Design-Based Research of an E-Coursebook for ESP

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Abstract
The paper deals with the design-based research of an e-coursebook for English for specific purposes (hereinafter referred to as ESP) which can serve as an example of good practice for teachers in higher education. The aim of this research project is to establish a link between the design of an e-coursebook English for Information Technology and its iterative testing for the purpose of evaluation and re-design so that the coursebook would be the most appropriate teaching and learning tool for the target group of students. The first part of this paper frames the concept of design-based research as a research design which puts emphasis on the development of research-based solutions to complex problems in educational practice and development or validation of theories about learning processes and learning environments. The second part outlines the design-based research of the e-coursebook English for Information Technology. It focuses on the research objectives, individual stages of the research, description of research samples and development of data collection tools.

Keywords: design-based research, intervention, iteration, design principles, e-coursebook for ESP, evaluation criteria checklist

1. Introduction
Despite a range and variety of coursebooks for ESP available on the market, it is still rare to find those meeting both the students' needs and the course requirements. It is obvious that every learning or teaching situation is unique and influenced by such factors as the constraints imposed by syllabuses, the dynamics of the classroom, the expectations and motivation of the learners. Often teachers have to either adapt existing learning materials by means of adding, deleting, simplifying, reordering and replacing, or design their own materials. Therefore, the need arises to design a made-to-measure coursebook for the particular course of ESP.

This paper focuses on the concept and iterative character of design-based research and outlines our own project of design-based research of an e-coursebook *English for Information Technology*, which may serve as a useful example of good practice for teachers of ESP in higher education.

2. Concept of design-based research

2.1 General characteristics of design-based research
Design-based research (hereinafter referred to as DBR) evolved near the beginning of the 21st century as a practical research methodology that could effectively bridge the gap between research and practice in formal education as it aims both at developing theories about domain-specific learning and the means designed to support that learning. In this paper a common label *design-based research* [1-4, 15, 18] is used, however, it should be noted that there are also other labels to be found in literature, such as *design experiments*[5-7], *formative research*[14], *developmental research*[11], *design-based research* and *educational design research*[10, 16,19]. The variety of labels for this type of research reflects the fact that it is still a relatively new trend characterized by "a proliferation of terminology and a lack of consensus on definitions" [19].

Even though the terminology has not become established, DBR has a number of common features. Building on previous theoretical, methodological and empirical studies[1- 4, 10, 16, 19], DBR can be defined by:

- being situated in a real educational context,
- focusing on the design and testing of a significant intervention,
- using mixed methods of data collection, involving multiple iterations,
- evolution of design principles,
- involving a collaborative partnership,
- having a practical impact on practice.

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2.2 Cyclical character of design-based research

The main purpose of DBR is the *systematic analysis, design and evaluation of educational interventions with the dual aim of generating solutions for complex problems in educational practice, and advancing our knowledge about the characteristics of these interventions and the processes of designing and developing them*[16]. Its methodology can be described as a continuous cycle of four stages as illustrated in Figure 1. An emphasis is placed on an iterative research process that not only evaluates an innovative product, but also systematically attempts to refine the innovation while also producing design principles that can guide similar research and development endeavours.
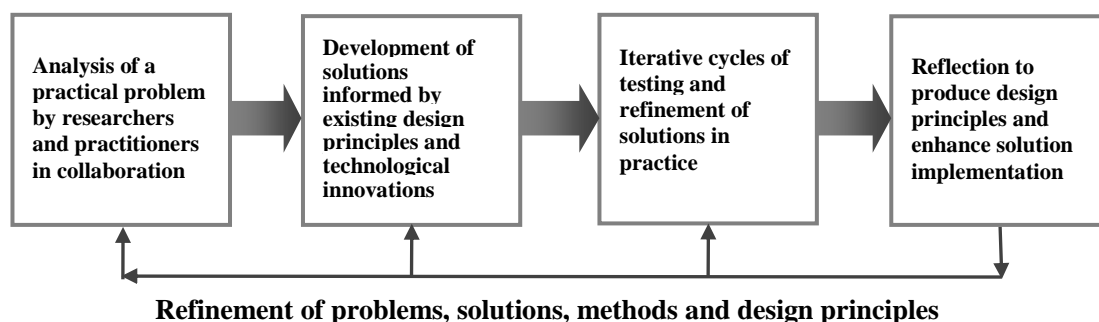
Analysis of a practical problem by researchers and practitioners in collaboration	**Development of solutions informed by existing design principles and technological innovations**	**Iterative cycles of testing and refinement of solutions in practice**	**Reflection to produce design principles and enhance solution implementation**

Refinement of problems, solutions, methods and design principles

Figure 1. Iterative cycle of design-based research.
Adapted from Amiel and Reeves (2008, p. 34)

DBR is therefore *cyclical in character*: analysis, design, evaluation and revision activities are iterated until an appropriate balance between ideals and realization is achieved. Each iteration represents a micro-cycle of research or a step in the process of conducting DBR.

3. Research design

3.1 Research objectives

The general objective of our DBR of the e-coursebook *English for Information Technology* is *to establish a link between the design of the coursebook and its iterative testing* (repeated implementation of the e-coursebook in the course *English for IT*) *for the purpose of evaluation and re-design of the e-coursebook* so that it would be the most appropriate teaching and learning tool for the target group of students.

The intermediate objectives of our DBR are two:
1) evaluation of the e-coursebook with *the aim to collect information about its quality* by means of checklists and didactic pre-tests and post-tests;
2) development cycle of the e-coursebook with *the aim to optimise the e-coursebook quality* by means of the production of substantive design principles (characteristics of the e-coursebook design itself) and procedural design principles (characteristics of the e-coursebook design approach).

On the one hand, the research is closely connected to the application sphere and, on the other hand, it includes the evolutionary production of specific procedures and tools, which may result in reflection upon the production of design principles and developing the existing theories of the coursebook design.

3.2 Stages of the research

Our research design is divided into one preparation stage and three realization stages. A *preparation stage* focuses on gaining an insight into the present state of scientific knowledge of DBR of e-learning materials for ESP and on designing data collection tools, which include (a) development of a checklist for evaluating the e-coursebook, (b) transformation of the checklist into questionnaire items and (c) design of didactic tests to verify knowledge and skills acquired by the students before and after using the e-coursebook.

The *first realization phase* involves implementation of the e-coursebook into lessons, which includes the four steps:
1) evaluation of the e-coursebook by teachers,
2) pre-testing of students,

3) students' evaluation of the e-coursebook by means of a questionnaire survey,
4) post-testing of students.

The research requires iterative cycles of the stages as illustrated in Figure 2, which will provide the opportunity to reflect and establish what dimensions of each intervention were "non-negotiable" or essential components at the core of each intervention that could not be changed.
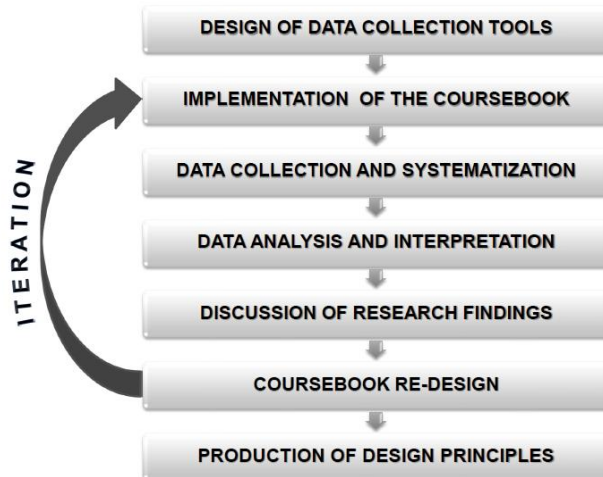
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Figure 2. The realization phase of DBR of an e-coursebook for ESP.

The *second realization phase* involves repeated implementation of the e-coursebook, its redesign, data collection and analysis, results evaluation and discussion. The aim of this phase is the second data analysis and interpretation.

The *third realization phase* consists of two parts – the production of substantive and procedural design principles. The aim of this last phase is to characterize the optimal e-coursebook design, optimal research design and to draw up recommendations to improve educational practice.

3.3 Research samples and data collection tools

The four research samples which were selected intentionally are described below.

Research sample 1 is an e-coursebook *English for Information Technology*. This coursebook is aimed at the intermediate level learners who study information and communication technology at universities and wish to further their careers in this field. Its aim is to equip the university students with both receptive and productive skills in professional English language at the level B2 according to the *Common European Framework of Reference for Languages* (*CEFR*) and to enable them to read a wide range of texts including technical documentation, scientific articles and textbooks, write academic assignments and research papers, listen to lectures, give presentations and participate in seminars and conferences as well as effectively communicate with teachers and colleagues.

The coursebook consists of fourteen units covering a wide range of topics dealing with information and communication technology and the revision unit. Each unit consists of the main topic, vocabulary practice, reading, listening, speaking and language functions, such as predicting, giving advice and instructions, classifying, qualifying, and describing features and functions. All tasks are designed according to the Cambridge English exams format including multiple matching, gap filling, multiple-choice cloze, multiple choice, sentence completion and true/false tasks. Speaking tasks require pairwork, group discussions, role plays and giving individual presentations. English-Czech wordlist of the specialized terminology as well as answer key accompany each unit.

Research sample 2 consists of students of the first year of the Bachelor's study programme English in Electrical Engineering and Informatics at FEEC BUT who attend the compulsory course *English for IT.* Professional profile of students:

- their output English language level is C1 according to the *CEFR* standard focused on English language usage in electrical engineering and information technology;
- acquire and develop receptive and productive skills in the field of professional discourse as a special communication tool, which is used by a global discourse community;

- demonstrate knowledge in English linguistics, professional English, cultural studies of English-speaking countries as well as in the fundamentals of electrical engineering, information technologies and management.

Research sample 3 includes English language teachers of the Department of Foreign Languages, FEEC BUT who teach academic and professional English to the target group of students.

Research sample 4 consists of teachers of electrical engineering and information technology courses from different departments of FEEC BUT who teach the target group of students in English.

Three kinds of *data collection tools* have been designed: evaluation criteria checklist, questionnaires and didactic tests.

To evaluate the e-coursebook by teachers and students, an *evaluation criteria checklist* has been developed based on the checklists created by some of the coursebook evaluators[8, 9, 12, 13, 17]. The criteria have been clustered into seven categories:

1) General aims of the coursebook
2) Clear arrangement
3) Adequacy
4) Learning guidance
5) Motivational characteristics
6) Language content
7) Language skills

The evaluation criteria checklist has been transformed into the twenty three *questionnaire* items presenting the respondents with a five-level Lickert scale.

Didactic tests for the course *English for IT* have been designed for pre-testing and post-testing students' knowledge and skills acquired before and after using the coursebook. The designed tests are criterion-referenced involving a cut-off score, where the student passes if their score exceeds the cut-off score and fails if it does not. The criterion is the domain of subject matter that the test is designed to assess. The tests also include the elements of proficiency tests consisting of reading, listening and use of English, and their output level is B2 according to the *CEFR* standard.

4. Conclusion

The presented paper attempted to contribute to the research in the field of design, evaluation and development of learning materials for ESP. The project of our DBR of the e-coursebook *English for Information Technology* was outlined including the description of research stages, research samples and the design of data collection tools. Taking into account the longitudinal character of DBR, it must be admitted, however, that there is still a long way to go before our research is ended and the results in the form of design principles can be published.

The value of DBR is that it focuses on a design and processes that respond to a local context; it is grounded in theory and yields knowledge or guidelines that can be shared and used by others to improve educational practice – demonstrating a commitment to theory constructions and explanations while solving complex problems in educational practice.

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