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A Holistic and Multifaceted Model for Ill-Structured Experiential Problem-Based Learning: Enhancing Student Critical Thinking and Communication Skills

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ABSTRACT

Educators have observed that our college graduates are not equipped with the complex problem-solving skills to contribute to the many challenges of industry and other professional contexts. This paper describes an experiential problem-based multifaceted instructional design and teaching model at the New York University School of Professional Studies, developed by instructional design and technological experts. The model combines traditional instructional design, evidence-based strategies, and learning theories for development of student critical thinkers who can transfer their new knowledge and capabilities to industry and various other professional contexts. This model includes unique faculty and student orientations and guides, students as active contributors, instructors as facilitators, and collaborative projects. Student surveys of four cohorts (68 students) over four academic quarters indicated strong positive results. Students practiced through experiential problem-based learning and thereby learned critical and creative thinking that increased their communication skills. The program, to continue through New York University, can also be adapted for professionally-oriented education degrees, certifications, and lifelong learning courses.

INTRODUCTION

In the United States, much debate has taken place about whether our graduates are properly equipped with the needed complex problem-solving skills and knowledge to succeed in and contribute to today's industry. For many, the answer is that they are not (Hora, 2016; Mourshed, Farrell, & Barton, 2013; National Association of College and Employers, 2019). In 2013, JP Morgan reported that 33% of business leaders agreed that

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college graduates lack the critical and strategic thinking skills needed to add to the knowledge economy. Moreover, many students reported that experiential learning and industry experience are very important to their learning (Chavan, 2011).

Further, through a series of industry forums, Japanese professionals explained that their industries needed graduates with advanced problem-solving and thinking skills (Miner-Romanoff, 2017). The Job Outlook 2019 survey of the National Association of College and Employers (2019) indicated that the highest rated competency was critical thinking/problem solving skills. This competency had been the highest rated for the past 2 years.

According to a report by the Association of American Colleges and Universities (2013), only 42% of employers felt that graduates were adequately prepared for the job market. Of the employers surveyed, 93% agreed that “a candidate’s demonstrated capacity to think critically, communicate clearly, and solve complex problems is more important than their undergraduate major” (p. 1). In this report, more than three in four employers said they wanted colleges to place more emphasis on helping students develop five key learning outcomes, including critical thinking, complex problem solving, written and oral communication, and applied knowledge in real-world settings.

Futurists recognize the need for greater thinking and conceptualizing skills. In extraordinary acceleration of Buckminster Fuller’s “knowledge doubling curve” of knowledge every 12-13 months, IBM predicted that by 2020, especially because of the Internet, knowledge will double every 11-12 hours (Rosenberg, 2017). In *Future Shock*, Alvin Toffler (1970) famously predicted that “Tomorrow's illiterate will not be the man who can't read; he will be the man who has not learned how to learn.” Toffler also suggested, “By instructing students how to learn, unlearn and relearn, a powerful new dimension can be added to education” (p. 211).

Drucker (1985/2014) observed that “what individuals have learned by age twenty-one will begin to become obsolete five to ten years later and will have to be replaced—or at least refurbished—by new learning, new skills, new knowledge” (p. 280). And Bass (2012) recognized the turning toward the higher cognitive and critical thinking skills in the disruption of traditional educational strategies and goals:

> [W]e are coming to value explicitly and systemically these outcomes of higher education--dimensions such as making discerning judgements based on practical reasoning, acting reflectively, taking risks, engaging in civil if difficult discourse, and proceeding with confidence in the face of uncertainty. (p. 7)

With such observations in mind, it is obvious that educators recognize the need for more effective teaching and learning models. Goodyear (2015) observed that "teachers' planning needs to take on more of the qualities of *design for learning*" (p. 28). Problem-based learning (PBL), rather than the traditional model of project-based learning—teacher-imparted knowledge and student-demonstrated understanding of that knowledge—has become more accepted and prevalent in academia globally and is learner-centered, fosters their sense of responsibility, increases and increases content learning as well as their cognitive and communication skills (Dischino, DeLaura, Donnelly, Massa, & Hanes, 2011; Saleh, Baker, & Al Barghuthi, 2017; Savery, 2006). In recognition of the demand and advantages of PBL, a Chair in Problem-Based Learning was established by UNESCO. The aim is to create a global society for researchers and academic staff working with PBL in PBL projects; that require real practice and real issues; are mainly sourced from industry and reflects positively on the students as it will give them opportunity to interact and team work in lookalike job environment and scenarios. (Saleh et al., 2017, p. 283)

THE NEED FOR INSTRUCTIONAL DESIGN

Research also indicates that we can increase student learning through development and implementation of instructional design theories and processes. These outcomes require the commitment of both instructional designers and subject matter faculty (Saleh et al., 2017; Twigg, 2003). Instructional design may be defined as "the systematic and reflective process of translating principles of learning and instruction into plans for instructional materials, activities, information, resources, and evaluation" (Smith & Ragan, 2005, p. 4).

Since design models often parallel scientific models, it is assumed that most models have great empirical support. Yet, as Richey and Klein (2014) reported, "historically there has been a scarcity of research on our models, products, and tools" (p. 141). Nor are there sound instructional design models that provide depth and breadth toward identifying crucial and mediating relationships in curricular design practice and implementation. Moreover, a need exists for research that focuses on instructional design within educational settings, rather than theoretical and scientific scenarios (Goodyear, 2015; Hmelo-Silver & Eberbach, 2012), although exploration of learner-centered education has recently accelerated (Reigeluth, Beatty, & Myers, 2017a).

Although much research addresses instructional design and the learning sciences, little guidance has been offered on optimal relationships between ID teams (IDs) and subject matter experts (SME) (Pan, Deets, Phillips, & Cornell, 2003). These relationships involve negotiation of expectations in respect to strategic roles (Collins & Stevens, 2013). The lack of clarity and understanding may lead to inefficiency, ineffectiveness, and frustration for instructional designers and subject matter faculty alike (Fyle, Moseley, & Hayes, 2012), which can then result in less than optimal instructional practices and learning. To counteract such deficiencies, a major aim of this longitudinal project is to measure and analyze the iterative cooperation, communication, and collaboration between IDs and SMEs.

Current research regarding educational design embraces the real-world complexities and an iterative "development of solutions to practical and complex educational problems" within the context of empirical investigation (McKenney & Reeves, 2013, p. 99). While embracing complexity, educational design research does not attempt to remove or cleanse variation, but to provide "usable knowledge" for contexts that assume variability (Lagemann, 2002). As many design researchers have explained, this knowledge leads to methodologically creative studies conducted in authentic settings (Fishman, Penuel, Allen, Cheng, & Sabelli, 2013; McKenney & Reeves, 2013) and includes designers' abstracted experience and reflections about their designs (Fishman, Peneul, Allen, & Cheng, 2013; Kali, 2008).

During our design forums, we engaged in this type of iterative reflective design and will continue to do so. Similarly, while design research and theoretical modeling have been conducted for decades, very few studies have addressed how instructional designers apply theories and models (Mosely, Wright, & Wrigley, 2018). Further, the current limited number of studies indicate that instructional designers do not spend much time applying rigid models but may creatively utilize them to generally inform their varied and multivariate work (Kenny, Zhang, Schwier, & Campbell, 2005).

Few holistic teaching and design models have been developed with evidence-based theoretical and pedagogical approaches combined and evaluated in one approach to overcome traditional pedagogical weaknesses and biases (Reigeluth, Beatty, & Myers, 2017b). In addition, learner-centered pedagogical approaches that foster students' critical and creative thinking skills are especially needed to meet the demands of industry today (Bernold, 2005; Saleh et al., 2017). It was with this need in mind that this new instructional design and teaching model was created. The model was created to increase students' problem-solving skills, in addition to knowledge acquisition, and to meet today's global industry demands.

THEORETICAL GROUNDING

As Middleton, Gorand, Taylor, and Banna-Ritland (2014) noted, unless the explicit framework and theoretical basis upon which the design is explained, little can be added to the body of knowledge about the validity of the design. It can be emulated in its entirely or unpacked and utilized in small parts. We started with two primary theories: experiential and problem-based, with a focused review of the research (Furman & Sibthorp, 2013; Hung, 2013; Kolb & Kolb, 2009; "Problem-Based Learning," 2001; Savery, 2006).

The ancient Chinese Confucian philosopher Xun Kuang (2019) said, "Tell me and I forget, teach me and I may remember, involve me and I learn" (erroneously often attributed to Ben Franklin). This dictum is the essence of experiential learning. In experiential theory, six basic principles hold: (a) learning is a process not an outcome; (b) learning best takes place by drawing on students' prior beliefs and opinions about a topic, examined and integrated with new ideas; (c) learning requires resolving conflicts and differences in terms of existing and new ideas and reflection; (d) learning is holistic, involving the entire person, and requires adaptation in terms of problem-solving, creativity, and decisions. (e) learning requires consistent, stable transactions between person and environment; (f) learning creates new knowledge, both personal and social, in contrast to traditional modes in which previous knowledge is imparted to be absorbed (Kolb & Kolb, 2006).

Problem-based learning was introduced in the late 1960s at McMaster University Medical School in Canada, is based on Deweyan pedagogical principles, and has gained popularity in the sciences and education in the last several decades as a teaching approach (David, 2014; Guze, 2015; Ungaretti, Thompson, Miller, & Peterson, 2015). Although not without its critics (e.g., Colliver, 2000), problem-based learning has been defended convincingly as a relevant and viable pedagogical approach (De Graaff & Kolmos, 2003; Norman & Schmidt, 2000; Savery, 2019).

Many attempts have been made to define problem-based theory. The attributes approach includes learner-centered learning, addressing of real-world problems, students working in small groups, and teacher as facilitator rather than knowledge dispenser (David, 2014; Krauss & Boss, 2013). Another approach is Savin-Baden's principles: the perception of knowledge, learning, problems, students, teacher roles, and assessment (as cited in De Graaff & Kolmos, 2003). Other theoretical explanations refer to learning theory principles and combinations of PBL and traditional methods (De Graaff & Kolmos, 2003).

Advantages are students' development of critical thinking, application of knowledge and creativity to real-world problems, development of leadership and communication skills, and students' higher motivation than with traditional teaching methods (David, 2014; De Graaff & Kolmos, 2003). Disadvantages may be teachers' unwillingness to relinquish control, few or no traditional grades and tests, shifting standards, students' discomfort working in teams, students' possible faulty judgment as to what is important to learning and application, and students' lack of perceiving broader perspectives of the problem (David, 2014; De Graff & Kolmos, 2003; Reigeluth et al., 2017a).

GENESIS OF THE PROJECT

The project was facilitated by the School of Professional Studies at New York University's Center of Academic Excellence and Support (CAES) and over 30 New York City industry experts, with input from Japanese industry professionals. The team included instructional designers, educational technologists, media specialists, content experts and administrators**.** The task was to design, develop, implement, and evaluate a suite of programs for global professionals across multiple industries and sectors.

Given the advantages and drawbacks of PBL, we set out to create the most effective and innovative educational experiences with the fewest constraints. Our goal was to develop critical thinkers and complex problem-solvers who can significantly contribute to the knowledge economy in an Asian country where passive learning was still the norm. Fifteen distinct disciplines were identified, and we set out with a white board, knowledge of learning and design theories and principles, pedagogical strategies, educational technology opportunities, an assessment of our learners, and courage to take an educated and theory-grounded risk. After many hours and conferences, a working flowchart was developed (see Figure 1).

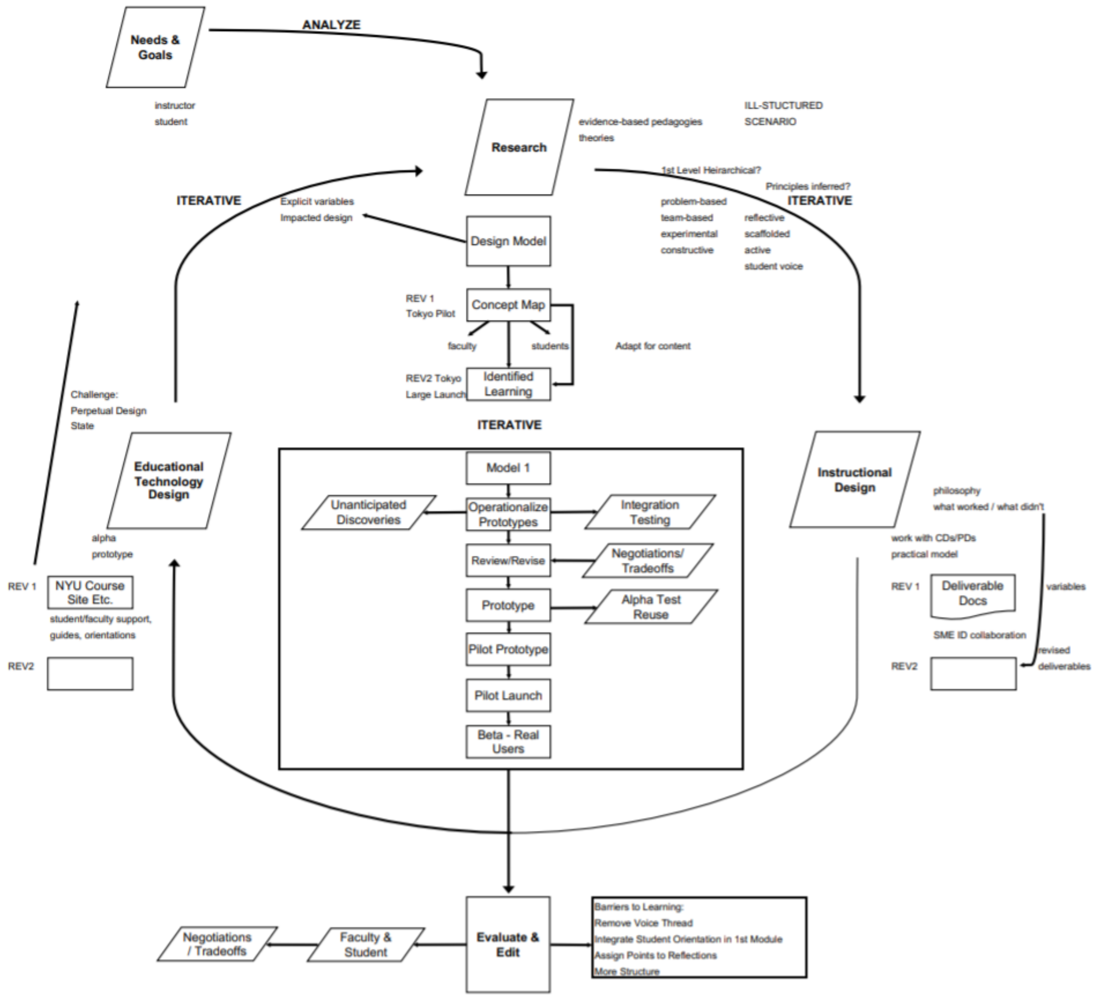
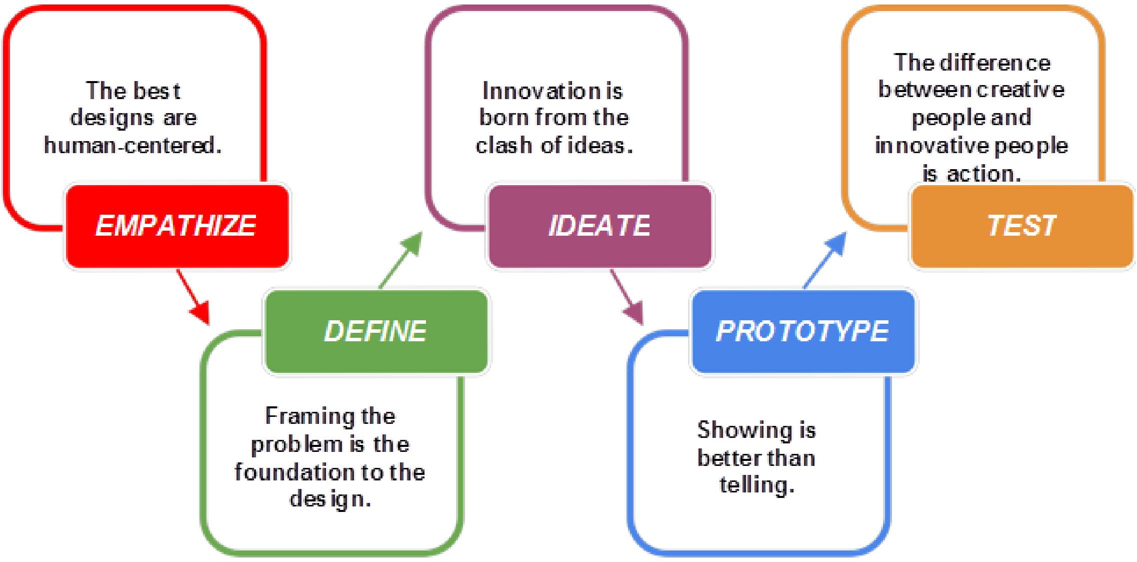


Figure 1. Flowchart Proces EPBL

PURPOSE OF THE PROJECT

Learners negotiate understandings about knowledge and achieve learning through multiple sensory channels while activating prior knowledge and layering new skills based on relatable stories and newly learned concepts (Kolb & Kolb, 2006). Since the late 20th century, leading educational researchers such as Chickering and Gamson (1987), Gagne (1985), and Merrill (2002) observed that active learning strategies lead to more engaged learners. Therefore, improved learning will take place. Active learning strategies align with other validated teaching practices, such as engaged pedagogy (Edgerton, 2001; Pascarella & Terenzini, 2005; Smith, Sheppard, Johnson, & Johnson, 2005), learner-centered learning, and interactive engagement. Well-recognized strategies include inquiry learning, problem-based learning, and collaborative learning. As Birdwell, Roman, Hammersmith, and Jerolimov (2016) observed, for "active and collaborative learning approaches," the need exists "for a reflective pedagogical observation tool specific to the context of active learning" (p. 29).

The ill-structured problems of experiential problem-based learning connect students' prior knowledge, experience, and examples to new cognitive thinking skills with support and structure while encouraging diversity of thought and flexible solutions through conscious decision making. This project was designed to foster students' cognitive, creative, problem-solving, and technological skills for their contributions to today's global, competitive industries. Figure 2 shows the principles of the project and the overall design.



Phases*	Description & Methodology	Results
Analysis	Analyze needs for learning program and target learner characteristics. • Industry, Faculty Expertise, Course Data Analysis, Faculty Reflections • Institution Data, Institutional Effectiveness, Assessments • Key stakeholder needs and expectations, and target learner characteristics	• Program description & outcome • Individual course learning objectives • Initial understanding of instructional approach
Design	Design learning experience to achieve program outcome and learning objectives. • Course content segmentation and sequencing • Instructional tactics, application of instructional theories and principles, problem-based & experiential learning • Multimedia, active learning experiences • Resource selections (liaise with Library)	• Course syllabus • Detailed design document that will be used as basis for program & course development
Development	Produce complete course package including all learning activities and materials, build course (on the hosting platform if needed).	• Complete program and course package
Implementation	Implement the designed program/course. • Learner registration & ongoing learner support	• Learner complete learning experience in program/course
Evaluation	Evaluate program/course effectiveness against established program/course outcomes and learning objectives • Formative and summative evaluation • Feedback/results used for continuous improvement of program/course	• Evaluation results • Action plan for program/course improvement

Figure 2. Principles guiding the project and phases

THE LEARNING MODEL AND CONCEPT MAP

A focused literature review was conducted after industry forum members indicated their desire for employees who could solve complex problems, discover valid and applicable information, work in teams, and transfer skills from one context to another while providing feasible solutions (Avdiji, Elikan, Missionier, & Pigneur, 2018; Brown, 1992; Dolmans, Michaelsen, Merrienboer, & Van Der Vleuten, 2015; McKenney & Reeves, 2014). The new model was born from prior work, combined and enhanced. Thereafter, teams of learning and teaching experts conducted over a dozen feasibility forums and iteratively improved the model. During and after the pilot of four courses (see Table 1), further technology and frameworks were simplified based upon student and faculty feedback.

Finally, the Experiential Problem-Based Learning (EPBL) concept map, Figure 3, was created to guide the project. The model in Figure 3 is divided into three parts. The first is the EPBL master scenario, framework, and components of learning styles. The second part delineates instructor roles, responsibilities, and strategies. The third outlines parallel student roles, responsibilities, and activities aligned with instructors' and the model as a whole. This model was initially intended as an early guide but become a guiding resource, with the addition of team-based learning as a complimentary theory that would address our design goals and challenges.

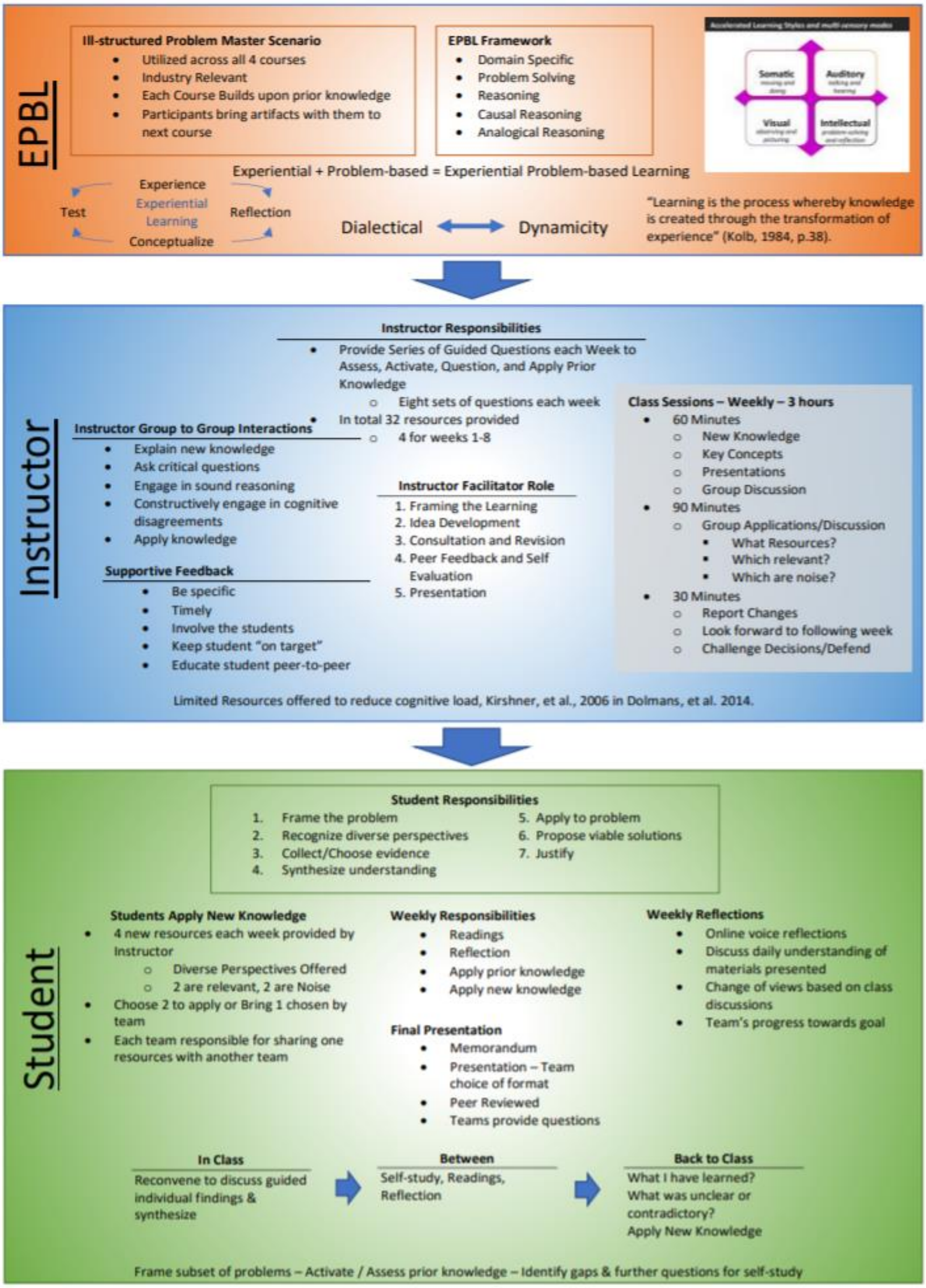


Figure 3. Experiential problem-based learning concept map

The model includes unique applications and theoretical combinations in an ill-structured problem-solving design and teaching model for an entire program. Ill-structured problems are not clear cut or well-defined; they result from specific contexts, have no obvious steps for solution, and include many unknowns. Moreover, these types of problems demand much thought, openness to alternatives and expansive overviews for solutions (Grohs, Kirk, Soledad, & Knight, 2018; Jonassen & Hung, 2015).

Through the ill-structured problems, students learn critical thinking and problem-solving skills. Learner-centered learning rather than the traditional passive learning has increased in recent years (Baeten, Dochy, Struyyen, Parmentier, & Vanderbruggen, 2016). In problem-based learning, the students develop from passive to active and the instructors develop from lecturers to facilitators. The pedagogical approaches in the model employ problem-based learning that provides them with the opportunities to take risks, receive feedback, and try new solutions that are evaluated by the industry experts and their peers - just as they would in the real world.

In our model, the courses are holistically integrated and scaffolded for an intensive and long-term learning experience (Kim & Lim, 2019). It includes many of the most evidence-based approaches, such as reflective, authentic, and active learning and learner-centered teaching. Multiple educational technologies further enhance the model, including expert podcasts, e-portfolios, digital discussions, embedded assessments and resources, and learning pathways. All encourage breaking down of classroom insularities and continuing engagement and learning between and long after the in-person components. Flipped learning, in which class time is spent on team-based problem-solving, is not a new concept (Flipped Learning Network, 2014; Reigeluth et al., 2017a). Combined with the other design elements, flipped learning provides for flexibility of strategies, support and facilitation for application of the knowledge, and peer-to-peer dialogue and feedback.

Although the research indicates that problem-based learning can increase critical thinking skills, it also indicates that PBL can devolve into chaos (Jones, 2006; Ribeiro, 2011; Ward & Lee, 2002**)**. To mitigate this drawback, we designed student and faculty facilitation and problem-solving guides and provided orientations that specifically addressed this risk and how to manage and teach through it. Faculty and student trainings prepare both groups for their unique roles and provide additional support for the model and help to overcome the reported chaos, fear, and intimidation (Pee, 2019) that can accompany an ill-structured learning environment.

Student training took place prior to each session, and time on task was estimated at 2 to 3 hours, with elements to be reinforced and applied during classes. The training, initially provided to students online to complete at their own pace, was changed for incorporation in the first in-person class to assure completion. Students received learning and problem-solving guides and a student handbook to provide structure and transferable techniques and strategies to increase self-efficacy and supply low-risk settings for learning new cognitive capabilities. Materials and resources remained online for students to access at their need.

The faculty were trained by CAES instructional designers who facilitated the EPBL faculty orientation and training. Time on task was approximately 4 hours, with a 2-hour synchronous session. Throughout, Bloom's Taxonomy (Bloom, Engelhart, Furst, Hill, & Krathwohl, 1956) was utilized as a guide for the instructors for transmission to the students: from lower-order thinking skills (knowledge, comprehension) to higher-order thinking skills (application, analysis, synthesis, evaluation).

Finally, the teams of designers and subject matter experts worked in a unique setting; the subject matter experts also received training on the model to assure understanding as the design moved forward. Additionally, modeling and testing student and faculty user experiences simulations and forums altered the tasks but not the theoretical structure. Through weekly design and technology forums with the designers and educational technologists**,** problems were exposed and the model was refined accordingly.

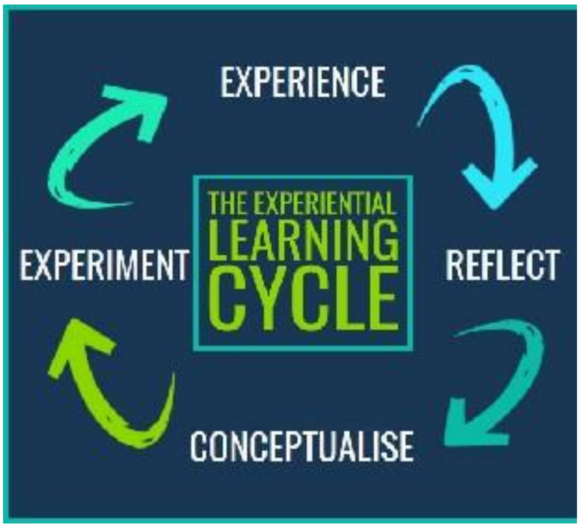
In the forums, potential conflicts about academic rivalry between industrial designers and educational technologists did not appear to be issues. Perhaps members of both groups recognized the complementarity and benefits in information, resources, training, and real-world applications. A case in point was a successful collaborative project of furniture production in Turkey with student and business owner evaluations "between academia, which is more close to design, and industry, which is more close to production" (Ali Altin, 2016, p. 193).

In ongoing development, multiple compatible pedagogical strategies further accentuate the learning and educational technologies, such as expert podcasts, e-portfolios, embedded resources and assessments, digitized learning pathways and a fully accessible learning management system. This system includes a full map that provides faculty and students with a clear learning pathway from the broader program learning outcomes to the course and module learning outcomes. The map illustrates how the learning is scaffolded and organized. More importantly, the map shows how all components are connected. Finally, the course Canvas page for access by all instructors and students for discussion, feedback, and resources is engaging and interesting for viewers.

Thus, this EPBL project is innovative and comprehensive and integrates theory and practice. The project incorporates teams of experts in instructional design, technology, subject matter, and industry; unique training and orientation of instructors and students prior to course implementation; blended learning strategies and use of the latest modes of technology; consistent summative evaluations for ongoing improvements and refinements; and pilot implementation and testing in one international venue (Tokyo). Figure 4 shows a broad overview of this project.

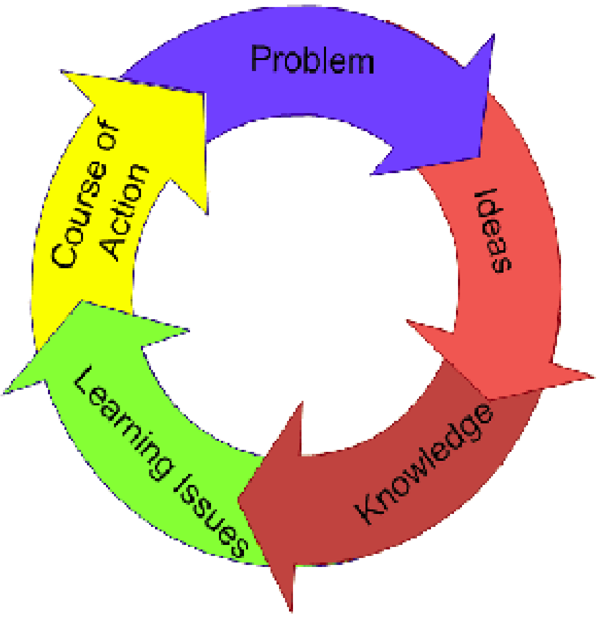
01. Global Education

Enabling students to understand the links between thir own lives and those of people throughout the world.



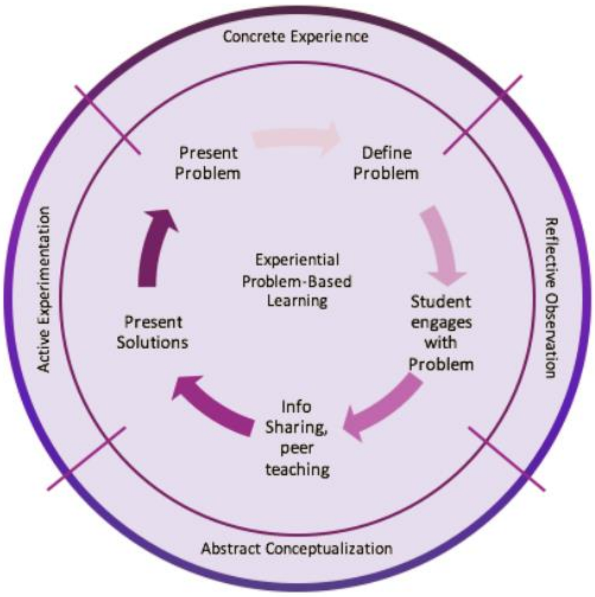
02. Experiential Learning

Giving students the opportunity to learn by reflection on doing.



03. Problem-Based Learning

Focusing on real-world, industry-relevant ill-structured problems.



04. Experiential Problem-Based Learning

Blending the strengths of Global Education, Experiential Learning and Problem-Based Learning.

Figure 4. Comprehensive overview of the Experiential Problem-Based Learning Project

LIMITATIONS

The model is multifaceted and complex, and the design, delivery and technologies are coordinated to flow seamlessly with the orientations and learning pathways, However, the students in the first pilot did not complete the orientation prior to beginning the course. We moved the orientation to the first in-person class to assure preparedness. Technologies are also important to the model's success to ensure students' comfort and ease in using technology. Thus, additional changes to streamline the model were implemented for the second cohort. Students' confidence in framing assumptions, using their voices to make choices, locate some of the needed resources, activate their prior learning, and other learner-centered approaches are new for most. Acclimation to EPBL by both students and faculty was the greatest challenge, but the trainings and orientations helped to overcome the challenges during the initial class.

Nevertheless, initial testing of the model revealed promising results, reported next. The model connects and incorporates fundamental principles, theories, and pedagogies with design decisions, as well as inputs, processes, and outputs in relation to each other (Romiszowski, 2016). This academic model for the development of students' independent and critical thinking skills, as well as their practice in real-world problems and solutions, can act as a process and guide for institutions, departments, individual faculty, and certainly students.

TESTING THE MODEL: DATA COLLECTION AND ANALYSIS

The model and initial implementation have been tested in two pilot studies with students at the New York University School of Professional Studies (NYUSPS) Global Executive Certificate Program in Tokyo, Japan. Students were enrolled in one of five Global Executive Certificate Programs: Marketing, Professional Writing, Data Analytics, Entrepreneurship, and Cybersecurity; the largest percentage of students were enrolled in Marketing and Data Analytics.

The evaluations took place in Tokyo, Japan, at the Global Executive Program with a total of 65 students**.** The survey items varied from 34 to 36 items on 4-point Likert-type scales, and including four open-ended items. Topics included names and number of courses taken, usefulness of course materials, homework, helpfulness of technology, quality of instruction, problem-solving guides, student reflections, and other elements of EPBL.

The surveys were administered to cohorts of students at the end of the Spring 2018, Summer 2018, Fall 2018, and Winter 2019 terms. The data were analyzed with descriptive statistics, frequencies and percentages, for the close-ended items. Responses were collected for the open-ended items.

RESULTS

The results overall were positive. Table 1 displays the survey results by frequencies and percentages for specific components of the program for the student in the four cohorts.

Item	Spring 2018 (*N* = 6)		Summer 2018 (*N* = 21)		Fall 2018 (*N* = 16)		Winter 2019 (*N* = 22)	
The problem-solving guides were . . .	NA[a]	NA	Very Helpful 52.38% (11)	Somewhat Helpful 47.62% (10)	Very Helpful 25.00% (4)	Somewhat Helpful 56.25% (9)	Very Helpful 54.54% (12)	Somewhat Helpful 36.36% (8)
The student reflections were . . .	NA	NA	Very Helpful 47.62% (10)	Somewhat Helpful 33.33% (7)	Very Helpful 31.25% (5)	Somewhat Helpful 56.25% (9)	Very Helpful 72.72% (16)	Somewhat Helpful 5.50% (4)
My learning experience continued and was enhanced through online sessions.	NA	NA	Strongly Agree 42.86% (9)	Agree 47.62% (10)	Strongly Agree 25.00% (4)	Agree 68.75% (11)	Strongly Agree 45.00% (10)	Agree 45.45% (10)
After completing this course, my ability to FRAME a problem has . . .	NA	NA	Improved Significantly 52.38% (11)	Improved Somewhat 42.86% (9)	Improved Significantly 25.00% (4)	Improved Somewhat 75.00% (12)	Improved Significantly 31.81(7)	Improved Somewhat 59.10 (13)
After completing this course, my ability to SOLVE a problem has . . .	NA	NA	Improved Significantly 47.62% (10)	Improved Somewhat 42.86% (9)	Improved Significantly 6.25% (1)	Improved Somewhat 87.50% (14)	Improved Significantly 27.27% (6)	Improved Somewhat 63.64% (14)

Item	Spring 2018 (*N* = 6)		Summer 2018 (*N* = 21)		Fall 2018 (*N* = 16)		Winter 2019 (*N* = 22)	
After completing this course, my ability to justify my solution . . .	NA	NA	Improved Significantly 33.33% (7)	Improved Somewhat 57.14% (12)	Improved Significantly 12.50% (2)	Improved Somewhat 81.25% (13)	Improved Significantly 31.81% (7)	Improved Somewhat 59.10% (13)
After completing this course, my ability to recognize diverse perspectives has . . .	NA	NA	Improved Significantly 61.90% (13)	Improved Somewhat 33.33% (7)	Improved Significantly 25.00% (4)	Improved Somewhat 62.50% (10)	Improved Significantly 27.27% (6)	Improved Somewhat 72.72% (16)
After completing this course, my communication skills have . . .	NA	NA	Improved Significantly 33.33% (7)	Improved Somewhat 61.90% (13)	Improved Significantly 6.25% (1)	Improved Somewhat 68.75% (11)	Improved Significantly 18.18% (4)	Improved Somewhat 63.64% (14)
After completing this course, my reasoning skills have . . .	NA	NA	Improved Significantly 47.62% (10)	Improved Somewhat 42.86% (9)	Improved Significantly 6.25% (1)	Improved Somewhat 75.00% (12)	Improved Significantly 22.72% (5)	Improved Somewhat 68.18% (15)
The teacher helped me reach my learning goals.	NA	NA	Strongly Agree 81.00% (17)	Agree 19.04% (4)	Strongly Agree 43.75% (7)	Agree 56.25% (9)	Strongly Agree 68.18% (15)	Agree 31.82% (7)
My course was effective in helping me achieve my goals.	Strongly Agree 16.67 % (1)	Agree 83.30 % (5)	Strongly Agree 66.67% (14)	Agree 28.57% (4)	Strongly Agree 31.25% (5)	Agree 68.75% (11)	Strongly Agree 45.45% (10)	Agree 54.54% (12)

Table 1. Student Evaluations: Results for Selected EPBL Items

Note: NA means that the first cohort did not complete.

With regard to quantitative results, Table 1 shows that for all four courses, the majority of students responded positively in many areas. On the 11 selected items especially regarding EPBL, for the Spring 2018 cohort, because of incompletion of the course, almost all items could not be answered. However, for course helpfulness in reaching students' goals, all chose Strongly Agree, 17%, and Agree, 83%. For the Summer 2018, Fall 2018, and Winter 2019 courses, most students evaluated the courses with the highest values of Very Helpful or Somewhat Helpful, Strongly Agree or Agree, and Improved Significantly or Improved Somewhat. In all cases, the students rated the courses primarily with these values, indicating their satisfaction.

With regard to qualitative results, in the surveys students were asked to explain their short-answer responses with four open-ended questions. Some of their responses:

From Spring 2018:

- This course helped me to change my perspectives and to make assumptions to find the problems and the solutions.

From Fall 2018:

- Teacher was very helpful but student problem-solving guide which is recommended by NYU was sometimes too complicated or not appropriate to solve the module problems.
- It was good course to improve my critical thinking skills but the given questions to answer were too general or vague so it was a bit confusing to answer.
- Overall it was a great experience to study at NYUSPS Tokyo not only to improve my skills but also to play the role to lead the discussion etc.
- The contents of the course itself is completely recommendable. . . . In our class we have only two students including myself. If we have at least three, our discussion in in-person classes would be more active and we could get various ideas or opinions.
- Instructor totally supported me during the course program; thus, my abilities might be able to increase accordingly.
- I think the course was well organized with good reading materials. I just could not spend enough time for the online learning materials.

From Winter 2019:

- From the NYUSPS teaching experience, I am persuaded that after completing all necessary courses, I will confidently be able to solve business problems to help companies successfully competing locally and globally by prioritizing digital marketing innovations.
- I well appreciate NYUSPS and recommend NYUSPS courses to other people who have interest in knowledge improvement.

- As new in the marketing field, the skill and tools received from the introduction to marketing lead me to another step by improving my background.
- I am persuaded I will finally break into business game because of the competitive skills that I am gaining from Tokyo NYUSPS.

Course developers and instructors had these comments:

- Creating a course-level problem for EPBL is a fascinating experience in itself, pushing you to reflect on the real-world industry challenges (course developer).
- EPBL is a solid methodology that turn a simple student into an active researcher, a thought provoker, it brushes away the common passivity found in a traditional classroom (instructor).
- In places where rote learning is still the educational standard, EBPL is especially crucial, however discombobulating it may be to students at first (instructor).
- Typically, students initially seek “right” answers from learning materials or instructors’ comments. Over time, many of them realize that they are responsible for reaching their own conclusions and that they can be confident about their thought process (instructor).

DISCUSSION AND FURTHER PLANS

Although the student samples were small, the results as a whole were positive. All students in the four courses either strongly agreed or agreed with the statement “Overall, I am satisfied with my NYUSPS Tokyo experience.” For Summer 2018, 50% (3) Strongly Agree, 50% (3) Agree; for Summer 2018 81% (17) Strongly Agree, 19% (4) Agree; for Fall 2018, 31% (5) Strongly Agree, 69% (11) Agree; for Winter 2019, Strongly Agree 63.64% (14), Agree 36.36% (8). With regard to the selected items relating to EPBL, for all items, 75% to 100% of students in all cohorts chose the top two values (Very Helpful, Somewhat Helpful, Strongly Agree, Agree, Improved Significantly, Improved Somewhat). Most of the combined values were in the 90% to 100% range. A major goal of the model was reached: students learned and practiced critical and creative thinking and increased their communication skills. Student and instructor comments supported the efficacy of the program.

At present, the EPBL project has been implemented with courses in the United States and Japan. We are also offering two fall workshops for NYU faculty. In continuation of the program, nine more courses and evaluations launched in the summer of 2019, including feedback not only from faculty and students but also from instructional designers and industry experts.

The School of Professional Studies at NYU has 16 master's programs, four new masters coming in the next year, nine bachelors, and several associate degrees. In addition, we offer hundreds of noncredit courses every year, including our Certificates and Diplomas. However, the model itself is not limited to these early programs but can potentially be utilized as well for professionally-oriented education degrees, certifications, and lifelong learning offerings.

Future evaluations of the model would include additional faculty and student evaluations in New York, Tokyo, and other international venues, with comparisons of these to the earlier evaluations, and adjustment of the curricula as necessary. In addition, after students are trained in using the model, the industry forums could evaluate the students' competencies, in contrast to the students' own evaluations. Further, students' views on the helpfulness of EPBL could be tracked to subsequent employment after they have been in the field, as well as their employers' assessments of their competencies. In addition, the involvement of different organizations and individuals, such as input from professional associations and CEOs, could be explored to refine and extend the model, as well as suggest directions for future research and applications.

The model and support structures have been completed so that scaling to larger programs and new contexts can be readily accomplished. Although a learning management system is required, it can be translated to any learning management system. The orientations, training, frameworks, and design templates, and trainings are also complete and can be scaled to any number of sections. Additionally, although some students evaluated the model as "complicated," the responses were nevertheless positive. Thus, the model can be transferred to other educational areas and disciplines**,** such as the biological and environmental sciences, information technology, economics, social sciences, and leadership.

The problems that the model seeks to address are universal. This new model can theoretically be transferred to almost any discipline or programs with creativity and disciplinary and taxonomy contextualizing. Good EPBL problems in whatever field can, with creativity, be adapted to any field (Duch, Grow, & Allen, 2011). Common characteristics distinguish the problems. They should be open-ended and ill-structured. They should be complex, although with a degree of complexity that embodies the following:

- They should engage students' interests, be challenging, and motivating enough to prompt students to seek a deeper understanding of the concepts involved.
- They should require students to make reasoned decisions and defend them.
- They should incorporate the content objectives.
- They should relate to students' prior course and life knowledge.
- They should enable students to analyze the problem[s] from multiple perspectives or disciplines;
- They should be adapted to students' cognitive development and readiness.
- They should be formulated to relate to students' future or potential workplaces.
- If a group project, the problems must have enough complexity to ensure students work together to solve them. (Duch et al., 2001; Jonassen & Hung, 2015)

CONCLUSION

In this article, the EPBL model has been presented highlighting holistic components and theoretical support. To experiment with or adapt this model, several preconditions are necessary. These include training of staff in the model and technology use, creation of handbook that addresses particular disciplines and educational areas directly, applications to real-world scenarios, and orientation of students to the model and mode of learner-centered teaching and the requirements, as instructors and students commented on. The primary considerations to be aware of are possible confusion on the stages of the EPBL problem-solving guides for both staff and students (as students commented on) and built-in periodic refresher training and/or troubleshooting with a staff member or faculty member who has worked with the model. Further, monitoring of the model success should take place with staff and student feedback, preferably before the end of the course so that corrections can be made.

An observation must be made on the use of the model created in New York City and implemented in Tokyo. All students were part of the New York University Global Executive Program delivered in Tokyo, and all were Japanese. To this member of the team, it was particularly impressive that the students were eager and open to mastering this challenging method of learning, especially because, like U.S. learners, the cohort members were accustomed to a highly structured faculty-directed learning environment.

As reported, the students also had high praise for the courses and saw the applications to their future careers.

The current surveys did not include a cultural component either for orientation to the model or in the surveys. With implementation in other educational areas and international programs, a cultural component could be added. This component would take into account traditional modes of learning and mores to tailor the curriculum for maximum effectiveness in each setting.

The EPBL model described here is an innovative and highly industry- and evidence-based transformative educational model that addresses many of the problems and challenges of today's higher education. With implementation, the model prepares students to grapple with the unknowns, draw on their life experiences, and holistically consolidate their learning for applications vitally necessary in industry and many other fields in the 21st century.

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