition, the feedback (both formal and informal) and assessment dimensions are a fundamental part of the process. When designing these assessment tools, one may further enhance the pedagogical engineering process by considering an action research approach to integrate a qualitative and quantitative investigation. Nevertheless, none of these components can be conceptualized before the careful consideration of certain variable factors.

2.2. The Foundation of ICD: Situational Factors

In his updated second edition book entitled *Creating Significant Learning Experiences: An Integrated Approach to Designing College Courses*, Fink (2013) demonstrates that that all three of the key components of the ICD Model are interdependent and founded on the definition of what Fink (2003) originally termed *Situational Factors*. In providing a detailed methodology associated with identifying these essential issues, he insists that one must first consider the Situational *Factors* when designing syllabi since they are the veritable foundation of course design and lesson planning. The factors that affect and serve as the basis of course design are highlighted below. Somewhat altered to reflect HE language teaching, they include the following:

1. Specific content of the teaching and learning situation.
How many students are in the class? Is the course at the lower division, upper division, or graduate level? How long and frequent are the class meetings? Will the course be delivered live, online, in a language center or laboratory, etc.? Which physical elements of the learning environment will affect the class?

2. General context of the learning situation.
Which learning expectations are placed on this course by the university or the institution (perhaps relating to curricula and outcomes), the specific profession, and society in general?

3. Nature of the subject.
Is this subject primarily theoretical, practical, or a combination of both? Are there important controversies or recent changes within the field?

4. Characteristics of the learners.
What are the life situations of the learners (what percent work, have family responsibilities, have a specific professional goal, etc.)? What prior knowledge and experiences relevant to this subject have students had? What are the goals and expectations of this course? What are their preferred learning styles?

5. Characteristics of the teacher.
What beliefs and values does the teacher have about teaching and learning? What level of knowledge does she/he have about the subject? What are her/his teaching strengths, weaknesses and methods?

As Fink (2005a) maintains the aforementioned factors inevitably impose limitations and guidelines on those seeking to design a significant learning experience. For example,

if the course is intended to provide background for a more advanced course, it is essential that the teacher understand the expectations and necessary outcomes which are required for that advanced course.

In a similar fashion, if at the onset of the course, most students appear to be indifferent with regard to the subject matter, the course design must be conceived with the flexibility to easily include special motivational features that provide an opportunity for students to derive learning pleasure and satisfaction. For students to do this, they need to discover and appreciate the importance and utility of what they are learning in a meaningful way. This can be done in an active and conscious or metacognitive manner.

In Fink (2003), the author cites a very revealing and extensive study (Courts and McInerney, 1993, pp 33-38) based on student reactions to instructional methods. The researchers of this study reported that "students' most common criticism was focused on the quality of their overall education, the way teachers teach, and the level of performance expected of the students." Although this study may be somewhat dated, the main findings are still very pertinent today. The researchers stated that the students in this study expressed a need for an overall improvement in their learning experience. They specifically requested more opportunities for 'interaction' and 'hands-on learning'.

According to CLIL scholars such as Mehisto (2008) and Coyle, Hood and Marsh (2010), student interest in the main content area serves as the prime motivator and consequently; language learning should not only be active, but also a passive pleasure, particularly in language for specific purpose (LSP) settings. Students can acquire language by using it as a tool of communication and understanding while simultaneously soaking up the target language they hear around them as they work in an interactive manner. On a more personal level, individual students process this absorbed language differently according to their personal learning style and strategies.

Having reflected on and identified the situational factors, the instructor is then ready to consider the second step in the pedagogical engineering design process: the establishment of specific learning goals. In order to establish these learning goals, instructors must consider the importance of a *significant* and *relevant* learning experience. In the next section, we will closely examine this line of reasoning.

2.3. Taxonomy of Significant Learning

An integral part of *significant* learning is the basic principle that the syllabi must be *relevant* and respond to learner needs and demands. In this next step, the situational analysis information is used to reflect on and answer the following question:

- *What is it that students should get out of this course?*

In traditional content-centered classrooms, the answer bears a resemblance to:

- *I would like students to learn about topics X, Y and Z.*

Even if this approach appears rather easy, swift and natural, it places most of the emphasis on the act of understanding, memorizing and remembering. For Fink (2003), this method falls short of what can really be accomplished in a classroom and beyond. The real questions that instructors should ask themselves are the following:

- *What would I like the impact of this course to be on my students 2-3 years after my course is over?*

- *What should distinguish students who have taken my course from those who have not?*

In asking themselves these types of questions, instructors will design courses and lessons that place more emphasis on critical thinking and helping students to develop a commitment to life-long learning. In this way, students will also have the opportunity to actively participate in learning how to:

- use course knowledge in a creative and practical manner;
- find solutions for real-world issues and problems;
- change the ways students think about themselves or others;
- improve their (interpersonal, communication…) skills to interact in society, and
- manage tasks or projects independently or with a team.

After first dedicating many years to research and the study of faculty responses on the subject of what constitutes a significant learning experience, Fink (2005a) created the following categories and subcategories which correspond to the categories of learning and main components for the framework of his *Taxonomy of Significant Learning*:

- **Foundational Knowledge** (understanding, remembering information and ideas);
- **Application** (creative, critical and practical thinking skills, project management);
- **Integration** (connecting ideas, people, realms of life);
- **Human Dimension** (learning about oneself and others);
- **Caring** ((developing new feelings, interests, values), and
- **Learning How to Learn** (becoming a better student, self-directing learners).

It is worth mentioning that with this taxonomy, each kind of learning is interactive and can stimulate any of the other kinds of learning. For example, Fink (2003) demonstrates that **Foundational Knowledge** may serve as a stimulus for the **Application of Critical Thinking**, which may in turn encourage the **Integration of Connecting Ideas**, and help students to **Learn about others**…

It is here that we distinguish the fundamental purpose and core of ICD since *Significant Learning* lies at the base and intersection of the interrelated categories of learning. To learn more about Fink's Integrated Course Design model and for practical worksheets to assist in planning learning activities (inside and outside of the classroom) as well as developing a course plan, a very useful guide to designing courses for significant learning can be found at http://www.deefinkandassociates.com/GuidetoCourseDesignAug05.pdf

3. The Active Learning Classroom (ALC) Environment

3.1. From the integrated course design to active learning

The ICD approach to designing courses can also include exciting and challenging learning environments known as the Active Learning Classroom (ALC). Active Learning implies much more than the idea of students who are actively involved while listening to formal presentations or traditional teaching methods in the classroom. In this setting, they are not only performing the basic reading and writing skills, but also and above all, discussing and engaging in meaningful and relevant exchange; like for example problem solving activities which solicit negotiation and communication skills.

Among the first researchers to refer to the ALC methods, Bonwell and Eison (1991) advance that to be actively involved, students must engage in such higher-order metacognitive

thinking tasks such as analysis, synthesis, and evaluation. Within this context, it is proposed that the strategies promoting active learning be defined as instructional activities involving students in "doing things" (task-based methods) and thinking about what they are doing and how they are doing it (metacognition).

A more recent study (Drake and Battaglia, 2014) shows that the use of these techniques in the classroom is vital because of their potential to engage and motivate learners. In their research on students from the Science, Technology, Engineering and Math (STEM) disciplines, Drake and Battaglia (2014) noted that students with different learning styles show a highly positive response to the pedagogical techniques and strategies which promote active learning.

3.2. What are active learning strategies?

Bonwell and Eison (1991) define the use of active learning strategies as the educational procedure of implementing a wide range of activities that involve students in meaningful things, as well as thinking about the things that they are doing. Active learning strategies are essential to enhance student learning. In a meta-analysis of research on active learning strategies in the STEM setting, Prince (2004) reports the following:

Active Learning Strategies have the capacity to:

- Significantly improve short-term and long-term recall of information;
- Significantly improve student academic performance;
- Increase conceptual understandings (twice as much as compared to a traditional course);
- Improve retention in academic programs;
- Increase student attention;
- Promote student engagement;
- Address students' misconceptions;
- Develop enhanced critical thinking skills;
- Improve students' self-esteem;
- Improve interpersonal relationships, and
- Improve teamwork skills.

In the ESP setting, these benefits can all have immediate repercussions on student motivation and individual or group success rates, but a closer analysis will reveal that the benefits can also have long-term effects. The benefits associated with active and significant learning experiences are often transversal in nature and will ultimately assist students in the communicative and metacognitive skills development during and long after their higher education experience.

An excellent illustration of this is the strategy proposed by Schank et al. (1999). They promote the theory of learning by doing, whereby students have the opportunity to share a meaningful, relevant learning simulation experience that they will be able to use or refer to in their professional future.

Drake and Battaglia (2014) advance that active learning includes the use or combination of any of the following strategies:

Table 1 Active learning strategies

Brainstorming	Panel Discussions
Classroom Assessment Techniques	Performances
Classroom Response Systems	Presentations
Collaborative Learning Strategies	Problem-Based Learning
Concept Mapping	Question and Answer Pairs
Concept Tests	Research
Cooperative Learning Strategies	Role plays
Debates	Question and Answer Pairs
Experiments	Research
Field Trips	Role plays
Games	Simulations
Interactive Discussion	Team-based Learning
Note Check	Writing-to-Learn

A combination of the above-mentioned strategies in Table 1 along with the ICD method in the ALC environment can prove to be both effective and motivating for students. These strategies represent diverse didactic approaches which break with the commonplace approach associated with traditional methods. Technology can also be integrated into any and all of these strategies to further enhance the teaching and learning experience. A clear illustration of this is the IUT HE learning environment in France.

Over the last fifty years, all across France, more than one hundred vocational institutions (*Instituts Universitaires de Technologie* or *IUTs*) have provided solid theoretical training for the employability of thousands of young technicians in a variety of domains. Having recognized the trends in changing demands and needs of students as well as society and employers, the Ministry of Higher Education alongside researchers and instructors began in 2005 to conceptualize and design national educational programs (*programmes pédagogiques nationaux* or *PPNs*) that would better prepare students for their future careers in various professional fields. The *PPNs* include a variety of pedagogical approaches placing emphasis not only on content learning, but also learner-centered learning methods such as; intermittent group work, cooperative learning strategies, presentations, projects, simulations and internships. After an initial test period, the *PPNs* were then upgraded in 2013. Not only does this example mirror the ICD and ALC approaches, but it also perfectly illustrates how stakeholders can collaborate to engage in preparing quality and relevant syllabi through the process of pedagogical engineering on a national level. Nevertheless, it is important to note that this very positive approach to modern pedagogical engineering in language teaching is not without a downside.

In the early stages of active learning research, Bonwell and Eison (1991) caution what still holds true today: most instructors hesitate to fully embrace these methods due to common barriers to instructional change. These common barriers include the powerful influence of educational tradition; faculty self-perceptions and self-definition of traditional roles, the discomfort and anxiety that unexpected change can create or simply the limited incentive or resources to facilitate these changes. Furthermore, certain specific obstacles are associated with the implementation of active learning, such as: the heightened difficulty in adequately covering the assigned course content in the often limited class time available, an increase in the amount of course preparation time, the difficulty and challenge associated

with using active learning methods in larger classes, a lack of necessary materials, equipment, or resources. Finally, they add that perhaps the single greatest barrier of all is the fact that faculty members' efforts to employ active learning involve assuming many risks. These risks include that the students will not participate in the higher-order thinking, or learn sufficient content or perhaps that faculty members will feel a loss of control, that the instructors themselves feel they lack the necessary skills, or the worse case scenario, they will eventually be criticized for teaching in unorthodox ways.

On a more positive note, they end with the thought that each obstacle or barrier and type of risk, however, can be successfully overcome through careful and thoughtful planning. And finally, although many instructors often rely on lecture-based courses to serve the vast majority of students, one recent study (Freeman et al., 2014) shows that STEM student outcomes improve markedly in classes where faculty do practically anything other than lecture. Failure rates decline by almost half a standard deviation and the improvement in exam results is statistically significant.

3.3. Useful ICD questions and guidelines

In order to ensure student academic success, prior to any discussion of instructional methods and the grading and evaluation of student work, it is important to review effective practices in pedagogical engineering. Today, one of the most widely used models was developed by Fink (2003) who provides straightforward questions or task-based statements to assist instructors in defining and applying the integrated approach to course design. When designing or redesigning any course, program or form of instruction, Fink (2003) recommends the careful consideration of the following steps:

1. Identify what you want students to learn - Student Learning Objectives (SLOs);
2. Describe how you (and the students) will know if these SLOs have been accomplished. (Feedback and Assessment);
3. Determine what you and the students need to do in order for the students to achieve the learning objectives. (Teaching and Learning Activities), and
4. Make sure the key components of the ICD model support and reinforce each other.

The above method reflects a more systemic learning-centered approach which encourages the students to assume an active role and an increased level of responsibility in the progression of their learning (Grunert O'Brien, Mills and Cohen, 2008). In the context of ESP and EAP, this is part of a metacognitive process whereby the learner develops an ongoing awareness of and responsibility for the practical study of language to reinforce competency and practice skills outside the classroom. A practical guide to Fink (2013) also shows that using an ICD task-based syllabus can favor this systemic learning-centered approach (as opposed to a traditional content-centered approach) which has been proven to increase students' cognitive investment in learning outside the formal classroom setting, while encouraging students' active participation in class, ultimately providing them with opportunities to work on their individual language problems in an independent manner.

After years of research and reflection on the creation of significant learning experiences through the utilization of ICD, Fink (2013) offers precious and insightful perspectives on the key issues on ensuring quality and relevance in educational programs.

4. Conclusion and Recommendations

Learning is further enhanced and much more meaningful if students are given the opportunity to develop their capacity to reflect on their own learning experience. When students reflect on what they are learning, how they are learning, its value, and what other elements of information they require, they are more inclined to both "own" and appreciate the process. The very same applies to language instructors and pedagogical engineering. When preparing and designing syllabi, instructors need to ask themselves the appropriate questions as well as reflect and build on their teaching experience and knowledge.

It is then possible to suggest that a dynamic ESP or EAP setting is one that motivates and creates significant metacognitive learning experiences for both the learners *and* the instructor. It is the result of successful pedagogical engineering, a complex process relating to the relationships between learning and teaching, which requires that the instructor assimilate specific situational factors, as well as the constant changing needs and demands of learners. Quality and relevant pedagogy can enable students to actively engage in their learning experience and assist them in acquiring the abilities, resources and understanding they will need to adapt to their professional lives in an increasingly demanding, competitive and complex job market. Their success is partly reflected in the time and effort instructors dedicate to the syllabi preparation process.

By integrating the ICD and ACL approaches, instructors are free to choose from a wide array of active learning techniques such as peer learning, group problem solving, project-based learning and experiential learning by means of workshops. Additionally, the opportunity for action research is much more accessible since the instructor fades into the background to observe, moderate and facilitate. This multifaceted process associated with preparing language programs may prove to be time-consuming and complex; however, when the teaching and learning experience feedback is critical, yet constructive and supportive, the overall positive results are very rewarding for all stakeholders. The lifelong learning benefits are more than worth the time and energy invested in the pedagogical engineering of successful syllabi.

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