

# Evidence-based Innovation methodology as a way to produce Open Educational Resources by in-service teachers

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## ABSTRACT

Innovation-based evidence methodology is a newly teaching approach that promotes the use of peer-reviewed information as grounds to design teaching projects. For this to occur three designing stages are needed 1: choosing the object to be studied, 2: searching for evidence in the literature, 3: write the innovative teaching project and two implementation stages: 4: enactment and evaluation, 5: Dissemination which are advised to be accomplished. The completion of those phases may serve to produce Open Educational Resources (OER), which at last, are seen as one of the products of educational innovation. The purpose of this paper is to show what object of study the participant in-service teachers selected for their innovation projects (phase 1) and how they produced OER –methodology- (phase 4) accordingly. Data analysis was conducted using a descriptive exploratory methodology. Results indicate that in-service teachers mainly chose projects in the disciplines of language and mathematics within primary and secondary education levels. On the other hand, Problem based learning (teaching strategy), b-learning (teaching modality) and IDB (teaching resource) were the most used methodologies for OER production. This leads us to understand that language teachers are more prone to design innovative projects in their classrooms. Additionally, they are mostly worried to implement innovative strategies in the OER they produced, rather than teaching modalities or ICT resources.

## Categories and Subject Descriptors

Applied computing–Education

## General Terms

Performance, Design, Experimentation, Human Factors.

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## Keywords

Innovation based evidence; open resource education; training in-service teachers.

## 1. INTRODUCTION

Universities and higher education institutions worldwide are immersed in change process to improve their quality teaching processes [21]. The use of Information and Education technology increase the possibilities of the universities to innovate their teaching process, and a way to do it; is by using Open Educational Resources (OER). According to [18] high education institutions requires both teachers and students to integrate learning resources, because they can access to new and flexible content, which allow them to interact better. Therefore, teachers should incorporate them into their classrooms as part of the syllabus, and as a result the teaching-learning process will be more dynamic and interesting.

The use of OER involves some activities to do such as reusing, redistributing, revising and remixing, its use also supports the virtual academic communities by giving the chance to share and disseminate innovative educational practices [16]. Because of this, it is important that teachers have the necessary skills and competences to face new ways of teaching.

Additionally, the integration of OER in education requires teachers enroll in digital training [20]. Digital Competence is recognized as a key competence for citizens at the 21<sup>st</sup> century and it highlights technology and pedagogy dimensions [6]. International Organizations have developed a teaching digital competences framework in order to guide and highlight the role of the teacher when using technology [10; 25].

The aim of this paper is to show how in-service teachers of a postgraduate on-line course produce OER as a result of a design and implementation of an innovative project using a strategy called innovation based evidence.

The information shown in this paper could be of the interest OER and innovative education researchers, because it includes some experience of having use, produce and disseminate it. OER allows teachers to innovate their teaching practices supporting it with scientific and update literature, which represents a challenge and an opportunity to go further in this area o study.

This paper has been divided into seven sections. Section 2 describes a framework that supports the proposal research. Section 3 describes the statement of the problem. Section 4 shows research methodology. And section 5 and 6 presents the results and discussion of this research.

## 2. FRAMEWORK

The emergence of Information and Communication Technologies (ICT), particularly Internet, has opened new ways to produce knowledge and disseminate within the Teacher Educators community [19]. One of the way is to develop OER as significant educational tools for equalizing access to education and guarantee free access to them [7]. Disseminate OER allow to know best teaching practice too.

OER has gained acceptance by educational researchers because it brings renewed ways of teaching practice. Teachers Educators have focused their attention on making students' learning with OER as they enables extensive and democratic practices [15]. Also, they are increasingly becoming facilitators who formulate challenges and offer support anytime from anywhere [2]. For that reason, it is important the implication of teachers as main responsible of the use and dissemination of OER as a best teaching practice.

To date, researches have highlighted the role of university and tertiary education as the predominant channel to promote the OER practices as innovative methods for teaching [8]. However, research also highlights that teachers, as active element in education, do not always demonstrate confidence to use open technology (OER) because evidences about good practices on how to use them are needed [3; 5; 23]. Other reason highlights the lack of skills needed to use technology and pedagogical issues [1; 4; 14; 15]. It is notorious as mentioned by [17] and [3] that there is a big challenge to face in education, if we want to link the gap between practice and research.

It has been largely recommended that teachers should be trained in the use of OER. According to [25] there is a need for training of ICT in order to improve the teacher's skill. Studies have revealed that teachers do not yet integrate technology effectively into their classroom [5; 9; 22] it is because is necessary pedagogic training [12; 13] to successful diffusion and adoption technology or OER. However, [5] mentioned that knowledge is not enough if teacher do not perceive by him/her self-competent in his use.

There is an innovative methodology that allows using, producing, and disseminating OER among teachers; its name is Evidence-Based Innovation in Education (EBIE). [24] mention that there is need for innovation in teaching practices, for guiding teachers to find the best practices and support their own practices, through activities such as finding scientific literature, critical reading, and evidence's evaluation found. At the same way [17] state that teachers should be able to find information, critical reading, and writing projects skills in order to put knowledge into practice through inquiry strategies supported by digital skills.

Therefore, it is widely assumed that EBIE has five steps 1) choosing the object of study, 2) searching for evidence in the literature, 3) write the innovative teaching project, 4) enactment and evaluation, 5) Dissemination.

## 3. THESIS STATEMENT

### 3.1 Problem statement

It seems that OER is not often used in the daily teaching practice [16], for that reason might be recommended to go for another kind of innovation model which allow for an effective integration: EBIE methodology could be an alternative [24].

### 3.2 Research Objectives

Our interest about this study is to analyze the EBIE model, specifically, how its application can support the use, production and dissemination of OER. In this study we are going to highlight the ability that in-service teachers who participation in an on-line course of a postgraduate program, to designing innovators project (phases 1 to 3) and its implementation (phases 4 and 5). For this study, phase 1 is one of the most representative because it shows how in-service teachers choose the object of study to write an innovator project; and also, phase 4 was chosen because it shows how in-service teachers produced OER.

## 4. RESEARCH METHODOLOGY

The methodology chosen to analyze the data was descriptive-exploratory [11]. This methodology involved the application of phase 1 and phase 4 of the EBIE model.

### 4.1 Sample

A total of 96 in-service teachers of an on-line postgraduate program, which is called "Modelos de Gestión del Aprendizaje" [Management models for learning] participated in the study. It was taught at the Instituto Tecnológico de Monterrey (ITESM, Mexico) during four months in 2016. Out of the initial sample, 94 in-service teachers completed successfully the on-line course.

### 4.2 Data collection

Data was collected upon three questions of a survey, which was applied to the in-service teachers. The first one was about application level of the innovator project, which involves user level, institutional level and national level. The second one was about educational level, that is to say, the educational degree to be applied in the innovation project (i.e., being educational level according the way of theirs jobs). The third question was about working field (See Table 1).

Data about production of OER was collected from participants' documents and was later uploaded to the learning platform as a result of their learning (See Table 2).

### 4.3 Data analysis

At the end of the on-line course, in-service teachers answered to the question's survey. We analyzed the before three questions regarding to the first and four phases of the EBIE model.

The elaboration of an OER was understand for the purposes of this paper as a research paper produced during and at the end of the implementation of the innovation project in the on-line course.

## 5. RESULTS

Main findings indicate how teachers work in the first step of EBIE. Teachers in the online course needed to start with a planning session where they mark the level they work in the project. Please see Table 1.

**Table 1. Choosing the object of study (Phase 1- IEBE)**

Dimension	Description	F	%
Application Level	User level	77	80
	Institutional level	17	18
	National level	2	2
	<b>Subtotal</b>	<b>96</b>	<b>100</b>
Educational degree	Kinder	4	4
	Primary school	35	36
	Secondary	7	7
	Post secondary	45	47
	Undergraduate studies	4	4
	Postgraduate studies	1	1
	<b>Subtotal</b>	<b>96</b>	<b>100</b>
Subject matter	Arts	5	5
	Science	19	20
	Social Science	4	4
	Spanish Language	12	13
	Humanities	4	4
	English and other languages	11	11
	Mathematics	20	21
	Educational Technology	12	13
	Other	9	9
	<b>Subtotal</b>	<b>96</b>	<b>100</b>

As shown in table 1, 80% of the in-service teachers chose to conduct an innovation project at a user's level that involved students and educators. Just 18% mentioned that it is going to be applied to institutional level, which involves administrative staff, librarians and technicians. Only 2% of the sample chose national level, which involve government, national agencies of accreditation and civil organizations.

Table 1 also highlights that there are 36% of the in-service teachers who applied their innovation projects at the primary school level and 47% in post secondary education. Regarding to work field, we can see that Mathematics (21%) and Sciences (20%) were the most chosen areas whereas Arts, Humanities and Social Sciences show percentages around 5%.

Table 2 shows the results of OER produced by in-service teachers.

**Table 2. Results of OER produced (Phase 4 - EBIE)**

Dimension	Category	Subcategory	F	%
Subject-matter knowledge	Sciences	Natural Science	17	18
		Educative Technology	12	13
		Mathematics	20	21
	Humanities	Language	41	44

Methodology	Modalities	Ethical principles	4	4
		<b>SUBTOTAL</b>	<b>94</b>	<b>100</b>
		Face to face	4	4
		b-learning	13	14
	Strategies	e-learning	9	10
		m-learning	8	9
		Problem-based learning	20	21
		Flipped learning	10	11
	Resources	Collaborative Learning	2	2
		music-therapy methodology	3	3
		White Digital Board	4	4
		audiovideo book	4	4
		Offline resources	4	4
		Electronic portfolio	11	12
wiki	2	2		
<b>SUBTOTAL</b>	<b>94</b>	<b>100</b>		

This phase was focus on five domains of knowledge where Language, Mathematics and Educational Technology were the most chosen, and because they are the main competencies.

## 6. DISCUSSION

### 6.1.1 About the OER design stage

EBIE model guides teachers to create and design innovation projects that improve their teaching practice and learning experience. The results at the design stage (phase 1) evidenced how the most in-service teachers choose a designing innovator project to apply in the user level the reason might be explained by the fact that most in-service teachers are not working as a manager or executive and it does not allow them to have the enough resources to implement project in those levels. But it allows as mentioned [15] focusing their attention and efforts on making students' learning a great experience. Furthermore, EBIE model can support in-service teachers to use, create and disseminate OER during the design stage of an innovation project.

On the other hand primary school and post-secondary teachers were the ones that mostly focused on improving their teaching practices through innovation projects. This may be explained by the fact that they have received more training hours on this regard and also because they are required so in their work. Another reason points to the fact those in mandatory educational levels that are being constantly assessed by the educational administration higher levels of ICT knowledge are required. Those reasons highlight that in-service teachers with the support of ICT produced new knowledge through innovation projects [19] leading to innovative teaching practices and the improvement of the learning process [2].

It is evident that the most innovative projects were found in the subjects of Natural Science and Mathematics field. Conversely, Social Science and Humanities were few represented showing that science are more prone to open new ways to innovation.

### 6.1.2 About the OER Production stage

OER production (phase 4) revealed two dimensions according to its focus and results: Subject matter knowledge and methodology.

Subject matter knowledge has been divided into Sciences and Humanities. The majority of OER was found in Mathematics and Language, probably because those subjects are representing the key competences from primary to post secondary school.

The methodology dimension showed that the b-learning modality was predominant as well as the online learning types. This may be explained by the characteristics of the school teaching programs.

As for the teaching strategies, in-service teachers showed especial concern in problem-based learning and Flipped learning. Most of the OER focused on them probably because they are novel methodologies greatly encouraged to be used in classroom.

Finally, regarding resources, Electronic portfolio was the preferred technology among the participants, probably because there is a high demand to offer students the chance to interact with subject contents and developing digital skills.

The OER produced by the teachers contributed to promote their methods as innovative ways for teaching [8]. On the other hand the training they received in digital skills serve to link teachers' practices with research [3; 17; 24].

One limitation of this study, though, is the sample size. This fact makes it difficult to generalize the collected results to other school contexts. For that reason we suggest expanding the study sample to other contexts with the purpose to better assess the real impact of OER.

Even though in-service teachers produced OER using EBIE, we believe that it is necessary to continue training teachers with the purpose to develop digital and research skills [17; 24]. This way, they could accomplish an effective integration of OER and technology in classes [5; 9; 22]. Through on-line course we can let the teachers rethink about the role of OER as tools for equal access to education and digital inclusion [7].

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