

# A Framework for Effectiveness of Institutional Policies on Technology-Enhanced Learning

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**Abstract.** For institutional policies associated with technology-enhanced learning (TEL) instruments, such as blended learning, mobile learning, massive open online courses, and open educational resources, their policy effectiveness is to a large extent affected by how ‘effectiveness’ is conceptualized. Studies on effectiveness of institutional policies reveal that a diverse conceptualization has been employed.

This paper proposes a framework based on the instrumental perspective summarizing different approaches of assessing institutional policy effectiveness and the variables involved in each approach. A systematic literature survey of institutional policies on TEL is conducted, showing that the framework is highly comprehensive in terms of capturing different dimensions of policy effectiveness. This study will provide a point of reference not only on assessing the effectiveness of relevant policies but also for formulating relevant policies by educational administrators.

**Keywords:** technology-enhanced learning, effectiveness of institutional policies, instrumental perspective.

## 1 Introduction

The use of technology in education, i.e., technology-enhanced learning (TEL), has been commonplace in the education world as shown in relevant institutional policies. Examples include blended learning [1], mobile learning [2], massive open online courses (MOOCs) [3], open educational resources (OER) [4], social media [5] and other e-learning modes [6][7]. Such wide application of technologies, in a sense, can be attributed to the purpose of enhancing efficiency and cost-effectiveness of delivery of education [8]. For institutions which have spent tremendous amount of resources in providing TEL, it is critical for them to evaluate the effectiveness of their relevant institutional policies [9].

Contemporary studies on effectiveness of institutional policies employ a diverse conceptualization of effectiveness, resulting in a wide variety of foci of analysis for understanding the concept. To illustrate a few, a focus of analysis lies in the effect of TEL on learning outcomes in terms of student performance. Comparative methods are commonly used in this kind of analysis, e.g. effectiveness of online versus traditional

classroom training [6]. Another focus is on the design of a TEL device and how the design suits a particular teaching and learning context. Zhang et al, for example, observe that integrating interactive instructional videos into an e-learning system can enhance learning effectiveness [7]. Analysis can also be focused on perceptions and attitudes of TEL stakeholders in general and learners and teachers in particular, with an assumption that institutional policies would not be effective without taking into considerations stakeholders' needs and wishes. For the case of OER, Gruszczynska emphasizes that "it is important to spend time exploring student perceptions and attitudes on OER", in order to "explore ways in which personalization can be achieved when lecturers use OER created outside their institutions" [10] (p. 2). The different foci of analysis reveal the dynamic nature of policy effectiveness, which presents a need of systematic summarization of its diverse conceptualization to facilitate evaluation of TEL-related institutional policies.

This paper presents a preliminary conceptual framework, based on the perspective of instrumentalism, for analyzing effectiveness of institutional policies on TEL. It first depicts the core of instrumentalism, and then reports the findings of a literature survey illustrating the comprehensiveness of instrumental perspective in terms of capturing the diverse conceptualization of policy effectiveness. Accordingly the components and variables of the framework are outlined and the values of the framework for TEL research and formulation of relevant institutional policies are discussed.

## **2 Effectiveness of Institutional Policies on TEL: An Instrumental Perspective**

Institutional policies refer to methods or means used by institutions to achieve desired effects in line with their own visions and/or missions. This section introduces four different approaches to assessing effectiveness of institutional policies with reference to instrumentalism [11][12][13].

### **2.1 Classical Approach: Character of Instruments**

This approach stems from the 'classical' theory of instruments, focusing on analysis of character of instruments. It assumes that an instrument has its own nature, characteristics and logics of operations and functions, and hence own line of effectiveness and limitations. Each instrument brings distinctive effects on different institutional policies, such as the choice of instrument and implementation design. In line with this school of thought, the key questions of evaluating policy effectiveness regarding an instrument, i.e., a TEL device, may include:

- What is the nature of the TEL device?
- How does the nature of the TEL device determine the implementation of policy?
- What is the impact of the TEL device on teaching and learning?
- What are the expected effects of the TEL device on learning outcomes?

## 2.2 Contextual Approach: Implementation Process

This approach is rooted in the ‘contextual’ theory of instruments that places its emphasis on the influence of the implementation process of a policy. It holds that there may be differences between instruments and no policy is universally applicable. Factors to address are contextual ones such as decision-making arena and policy network, with particular attention to the implementation process. The point of departure in examining policy effectiveness, according to this approach, is not so much about the TEL device *per se*, but how the implementation of the TEL device shapes the intended effects of the device. In this line of thinking, the key questions of evaluating policy effectiveness may include:

- What is the nature of the TEL implementation setting?
- What barriers and/or enablers are there in the TEL implementation process?
- How do the barriers and/or enablers shape the TEL device in the implementation process?
- How does the implementation process affect the expected effects of the TEL device?

## 2.3 Instrument-Context Approach: Requirements of a Problem Setting

This approach is rooted in the ‘instrument-context’ theory of instruments. Its focus of analysis is on the matching or ‘good fit’ between instrument and context. The choice of instruments depends on the requirements of a problem setting in the context. Once the requirements are identified, instruments that are considered most appropriate in satisfying the requirements can be chosen. Hence there are two tasks in this approach, i.e., to figure out the requirements of a particular problem setting, and to choose the instruments in accordance with the requirements. In line with this approach, questions of evaluating policy effectiveness may include:

- What is/are the problem(s) of teaching and learning in a particular setting?
- What are the requirements of the problem setting? That is, how can the problem(s) be solved?
- What are the options (solutions) available for solving the problem(s)?
- Is TEL the way out? If so, which kind of TEL device?

## 2.4 Constitutive Approach: Subjective Meaning of Instruments

This approach is vested upon the ‘constitutive’ theory of instruments which holds that effectiveness of policy instruments may be hampered or supported by subjective factors. It is interpretive and constructive in nature, with a starting point lying in the ‘meaning’ of instrument which can only be understood subjectively and therefore differently. The subjective meaning of instruments can be socially constructed and reconstructed over time and changes with value systems. Therefore, to study TEL policy effectiveness in this line of thinking, the following key questions can be raised:

- What do institutional leaders think about TEL?
- What do teachers think about TEL?
- What do learners think about TEL?
- To what extent is TEL accepted by institutional leaders, teachers and learners?

In sum, the four approaches of policy instruments, as elaborated above, constitute the core of instrumentalism, which offers the basis of developing a conceptual framework for evaluating policy effectiveness.

### 3 Comprehensiveness of the Instrumental Perspective

To examine the power of the instrumental perspective in offering a comprehensive framework for analyzing TEL policy effectiveness, a survey of relevant studies was conducted to investigate the extent to which the instrumental perspective is able to capture various conceptualizations of effectiveness in evaluating institutional policies on TEL.

#### 3.1 Data Collection and Analysis

This study adopts Price and Kirkwood's approach to collecting data for analysis [14]. Google Scholar was used to dig out relevant papers published in 2000–2014. The keywords used were: 'institutional policy', 'technology enhanced learning', 'mobile learning', 'blended learning', 'massive open online courses', 'open educational resources', and 'social media'. Abstracts of the retrieved papers were examined to ensure that they satisfy the following inclusion criteria:

1. The paper involves an institutional policy in one or more of the following areas associated with applications of technology in higher education institutions:
  - Mobile learning
  - Blended learning
  - Massive open online courses
  - Open educational resources
  - Social media
2. The paper presents a study that was implemented and evaluated to inform institutional policy on applications of technology in education.
3. The paper involves some forms of evaluation of institutional policy.
4. The paper provides a literature review of existing studies that fulfill the criteria in this list.

In addition, the following exclusion criteria were applied:

1. Technology applications in schools;
2. An institutional policy on TEL in schools;
3. An institutional policy on TEL that was proposed but had not been implemented.

Given the above criteria, a total of 101 papers were collected and reviewed. The following aspects were considered in the process of reviewing the papers using a simplified thematic analysis:

- Which dimension of the effectiveness of the TEL was/were investigated?
- Which instrumental approach(es) did the dimension belong to, if any?

### 3.2 Findings

Table 1 shows the frequency of the dimensions of policy effectiveness applied in the papers. The results show that all the dimensions can be captured by one or more of the four instrumental approaches. A few papers adopt more than one dimension within the purview of the instrumental perspective, thus the accumulated total number of dimension (i.e., 114) is larger than the total number of papers reviewed (i.e., 101).

**Table 1.** Frequency of the dimensions of policy effectiveness applied in the collected papers

TEL device	Instrumental perspective			
	Classical	Contextual	Instrument-context	Constitutive
Blended learning	3	6	0	11
Mobile learning	4	2	0	2
MOOCs	4	6	0	4
OER	6	20	1	6
Social media	14	4	0	2
General*	13	0	0	6
Total	44	38	1	31
Accumulated total	114			

\* This TEL device refers to studies on e-learning or online learning.

As shown in the data, the instrumental perspective is able to penetrate all of the TEL devices collected in this study, suggesting that the instrumental perspective is by and large not hindered by any type of TEL device.

There is only one paper falling in the instrument-context dimension. It does not, however, imply that this dimension is not useful given the small sample of papers reviewed. A possible reason for the lack of attention to this dimension which focuses on requirements of the teaching and learning setting is that TEL has largely been commonplace in the educational world [8]. This seems to have discouraged further exploration into whether there is a need for TEL in an institutional setting. On the other hand, it is observable that most papers fall into the other dimensions of effectiveness, i.e., what TEL device can produce effective learning outcomes, what barriers and enablers are in the implementation process, and what people think about TEL.

## 4 Towards a Framework for Analyzing the Effectiveness of Institutional Policy on TEL

Table 2 outlines a framework for evaluating TEL policy effectiveness based on the four dimensions in institutional perspective. The following discusses the variables related to each dimension of effectiveness.

### 4.1 Character of TEL Devices

The purpose of institutional policies on TEL should not be about the technology involved, but teaching and learning. However, as the classical approach would suggest,

**Table 2.** A framework for evaluating TEL policy effectiveness

Dimension of effectiveness	Variables of TEL policy effectiveness
Character of TEL devices	<p><i>Effects on institutions, learners and teachers</i></p> <ul style="list-style-type: none"> <li>• Efficiency and cost-effectiveness</li> <li>• Learning outcomes (e.g. students' performance)</li> <li>• Impacts on teachers (e.g. teachers' freedom, identity and credibility)</li> </ul> <p><i>Technological, pedagogical and content designs</i></p> <ul style="list-style-type: none"> <li>• Technological and pedagogical 'good fit'</li> <li>• Interoperability and compatibility of TEL devices</li> <li>• Culture issues and 'localization'</li> <li>• Language barriers</li> </ul>
Implementation process	<p><i>Institutional and structural settings</i></p> <ul style="list-style-type: none"> <li>• Internal institutional policy and structure; knowledge of senior management</li> <li>• Government regulatory framework</li> <li>• Availability of resources (financial, time, staff with relevant expertise)</li> <li>• Technology infrastructure; quality and stability of technology service provider</li> <li>• Intellectual property right and licensing</li> </ul> <p><i>Quality assurance</i></p> <ul style="list-style-type: none"> <li>• Content and pedagogical quality assessment/assurance</li> </ul> <p><i>Role of learners and teachers</i></p> <ul style="list-style-type: none"> <li>• Students' understanding and knowledge, techniques or experience of TEL described, students' age</li> <li>• Students' self-confidence in mastery of technology in learning</li> <li>• Level of teacher and student engagement in the development of TEL described</li> </ul> <p><i>Assessment and evaluation</i></p> <ul style="list-style-type: none"> <li>• Student assessment and teacher evaluation</li> </ul>
Requirements of a teaching and learning problem setting	<p><i>Relevant requirements of a teaching and learning problem setting</i></p> <ul style="list-style-type: none"> <li>• Demand for supply of teachers or educational services</li> </ul>
Acceptability of TEL	<p><i>Institutions</i></p> <ul style="list-style-type: none"> <li>• Institutional norms and values</li> </ul> <p><i>Stakeholders</i></p> <ul style="list-style-type: none"> <li>• Institutional leaders, teachers and students' perceptions, attitudes and preferences</li> <li>• Teachers' field of teaching or students' field of learning</li> </ul>

the TEL device definitely matters in shaping the effectiveness of TEL in practice. Effects of TEL devices on institutions such as cost-effectiveness and efficiency [15] and teaching and learning outcomes have been central foci. Positive effects of TEL on learning outcomes such as understanding of complex concepts have been reported [16],

although they did not always do positively [17]. Effects of TEL on teachers have also been an important aspect of concern. In applications of social media such as Facebook in education, for example, the requirement of teacher participation in the use of this social media to enhance communication and interaction between students and teachers has raised concerns about teachers' freedom, identity and credibility [18][19].

There have been tremendous efforts in technological, pedagogical and content design in order to procure positive effects of TEL devices on learning outcomes. Technically, interoperability and compatibility have been identified as critical variables that affect the effectiveness of communication in virtual TEL environments [20]. Another key aspect is how TEL can be designed to suit pedagogical needs and to ensure a technological and pedagogical 'good fit' [21]. For example, the nature of Facebook makes it a popular platform for social networking but it is also this nature that often makes it not always suitable pedagogically to be used for academic purpose [22].

Culture issues and 'localization' embedded in TEL device (the extent in which the understanding of educational materials is not hampered by cultural difference) and language barriers have appeared to be an important variable swaying whether or not there could be proper communication between learners and TEL materials (e.g. [23][24]). A possible way to overcome cultural effects, as Kanuka and Gauthier have suggested in the case of OER, is to employ strategic use of surveys, interviews and evaluation frameworks to ensure that OER are culturally relevant to local learners [25].

## 4.2 Implementation Process

Studies in TEL have also looked at variables under the purview of the contextual dimension of effectiveness. Variables may be on institutional and structural settings, i.e., whether or not internal institutional policies and structures are in conflict with a policy on TEL and the friendliness of government regulatory framework [21][26] as well as knowledge of senior management [27]. Following closely, the availability of resources and technology infrastructure is an aspect of concern in the implementation process [3]. Al-Fahad has found that while students perceived mobile learning as a useful means to enhance learning experiences, the process of implementing this mode of learning was hindered by various contextual factors such as poor networking in the city [28]. Closely associated with resources and infrastructure is the quality and stability of technologies by service providers. Phillips has observed, for instance, that "there is the monitoring of hyperlinks, as after a period of time some of them become 'broken' for various reasons, such as the movement of web servers. Hence, it is the task of the subject-matter expert to promptly replace these 'dead' links with equivalent alternative links" [29] (p. 184), and therefore, informal and just-in-time support for users [30] was considered imperative and necessary in the process. Another resources related variable is about intellectual property right and licensing issues, which is an immensely imperative issue especially for OER (e.g. [31]). van Wyk has pinpointed that "OER alone cannot increase access and quality in higher education", and that governments should play a role in supporting "the principle that products of publicly funded work should carry such licenses" [32] (p. 13).

Content and pedagogical quality assessment and assurance issues have proved to be a critical concern in the TEL implementation process [33][34]. A primary concern is about who are involved in the development of online contents and who are to ensure that those contents are relevant and pedagogically sound. Misra has noted that many TEL enthusiasts who worked with some support from institutions to design and develop OER-based courseware were in many cases without any related training, and proper quality control is needed to prompt the production of TEL materials with reasonable quality [33].

The role of learners and teachers are key variables in the implementation process. Students' understanding, knowledge, techniques and experience of TEL [35] and self-confidence in mastery of technology in learning [36] are important aspects of concern in the learning process. White and Manton have observed that students are often not sure about their ability to choose appropriately the abundance of materials available online and "recognise how easy it is to become 'lost' in the web and to risk wasting significant amounts of time engaging with resources that prove later to be irrelevant or unreliable" [35] (p. 26). On the other hand, level of teacher and student engagement and empowerment in the development of TEL described has also played an important part in the process of teaching and learning [37][38], while student assessment [34][39] and teacher evaluation [40] have also imposed great challenges to the effectiveness of TEL.

### **4.3 Requirements of a Teaching and Learning Problem Setting**

For the connection between this theory of instrument and TEL, it is helpful to restate that TEL is a means to an end, not an end in or by itself. For an educational goal, there can be various means to achieve it, and TEL may be only one of them. One should ask, therefore, before adopting TEL as a means: Why should TEL be the means in the first place, and, if TEL is deemed necessary, which TEL mode is more suitable? Wolfenden's study on OER in Sub-Saharan Africa, as one of the few relevant studies, focuses on the teaching and learning problem setting that there was tremendous demand for new teachers to provide school services, and OER was used as a means to solve the problem [26]. It is found that the creation and use of OER provided ample opportunities for teacher education and helped alleviate the pressure of the huge demand for school teachers.

### **4.4 Acceptability of TEL**

The extent to which TEL in general is accepted as a mode of learning is a critical variable swaying the degree in which a TEL policy is effective. Ezer has distinguished two thoughts about technology – "what [technology] can do, what forms of interaction it invites, what properties it has" and "the idea of technology, what people think of it, how they see it helping their situation, how they shape its meaning" [41]. In mobile learning, for instance, Corbeil and Valdés-Corbeil have noted that "frequent use of mobile devices does not mean that students or instructors are ready for mobile learning and teaching" [42] (p. 51). In Beddall-Hill and Raper's terminology [43],



mobile devices can be considered as ‘boundary objects’, the meaning of which is influenced by discourse and practices.

A variable of this dimension of effectiveness stems not from people but institutions *per se*. Wallace and Young have observed that taken-for-granted institutional values and norms hinder the implementation of blended courses, and in some case blended delivery was bounded to serve existing values and norms and long accepted protocols are often ill-fitted to make the most potential use of blended delivery within the new learning context [44].

Institutional leaders’, teachers’ and students’ perceptions, attitudes and preferences towards TEL have often been observed as critical variables shaping or determining the extent to which TEL devices are accepted [45][46], which is often reflected in terms of degree of participation in the learning process and course dropout rates. Al-Fahad studies students’ attitudes towards mobile learning and found that the primary advantage of this technology is that “it can be used anywhere, anytime and adopt their mobile learning systems with the aim of improving communication and enriching students’ learning experiences in their open and distance learning” [28] (p. 111). In the context of OER, however, White and Manton have observed that one of the challenges of implementing OER is that “there is still a sense among students that non-textual online sources have less academic legitimacy than books or journals” [35] (p. 26).

## 5 Conclusion

Existing studies of institutional policies associated with TEL have provided a broad range of variables for analyzing TEL policy effectiveness. Through a literature survey, this study has examined the extent to which the instrumental approach to policy effectiveness is able to capture those variables for developing an encompassing conceptual framework for analyzing the effectiveness of TEL policy. Findings of the survey have demonstrated that the dimensions in instrumental perspective are comprehensive enough for this purpose, that all literature reviewed can be categorized into one of the four dimensions.

The conceptual framework presented in this paper thus potentially serves as a useful lens for analyzing the effectiveness of institutional policies on TEL and a point of reference for formulating relevant institutional policies. Nevertheless, we do not deny the possibility that a good number of relevant studies which have looked at TEL policy effectiveness beyond the four dimensions have not been covered in this survey. The proposed framework remains extensible to encompass more dimensions and variables for further improving its usefulness.

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