



Definition Purpose and Procedure of Developmental Research: An Analytical Review

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Author's contribution

The sole author designed, analyzed and interpreted and prepared the manuscript.

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ABSTRACT

This paper aims to present and analyze the various definitions and domains of developmental research. Specifically, this paper reviewed analyzed the definitions of developmental research its purpose as well as the types of developmental research. Moreover, the paper analyzed the stages of conducting developmental research, the methodologies of data collection and the expected participants of each of the stage.

Keywords: Developmental research; methodologies; data collection.

1. INTRODUCTION

In the field of instructional technology as it exists today, developmental research is seen as a research methodology adopt by a researcher whose research aim is establishing an empirical basis for the creation of instructional and non instructional products and tools and new or enhanced models that govern development. In

other words developmental research is considered as one of the most fundamental research methodology employed when developing instructional materials to facilitate instruction. For this essence, developmental research becomes an area of discussion like a mantra in literature of the instructional technology since [1] definition of developments research. Subsequently, the notion of developmental

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research continue to evolve as the scholars of the field like [2,3,4,5,6], etc extensively discussed on the definition, aim, and diversified procedure of the research. However, despite such discussion of the term developmental research, the concept is relatively unknown to many researchers in instructional technology [7]. Moreover, many articles on developmental research were based on one direction of the eminent scholars of the field like Richey and [1] and [3]. This paper reviews and elaborates their write up on developmental research by emphasizing on the definitions, aims, and procedure and instruments of developmental research. Hopefully, this may give a clear direction or guide for ongoing researchers in the field of instructional technology.

2. DEFINITION OF DEVELOPMENTAL RESERACH

To avoid confusion, many terms are interchangeably used with developmental research in the literature, some of these terms include Design Experiment [8], Developmental Research [9,3], Formative Research [4], Designed Based Research [5], and Design and Development Research [6]. Each of the term has its corresponded definition and procedure by the scholar who came up with the term as mentioned above. However, there are similarities and differences between the definitions, purpose, and research procedure of each of the terms.

There are many definitions of Developmental research, all definitions rooted from the same grounds which are design, development and evaluation. The famous definition among the others is that of [1] in which they defined developmental research as a systemic study of designing, developing and evaluating instructional programs, processes, and product that must meet the criteria of internal consistency and effectiveness. [3] defined developmental research as:

“An interactive, cyclic process of development and research in which theoretical ideas of the designer feed the development of products that are tested in classroom tastings, eventually leading to theoretically and empirically founded products, learning process of the developer and (local) instruction theory”.

Brown [8] Design experiments are composed of three complex features: 1) Input (i.e., teacher training, curricular change, testing, technology

innovation, etc) is treated as a whole rather than independently; 2) Output (i.e., particular outcome that a given learning design was intended to achieve); and 3) Contribution to a theory of learning through its enactment in practice or dissemination. Formative research as defined by [4] is a methodology of improving instructional resource and curriculum. It entails questions like “what is working” “what needs to be improved” and how can it be improved”. [5] defined developmental research as a research which is socially constructed, contextualized process for producing educationally effective intervention with a high likelihood of being used in practice.

In 2007 [6] came up with a revised definition of developmental research as it is defined as a systematic study of design development and evaluation process with the aim of establishing an empirical basis for the creation of instructional and non instructional products and tools and new or enhanced models that govern development. The revised definition clearly identifies the purpose of developmental research such as initiating both instruction and non instructional gadgets that run improvement of instruction.

Similarly, from the area of curriculum design, [3] (1993) defined developmental research based on its purposes which are:

- 1- Supporting the development of prototypical products which include providing empirical evidence for their effectiveness, and
- 2- Generating methodological decision for the design and evaluation of the production.

In this approach, the major aim of developmental research is to inform the decision making process during the development of a product or a program in order to improve the product or the program being developed and the developers' abilities to create things.

3. TYPES OF DEVELOPMENTAL RESERACH

There are two types of developmental research; Type I and Type II [10,9]. Type I involves situation in which the product development process used in a particular situation described and analyzed and the final product is evaluated [9]. [11] labelled this type of research as “system based evaluation”, in addition to that, [3] calls it “formative research” which is defined as activities performed during the whole development process of a specific intervention from exploratory studies through both formative and summative evaluation studies.

To [9] Type I developmental research reflects traditional evaluation orientation in which the developmental process is not addressed, and only the product or program evaluation is described. Besides that, results in type I study are typically context and product specific.

On the other hand, Type II developmental research is oriented toward a general analysis of design, development and evaluation process addressed either as a whole or as a particular component. This type of research is also called “model development/technique development research” [11]. [3] on the other hand named it “reconstructive studies” the term which emphasizes a common situation in which research takes place after the actual design and development process. Unlike Type I. conclusion in type II developmental research can be generalized to other situation [9]. Table 1 summarizes two types of developmental research.

4. PURPOSE OF DEVELOPMENTAL RESEARCH

Despite the different terms of developmental research from different scholars in the field of instructional technology, the terms share the same purpose which is improving, and making effective instruction through either developed or modified prototype by the researcher. For instance, [1] identifies the purpose of developmental research such as initiating both instruction and non instructional gadgets that run improvement of instruction.

Akker [3] recognize the purpose of his terms of definition as supporting the development of prototypical products which include providing empirical evidence for their effectiveness, and

Generating methodological decision for the design and evaluation of the production. Similarly, [4] purpose is improving the designed theory for improving instructional practices or processes, and that of [5], construction of preposition about learning and teaching, engineering and constructing effective learning environment (using software and other artefacts) that allow teachers to make these propositions actionable.

5. STAGES OF DEVELOPMENTAL RESERACH

Through a critical review of the above definitions of developmental research, it could be revealed that the definitions identified four phases or stages of developmental research; design, development, implementation and evaluation. In [1] definition and that of [4] are design, development, implementation and evaluation though [1] did not identify implementation phase in the definition, however, it was presumed to be there. Unlike [5] whose term recognizes eight ISD phases in the research; needs analysis, analysis, design, development, formative evaluation, revision, implementation and summative evaluation. [3] has ISD which is similar to that of [5] in sequence of ISD phases, though implementation is not mentioned in the former’s definition. The phases are arranged as; analysis, development, formative evaluation, summative evaluation and reflection on the development methodology. For the purpose of this paper, four fundamentals phases of developmental research in relation to instructional design model (Analysis, design, development and evaluation) is explained on one hand, and the techniques of conducting each of the phases on the other hand.

Table 1. Summary of two types of developmental research

Features	Type I	Type II
Named as	Formative Research System Based Evaluation	Reconstructive Studies Model Development and Technique Development
Emphasis	Study of specific product or program design, development and evaluation project	Study of design, development and evaluation processes, tools or models
Product	Lesson learned from developing specific product and analyzing the conditions that facilitate their use	New design development and evaluation procedures and / or models that facilitate use
Conclusion	Context specific	Generalized

5.1 Analysis

Analysis is considered by many scholars as the first phase of conducting developmental research in one hand, and a key element for the success of the subsequent phases of the research. Needs assessment is interchangeably used with analysis which aimed to help a designer know more about students' instructional needs [12]. It also reveals the actual outcomes that exist within the system and differences between what is tangible and what is possible [13]. Consulting Subject Matter Experts (SMEs) is required, as they help an instructional designer to make sense of any inconsistency, develop coherent solutions to the existing problem during analysis [14].

Shambaugh and Magliaro [12], and Dick et al. [15], are in the view that analysis step comprises identifying the full range of content to be learned by students, learners' analysis and context analysis. Thus, in this phase, a researcher can apply different methodologies to collect data. The methodologies include case study, in-depth interview, filed observation and document analysis [10]. However, the expected participants of this phase of developmental research include, but not limited to Subject Matter Experts, students, teachers school administrators etc.

5.2 Design

The design phase is where a researcher tries to provide solution to the identified problem (s) by creating a design specification [16]. This phase is very crucial in the field of instructional technology and developmental research, because the design should be systematic and specific. The former means a logical and orderly method of identifying, developing and evaluating a set of planned strategies targeted for attaining the project goal. The latter means that each element of the instructional plan needs to be executed with attention to detail [17].

This phase is conducted based on the information obtained in the analysis stage. In the analysis stage, a designer planned and gathered data on the issues related to particular area of the interest of his research, then moved to how he would solve the issues through his developmental product (design). To [12] at this phase, a designer struggles to get answer to following questions; what will students learn? (Learning outcome) how will he know if students learn? (Learning assessment) how will he assist

students to learn? (Instructional strategies) and how will technology help students to learn?

The main objective of designing instruction is to increase the effectiveness of classroom instruction [18]. Therefore, designer should create instructional strategies related to data about the real condition of teaching and learning process. He should also prepare for a comprehensive and well prepared lesson plan because to [19] it has significant impact on both teachers and students. The expected methodologies the designer will employ at this stage are in-depth literature review through which he will identifies theories upon which he will design his product, document analysis and consultation with Subject Matter Experts and Technical Matter Experts of his area of research.

5.3 Development

The development phase is built on the two previous phases: Analysis phase and design phase. Moreover, this stage is the combination of both previous stages. It is seen as the process of authoring and producing the materials needed to attain instructional objectives [13]. The ultimate aim of development phase is the production of the developmental product. For instance, if the product is educational video, the designer is expected to collect, prepare and create all audio, video, text materials and so forth which support the instructional process [20]. Moreover, this is the phase where a designer creates, assembles the content assets created in the design phase. In this phase the projects are edited, published and validated [14].

In the development phase, more emphasis is given to instructional materials or media to be produced. The main deriving question to be considered by the designer as suggested by [14] is "how will the product look and sound?" Therefore, the designer should work closely with Subject Matter Experts and Technical Matter Experts. If the product is educational video for example, the designer should work with the screen player, video producer, director, editor, artists, photographer, and computer programmer as they contribute significantly in producing quality video.

Material development, however, includes a process of formative evaluation whereby the materials are tried out. According to [20] formative evaluation answer two questions; do the materials teach? How do we improve them?

This kind of evaluation is needed to be conducted because it provides data for revising and improving the developing instructional materials [13].

In the instructional design process, formative evaluation is conducted through two steps; first step is conducted by Subject Matter Experts SMEs and Technical Matter Experts TMEs to evaluate the products to find out whether the developed material is valid, qualitative and practicable in the class or not. The second step of the evaluation is conducted by implementing the products to be tried out on students before the project is finalized.

5.4 Evaluation

Evaluation is the last stage of the developmental research process, it is conducted to determine the values and importance of a product [16], and to measure the effectiveness of instruction [13]. Evaluation is defined as the process of generating information about the merit and worth of an instructional program and material for the purpose of making decision about its effectiveness or improvement [21]. In this research, evaluation is defined as the process of determining the value, effectiveness, and value of instruction or a program through the identification of standards, generating information from the audience and making decision about the worthiness of the product or a program.

There are two types of evaluation in instructional design; formative evaluation and summative evaluative. Formative evaluation is considered as fundamental in instructional design [22], because it is conducted to identify the deficiencies in the developing product during production and it involves the process of gathering information on adequacy and using the information as a basis of further development [1]. Formative evaluation is conducted during the development or improvement of a program or product. It is also for in-house staff of the program and it normally remains in-house; but it may be done by an internal or external evaluator or by combining the two [23].

Smith and Ragan [22] identified four stages of formative evaluation; (i) design review which is conducted before the actual development of a product or program, (ii) expert review which occur after the completion of the materials, but prior their actual use with learners, (iii) learner validation and (iv) ongoing evaluation which are

conducted during the actual use of the instructional materials with learners who represent the target audience. To [1], methods of data collection in formative evaluation are often informal, such as observation, debriefing, and short test. Similarly, Subject and Technical experts' reviews could also be used as a tool of formative evaluation especially during the development of instructional materials, because their comments and suggestions are considered to improve the materials.

Summative evaluation on the other hand is conducted after the completion of instruction; it involves gathering information on adequacy and using the information to make decision about utilization [1], and [15]. The purpose of such evaluation is to collect, analyses and summarizes data to make decision [22]. To them summative evaluation tries to answer the question "does the instruction adequately solve the problem which was identified in the needs assessment and resulted in the development of the instructional materials?" To [1] summative evaluation differs from formative evaluation, the former, requires formal procedure and methods of collecting data. The methodologies used for data collection in evaluation stage include experimental research, in-depth interview, expert review and replication [2].

6. CONCLUSION

Developmental research is a research employed when developing instructional materials to facilitate instruction. For this essence, developmental research becomes an area of discussion like a mantra in literature of the instructional technology since Richey's 1994 definition of developments research. This paper analytically reviewed the definitions, purpose and types of developmental research. In addition to that, the paper discussed on the process of conducting developmental research and as well as methodologies of data collection and the expected participants of each of the stage. Therefore, it is recommended for instructional designer to adopt this methodology for developing or enhancing instructional materials of their interest, by so doing, they can empirically ensure the effectiveness, and usability of their materials.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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