Evaluation and Program Planning 63 (2017) 93–100

Contents lists available at ScienceDirect

Evaluation and Program Planning

journal homepage: www.elsevier.com/locate/evalprogplan

An AHP-based evaluation method for teacher training workshop on information and communication technology

Rochelle Irene Lucas[a,*], Michael Angelo Promentilla[b], Aristotle Ubando[b], Raymond Girard Tan[b], Kathleen Aviso[b], Krista Danielle Yu[c]

[a] Br. Andrew Gonzalez FSC College of Education, De La Salle University, 2401 Taft Avenue, Manila 1004, Philippines
[b] Gokongwei College of Engineering, De La Salle University, 2401 Taft Avenue, Manila 1004, Philippines
[c] School of Economics, De La Salle University Manila, 2401 Taft Avenue, Manila 1004, Philippines

ARTICLE INFO

Keywords:
Workshop evaluation
Analytic hierarchy process
Information and communication technology
Professional development

ABSTRACT

The emergence of information and communication technology (ICT) has created opportunities for enhancing the learning process at different educational levels. However, its potential benefits can only be fully realized if teachers are properly trained to utilize such tools. The rapid evolution of ICT also necessitates rigorous assessment of training programs by participants. Thus, this study proposes an evaluation framework based on the Analytic Hierarchy Process (AHP) to systematically evaluate such workshops designed for teachers. The evaluation model is decomposed hierarchically into four main criteria namely: (1) *workshop design*, (2) *quality of content of the workshop*, (3) *quality of delivery of the content of the workshop*, and the (4) *relevance of the workshop*. These criteria are further disaggregated into 24 sub-indicators to measure the effectiveness of the workshop as perceived by the participants based on their own expectations. This framework is applied to a case study of ICT workshops done in the Philippines. In this case, *relevance of the workshop* is found to be the most important main criterion identified by the participants, particularly on the new ICT knowledge that promotes teachers' professional growth and development. The workshop evaluation index (WEI) is also proposed as a metric to support decision-making by providing a mechanism for benchmarking performance, tracking improvement over time, and developing strategies for the design and improvement of training programs or workshops on ICT for teachers.

1. Introduction

Teachers must be prepared to empower students with the advantages technology can bring since several studies have shown that there is no big improvement in student learning when teachers only make use of technology in a passive way (Carlson & Gadio, 2002; Ertmer & Ottenbreit-Leftwich, 2010; Tamim, Bernard, Borokhovski, Abrami, & Schmid, 2011). For example, ICT has created great opportunities for enhancing education at different levels. Schools and classrooms, both real and virtual, must have teachers who are equipped with technology resources and skills and who can effectively teach the necessary subject matter content while incorporating technology concepts and skills (Resta & Semenow, 2002).

Professional development is extensive as it should provide consistent access to teachers as the technology constantly changes. Ongoing opportunities for professional development should be available to university and basic education faculty and administrators who participate in the preparation of the curricula. It is not a one-time event as it should focus on the needs of the faculty member, teacher, or administrator and must be sustained through coaching and periodic updates (Loucks-Horsely, Hewson, Love, & Stiles, 1998; McLaughlin & Marsh, 1990; Resta & Semenow, 2002).

An important aspect of professional development is not only enabling educators to understand and use ICT tools in their teaching practices, but also in discerning how technology coupled with new approaches to teaching and learning, may enhance student learning. Many educators recognize that approaches to education are changing and that new technology has the potential to improve education and student learning (Jung, 2005; Resta & Semenow, 2002).

In the context of teachers' professional development, knowing how to use ICT means knowing how to integrate them into practices. It is where students interact with peers and with the teacher; encouraging them to build their knowledge to cope with these new and emerging 21st century learning skills (Abuhmaid, 2011; Bonk, Lee, & Reynolds,

* Corresponding author.
E-mail addresses: rochelle.lucas@dlsu.edu.ph (R.I. Lucas), michael.promentilla@dlsu.edu.ph (M.A. Promentilla), aristotle.ubando@dlsu.edu.ph (A. Ubando), raymond.tan@dlsu.edu.ph (R.G. Tan), kathleen.aviso@dlsu.edu.ph (K. Aviso), krista.yu@dlsu.edu.ph (K.D. Yu).

http://dx.doi.org/10.1016/j.evalprogplan.2017.04.002
Received 28 May 2016; Received in revised form 14 March 2017; Accepted 16 April 2017
Available online 19 April 2017

2009; Ramos, Costa, Gewerc, & Moreira, 2007), and making them aware of the benefits of using ICT in their own classes (Cox, Preston, & Cox, 1999; Ronald & MacDonald, 2008). The implementation of ICT professional development programs has actually been proposed to improve ICT usage in secondary education (Hogenbirk & van de Braak, 2009).

In a similar vein, ICT professional development programs should encourage and respond to teachers' reflective practice matching the teaching and learning demands of the 21st century (Bradshaw, Twining, & Walsh, 2012; Phelps & Graham, 2008). Such programs make teachers more reflective and self-conscious of their on-going learning which influences their ability to engage with students more interactively to create open spaces into which students can bring their experiences to create quality learning (Bruce, 2004).

University teacher training has become a pertinent topic because of the curricular and methodological reforms initiated by the Bologna Process. However, evaluations have been limited to measure participants' training satisfaction and not its impact on current teaching practices (Renta-Davids, Jimenez-Gonzales, Fondas-Garrido, & Gonzales-Sato, 2016).

A consideration of alternative evaluation methods involving students' and peers' assessment of their teachers' performance was found to be an effective measure to check if training programs are indeed relevant to address actual classroom needs (Baral, Nepal, Paudel, & Lamsal, 2015). These approaches have been used for evaluating workshops on positive adolescent training (Shek & Wu, 2012), writing multiple choice questions for dental faculty (AlFaris et al., 2015), and real outcome situations for undergraduate medical students (Baral et al., 2015) to name a few. Similarly, through the involvement of students as regards the evaluation of their teachers' actual performance in their classes after undergoing training, it has been found that there were significant improvements with their teaching methodologies and better transmission of knowledge (Ebrahimi & Kojuri, 2012).

As such, the effectiveness of the professional development programs depends on the extent to which these outcomes are achieved and vary based on their design and implementation. A recent study of Renta-Davids et al. (2016) demonstrated that the nature of workshop delivery affects the effectiveness of the workshop outcomes. Previous studies have looked into evaluating the effectiveness of the workshops, however, a more holistic evaluation of development programs can be made if assessments simultaneously look into workshop design, quality and relevance. Thus, there is a need to develop a methodology for evaluating the professional development programs which simultaneously consider workshop design, quality and relevance. It is imperative that an evaluation of the effects of professional development not be regarded as a mere learning satisfaction of a particular training program, but an understanding of whether teachers actually learned something that was relevant, valuable and applicable to their daily practice (Lawless & Pellegrino, 2007; Stes, Min-Leliveld, Gijbels, & Van Petegem, 2010).

The current study thus proposes a systematic approach of evaluating teacher training workshop on ICT using the Analytic Hierarchy Process (AHP) decision model. It should be noted that the failure or success of the workshop is not the only issue, but it is imperative to evaluate exactly how good the event is, with respect to each contributing factor to its effectiveness; and furthermore prioritize those, since such information is essential for improving the delivery of similar workshops in the future. The rest of this paper is organized as follows: Section 2 briefly discusses the Analytic Hierarchy Process (AHP) and some of its application in the field of education research, Section 3 describes the proposed evaluation framework for teacher training workshop on ICT, Section 4 discusses the findings from an illustrative case study in the Philippines, and Section 5 provides conclusions and recommendations for future work.

2. Analytic hierarchy process

AHP is a relative measurement theory that derives ratio-scale priorities of intangibles from pairwise comparison matrix of human judgments. Translation of these subjective judgements into a fundamental 9-point scale has rigorous empirical basis, and is described in the early work of Saaty (1977). The AHP eigenvector method measures these priority weights from an individual or group using their own personal psychometric scale for making the required pairwise comparisons. For example, these pairwise comparisons represent the ratio of weights and express the relative importance, preference or dominance of one element over the other with respect to a common goal or criterion. It also measures the consistency of one's judgments by cross-checking on how well that scale is being followed. Details of such sample AHP computation are described in the next section.

This approach has been widely used and extended to multi-criterion decision making problem to obtain a composite priority vector in hierarchical structures. The hierarchical structure is used to facilitate decomposition of complex problems into sub-problems that can be easily and consistently handled by the human mind; it also provides a framework for synthesizing the results of the various sub-problems into a coherent solution to the overall problem at hand. Typically, a decision structure is composed of three main parts namely the goal, criteria and the decision alternatives (Pohekar & Ramachandran, 2004). The goal or the objective of the AHP decision problem is found at the highest level of the hierarchy. The considered criteria and sub-criteria are found at the mid-level of the structure. The decision alternatives are found at the bottom of the hierarchy. AHP provides a computational framework unifying all local priority calculations from each of the pairwise comparisons into a holistic decision framework. Numerous applications of AHP can be found in Vargas (1990) and Vaidya and Kumar (2006).

An enhancement of the methodology of AHP is found in Ishizaka and Labib (2011). One of the capabilities of AHP is combining quantitative data from pre-defined sources or historical data and qualitative data from the judgment of a panel of experts or stakeholders. Previous studies on AHP have also dealt with data uncertainty through fuzzy set theory (Van Laarhoven & Pedrycz, 1983), probabilistic approach (Rosenbloom, 1996), and interval analysis (Saaty & Vargas, 1987). Specifically, the fuzzy AHP approach has been applied in the field of education in combination with other mathematical techniques in order to capture the vagueness in human decision making in achieving the desired objectives. These AHP variants make use of principles from fuzzy set theory, which provides a mathematical theory to approximate human reasoning (Zadeh, 1965). For example, teaching performance in higher education institutions has been evaluated using fuzzy AHP approaches (Chen, Hsieh, & Do, 2015). Likewise, AHP has also been used with the compressed proportional assessment (COPRAS) methodology, to evaluate and measure the relative performance of technical institutions in India (Das, Sarkar, & Ray, 2012). Its integration with linear programming in quality function deployment (QFD) has been utilized for the assessment in capturing and prioritizing student's requirement courses' learning outcomes within the process of an academic course design (Kamvysi, Gotzamani, Andronikidis, & Georgiou, 2014). Furthermore, it has been applied in the evaluation and prioritization of enabling factors for strategic management and deployment of university business incubators (Somsuk & Laosirihongthong, 2014). The fuzzy AHP framework, coupled with fuzzy Decision Making Trial and Evaluation Laboratory (DEMATEL) methodology, has been employed to evaluate the criteria for human resource for science and technology (Chou, Sun, & Yen, 2012). Moreover, an AHP-based model has also been implemented to quantify the relative importance of course criteria for designing English for Second Language (ESL) curriculum for elementary school students