



Triangulation in Educational Research: A Literature Review

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Abstract. The education field has long been one of the central focuses of practitioners. Research in the educational field is one of the means to enhance the quality of education. Meanwhile, the validity of a study can be examined through triangulation. This study aims to explore the researchers' perspectives on using triangulation, along with the function and purpose of triangulation in their studies. To ensure the involvement of excellent studies, this literature review selected only recently published scientific articles from peer-reviewed journals. Our findings suggested the absence of definite arguments or techniques for triangulation, but previous relevant studies demonstrated that most researchers conducted triangulation to validate, challenge, extend, and enhance confidence data collected in their research

Keywords: Triangulation, Research in Education, Validity, Research Quality.

1 Introduction

To date, one of the fields being the main focus of practitioners is education [1]. To improve the quality of the education system, many stakeholders conduct research on education [2]. Even since the commencement of formal education, research has been commonly used to enhance education quality [3]. The final purpose of all research in education is to generate advantageous theories for the practice of education [4]. Consequently, practitioners are expected to use the knowledge obtained through educational research.

In recent years, research in education has rapidly accelerated in both qualitative and quantitative approaches [3][5]. Over the course of time, the available research models have been simplified and modified by researchers in the education field [6][7]. Additionally, alternative research models have been formulated to attain more optimum results [8]. With this development of the research model, researchers carry out more complex studies. Meanwhile, those complex studies obligate researchers to ensure their research validity.

One of the methods that are commonly used to evaluate the validity of research is triangulation [9]. Up to recently, triangulation has been a common trend. Triangulation was first presented in the 1950s in a number of studies in the psychology

field [10] with “multiple operationism.” Then, it was introduced in the 1980s [11]. However, triangulation has long been a topic of debate and discussion, primarily in its role in enhancing research development and contribution.

Purpose of Review

This study explores the researchers’ perspective on the use of triangulation and the purpose of triangulation in a study

2 Method

To attain a reassuring illustration, this literature review involved recently published articles from peer-reviewed journals. The research stages consisted of literature selection and categorization. The relevant articles focusing on triangulation exploration were selected.

Selection of Articles

The article selection was initiated from the peer-reviewed journal in the Google Scholar database, using the keywords of ‘triangulation’ and ‘educational research development.’ Initially, we used the Google Scholar database, resulting in selected articles to identify the definition, classifications, functions, and purposes of triangulation.

Data Analysis

The analysis review was carried out using the best evidence approach on the research articles selected based on the research question. Further, the articles were analyzed and verified. In this process, we used the same criteria, following the same research question.

Categorization of Articles

Each of the selected articles was reviewed based on the recent developing research question. We also ensured that each article potentially had more than one finding, such as they had the definition, classification, function, and purposes of triangulation.

3 Results

How do researchers carry out triangulation?

Denzin (1970) distinguishes triangulation into four types, namely, data triangulation, data triangulation, theory triangulation, and method triangulation. He further described the differences between in-method triangulation and inter-method triangulation. Previous studies also involve the same method variation in investigating a research problem, such as a self-completion questionnaire consisting of two contrasting scales to measure emotional performance. The inter-method triangulation commonly associates contrasting research methods, such as questionnaires and observation. Oftentimes, triangulation is defined based on the combination of qualitative and quantitative methods to determine how far they formulate a convergence result. However, there is no singular procedure for correct [13].

Triangulation is sometimes used in studies involving two or more methods, but it carries a different definition from mix-method. This triangulation technique is used in studies with double research methods, a combination of quantitative and qualitative methods, to generate a more complex finding than the studies with only a single method. Researchers also mostly conduct particular actions to ensure the validity of their findings, such as carrying out an observation, followed by cross-checking using another method. These procedures are frequently used by researchers to validate and

ensure the efficacy of their research results. Our review also suggested a number of triangulation procedures from previous studies, as presented in Table 1.

Table 1. Triangulation Procedures from Previous Studies

Authors	Findings
(Ramón et al., 2018) [14]	Triangulation is adopted in studies with a naturalistic approach
(Vercellotti & McCormick, 2018) [15]	The quantitative and qualitative methods can be used simultaneously as a triangulation method
(Chen, 2018) [16]	Triangulation can be carried out in a study with the descriptive qualitative method and emergent design
(Diez-Gutierrez & Diaz-Nafria, 2018) [17]	Triangulation is used in studies with a mixed method
(Fuchs, 2020) [18]	The triangulation data can be in the form of a pre-and post-project survey, social media interaction, and ethnography project
(Burmansah et al., 2020) [19]	A validity test through data source triangulation and method triangulation can be carried out in analysis with matching pattern
(Kusmaryono et al., 2021) [20]	Triangulation can be conducted to test the validity of research data obtained through observation and interview
(Hobri et al., 2018) [21]	Triangulation technique can validate the results of studies with quantitative and qualitative data collection and data analysis to ensure the research objectivity
(Sianturi et al., 2018) [22]	Triangulation procedure can be implemented in the quantitative and qualitative research concurrently, in the same phase, but in a separate data analysis
(Carter et al., 2014) [23]	Data triangulation on interview data in qualitative research can produce wider data on a specific phenomenon

The researchers have different triangulation procedures based on the types of their research. For example, some researchers conducted triangulation on qualitative research, followed by quantitative data collection, to broaden their obtained information. In another type of research, quantitative research, the researchers conducted triangulation by adding data through qualitative means. Meanwhile, some mixed methods research enhances the reliance of their findings using triangulation by comparing their finding with the existing theories and previous research findings. Triangulation is frequently correlated with the mixed methods approach, but it does not regard triangulation to be the equivalent of the mixed method. In other qualitative studies, triangulation is carried out through expert validation and interviews to garner

more extensive data. The researchers’ procedure for triangulation is illustrated in Figure 1.

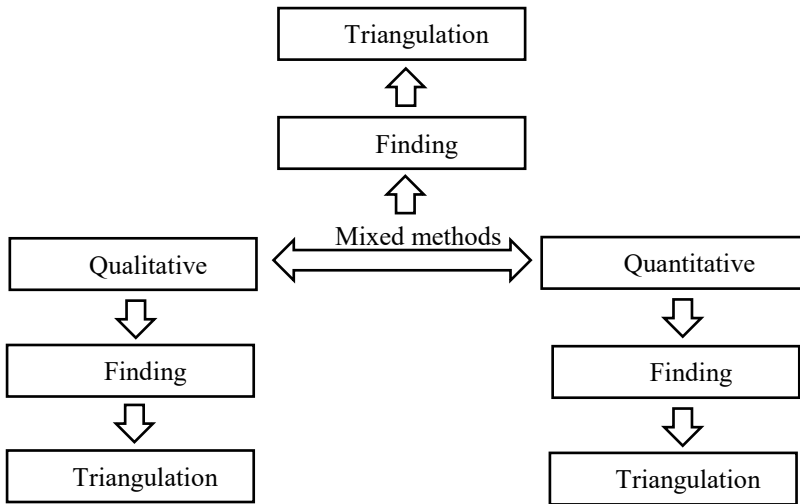


Figure 1. Procedures of Triangulation

What are The Purposes of Triangulation?

Triangulation is one of the techniques in mixed-method research. Triangulation assumes various significances as a strategy of convergence validity. It refers to the use of more than one research approach to improve the reliance on research results. The studies which commonly use a single method may have limitations, thus lowering their results’ credibility. Triangulation is addressed for studies that use more than one particular research approach to enrich the data collection and confirm the research results [24].

Mathison (1988) defines triangulation as a strategy to intensify the validity of research based on the evaluation and research results. Triangulation is a suggested excellent technique for a case study and is traditionally acknowledged to be capable of generating valid findings, data, and convergent methods [26]. However, researchers have different perspectives on triangulation usage [27] since each of them possesses a different research purpose but still maintains the essence of triangulation. The purposes of triangulation from the researchers who use triangulation in their study are presented in Table 2.

Table 2. Researchers’ Purpose of Triangulation Following Their Research Purposes

Authors	Purpose of Triangulation
(Levitan et al., 2018) [28]	Triangulation with a mixed method (concurrent triangulation) is used to obtain more accurate data

(Muhammad, 2020) [29]	Triangulation is carried out to widen the data collection and deepen the possibilities of the occurrence of a variable from different perspectives
(A, Nuraeni et al., 2019) [30]	Data triangulation is carried out to confirm the data or information garnered through observation, interview, and documentation
(Morse, 1991) [31]	The research that adopts triangulation and mix-method aim to attain different data that correlate to the same topic to gain a better understanding of a particular phenomena
(Creswell, 2009) [32]	As the variance of the triangulation model is only a convergence model, most researchers applying triangulation aim to validate, confirm or reinforce the quantitative data with the qualitative data
(Wong & Seah, 2019) [33]	Triangulation does not only cross-validated using the double method but also garners the contribution of different components to generate an illustration of the research
(Wong & Seah, 2019)	The idea of triangulation is originated from a survey result. In social science, conventionally, triangulation is applied when a study adopts different methods to validate the same results.
(Odori, 2019) [34]	The central purpose of triangulation is to enhance the credibility and validity of the research finding
(Odori, 2019)	The most crucial factor in triangulation should not be underestimated to assure the reliability and validity of the findings
(Odori, 2019)	Data triangulation minimizes bias measurement caused by the data collection procedures

4 Discussion

Triangulation is a method to verify the data validity by comparing the obtained data, data collection technique, data source, or theory [19]. It is carried out when a study adopts theories, data collection techniques, or methods to generate a particular comprehension [34]. One of the triangulation is to compare the obtained research result with data, theories, researchers' arguments, and methods of previous research [21][22]. Therefore, triangulation's central focus is to enhance [31][34].

Researchers carried out different procedures of triangulation. Levitan et al. (2018) used triangulation and mixed methods to attain more accurate research data. Contrastingly, in research with different approaches, triangulation is adopted to broaden and deepen the likelihood of an occurrence in a variable from a different point of view [29]. Recently, there has been no widely accepted definition of triangulation among

researchers [27][13]. Even if triangulation is carried out in different means, that research has the same purpose of triangulation to extend the data.

In addition, Creswell (2009) describes that triangulation is a convergence model that aids researchers in validating, confirming, and corroborating the quantitative results using qualitative findings. Meanwhile, other researchers conducted triangulation to identify the research validity [33][35]. Additionally, aside from those purposes and functions, triangulation also functions to analyze (challenge) by using more than one data collection technique [36][37].

Even if triangulation has no widely accepted definition and single proper technique, but, generally, it is conducted to validate, challenge, extend, and enhance confidence, as presented in Figure 2.

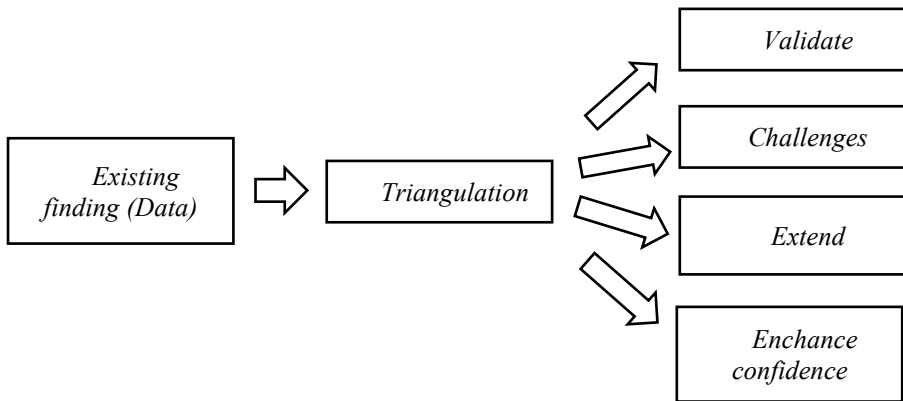


Figure 2. Researchers' Purpose of Conducting Triangulation

5 Conclusions

Triangulation is one of the data validity assessment techniques, through comparing the obtained data from its technique, data source, or theory. There are four most common triangulation, namely data triangulation, investigator, theory triangulation, and method triangulation. Even if triangulation is frequently correlated with a mixed-method approach, practically, triangulation research only applies a single approach, qualitative or quantitative. Linearly, it should be noted that triangulation has a different meaning from mixed-method. Up to now, there is no single commonly

acceptable triangulation technique, but following the relevant previous studies, triangulation is mostly carried out to validate, challenge, extend data, and enhance confidence data collected in their research.

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