

Using Phenomenography in Educational Technology Research From 2003 to 2017: A Systematic Review and Content Analysis

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Abstract: Educational technology has been tremendously growing and there are many potentials for investigations. Phenomenography is known as a useful strategy to investigate variations in conceptual understandings of different phenomena. The paper aims to: (1) examine the research papers in educational technology studies over the past 15 years (2003-2017), and (2) evaluate the feasibility of phenomenography in the field of educational technology studies. A systematic review is done to the educational technology research papers that involve the use of phenomenography. A systematic literature search in the 14 SSCI journal websites produced 35 articles. Although there were only few papers which used phenomenography as research approach in educational technology studies, there was a gradual rise in the number of studies using phenomenography across years, with more focus on studying students' learning experiences, especially in the higher education sector. Implications about the use of phenomenography in educational technology field will be discussed.

Introduction

Educational technology is defined as “the study and ethical practice of facilitating learning and improving performance by creating, using, and managing appropriate technological processes and resources” (Januszewski & Molenda, 2008, p.1). Educational technology is also associated with other terms like instructional technology, information technology (IT), information technology and communication (ICT), computer-supported collaborative learning, online learning, distance education and computer education (Pelgrum & Plomp, 2002). Educational technology is a rapidly growing research area with the big leaps of technology development in the 21st century. This represents that the field of educational technology, also known as instructional technology, is potentially a fast-growing pool for research development concerning the facilitation of learning and teaching with the application of technology. Therefore, there is a need for evidence-based approach to inform ‘better’ practices of educational technology. Interestingly, most educational technology studies were design-based and quasi-experimental (Amiel & Reeves, 2008).

Systematic review: An overview

Various literature reviews were carried out to investigate different applications of educational technology such as hypermedia (e.g. Dillon & Gabbard, 1998), games (e.g. Randel *et al.*, 1992), and so on. Some attempted to inquire the factors affecting the effectiveness of the use of educational technology, including learning environments (e.g. Winn, 2002), professional training and development (e.g. Daly, Pachler, & Pelletier, 2009), while some investigated the factors that affect the implementation of educational technology (e.g. Durlak & DuPre, 2008). Still, most of these reviews were either narrowly studied or loosely organized. Few were doubted for the trustworthiness as they might contain ‘questionable findings’ due to ‘under-examined assumptions’ (Kirkwood, & Price, 2013, p.536). Systematic review has received much attention in scientific and academic fields for its great power in providing ‘high level of evidence’ to inform recommendations and contribute to the development of new knowledge (Higgins & Green, 2011). Recently, systematic reviews have been done to find out the recent trends on the application of different learning approaches, for example, problem-based learning approach (Tsai & Chiang, 2013). They are also used to study the applications and impacts of different types of educational technologies such as flipped classrooms (e.g. Karabulut-Ilgu, Jaramillo & Jähren, 2017), games (e.g. Graafland, Schraagen, & Schijven, 2012).

Phenomenography: Origins and usage

The use of phenomenography as a research approach has gradually received much attention from educational researchers (e.g. Entwistle, 1997), which is known as ‘a research method for mapping the qualitatively different ways in which people experience, conceptualize, perceive, and understand various aspects of, and various phenomena in, the world around them’ (Marton, 1986, p.31). This approach is regarded as an effective approach to investigate variations in conceptual understandings of different phenomena (Bowden, & Walsh, 2000). Phenomenography is also recommended in studying educational technology due to its ‘potential impact that

phenomenography and the relational perspectives have on pedagogical practices' (Andretta, 2007, p.152). However, little is known about to what extent phenomenography can be applied in the context of educational technology. To our knowledge, there is a lack of systematic review on the use of phenomenography in the field of educational technology research. Therefore, the objectives of this paper are: 1) to examine the research papers in educational technology studies over the past 15 years (2003-2017), and (2) to evaluate the feasibility of phenomenography in the field of educational technology studies, with the following research questions: (1) *How is phenomenography applied in studying educational technology?*, and (2) *What are the key limitations and possible future development in the use of phenomenography in educational technology studies as stated in the published articles in the SSCI journals?*.

Methods

The review process involves data collection, data analysis and synthesis. Data were collected by the researchers who identified the relevant papers from the Social Science Citation Index (SSCI) journals in the field of educational technology. We selected SSCI journals for review because these journals are of high quality and impacts in the field. In order to identify the trend of the publication, we first targeted at finding the papers which were published in the recent 15 years (2003-2017). We then used keywords and search terms (e.g. phenomenographic study, phenomenography) in the SSCI journal websites. Only full-text available papers, which were written in English, were selected for review. After obtaining the set of papers, we organized the contents of these selected papers according to the origin (location) of study, year of publication, data collection method, targeted groups in the study, research questions, objectives of the study, open space, structural aspect, referential aspect and limitations of study. Data analysis include: (1) descriptive analysis (i.e. counting the number of published papers, origin of papers, targeted groups, data collection methods) with the use of MS Excel software, as well as (2) content analysis (i.e. thematic analysis) using coding strategies with the use of NVivo (version 11.0) software that enables to generate and search for patterns as emerged from the contents of the papers (i.e. limitations of the study, future research directions) (Bazeley, 2013; Clarke & Braun, 2013). A preset coding system was initially used to identify and construct themes. Examples of codes included generalization of the study, challenges, solutions, forms of data collection, perspectives of stakeholders) and number of participants (sample size).

Preliminary findings

Research question 1: How is phenomenography applied in studying educational technology?

A total of 35 articles were identified in the systematic literature search from the 14 SSCI journal websites. There was a gradual increase in the number of studies using phenomenography across years (Table 1). Most of these studies focused on inquiring students' learning experiences when using educational technology, whilst these studies were mostly conducted in the higher education sector.

Table 1. Number of papers using phenomenography in educational technology studies.

<i>Journal Title</i>	<i>2003-2007</i>	<i>2008-2012</i>	<i>2013-2017</i>	<i>Total</i>
Australasian Journal of Educational Technology (AJET)	1	0	2	3
British Journal of Educational Technology (BJET)	1	1	1	3
Computer Assisted Language Learning (CALL)	0	0	0	0
Computers & Education (CS)	1	7	3	11
Educational Technology & Society (ETS)	0	0	0	0
ETR&D-Educational Technology Research and Development (ETR&D)	0	1	0	1
Eurasia Journal of Mathematics Science and Technology Education (EJMSTE)	0	0	0	0
Internet and Higher Education (IHE)	0	1	2	3
International Journal of Computer-Supported Collaborative Learning (IJCSCL)	0	0	0	0
Journal of Computer Assisted Learning (JCAL)	4	3	0	6
Journal of Science Education and Technology (JSET)	0	3	0	3

Language Learning & Technology (LLT)	0	0	0	0
Learning Media and Technology (LMT)	0	0	1	1
Technology Pedagogy and Education (TPE)	1	0	3	4
Total number of papers	8	15	12	35

Research question 2: What are the key limitations and possible future development in the use of phenomenography in educational technology studies as stated in the published articles in the SSCI journals?

The key limitations of the use of phenomenography in the educational technology studies mainly included the small sample size and single perspective on the object of the study (e.g. students' conceptions of using multi-media). However, it is commonly revealed that such phenomenographic studies help enrich our understandings of learning and teaching with the use of educational technology and therefore provide insights into preparing for future pedagogical applications of educational technology.

Significance of the study

The systematic review of the study will add to the current literature. First of all, this helps extend our knowledge about the use of phenomenography in the field of educational technology research by assessing its methodological rigors and practices. Second, the study provides evidence-based investigations of the feasibility of phenomenographic approach and further improvise how this approach can be used and strengthened in the educational technology field.

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