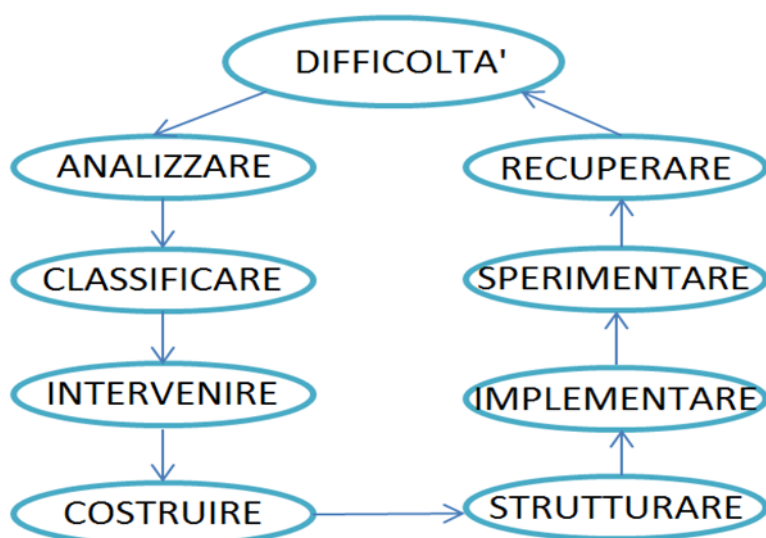Abstract della tesi in inglese:

My PhD thesis enters the sphere of the studies which aims at the integration between the outcomes of the research on mathematical education and the outcomes of the research about e-learning. Particularly, the thesis inquires and discusses the potentialities of self assessment in e-learning modality through routs built from the analysis of errors that have been made.

In this context, my question of research has been: "to identify a methodology for the building of learning paths, in self-education on e-learning platforms, to overcome difficulties in mathematics"

For this reason, first of all I have identified a sphere of intervention and several connected parameters.

I chose to treat the learning of linear algebra at first-year of scientific colleges, where mathematics is at the service of practical activities, such as engineering. This choice has been suggested as well by the real chance of having data available both in the starting phase of analysis as in phase of verification /validation. Among the potentialities of e-learning , I've chosen to give priority to the personalization of the learning, so the paths to build differ from each other according to the difficulties of any single student. At the same time, I wanted to offer large-scale versions of these paths: so, given the large number of students, I chose to ground such paths on «automatic» instruments findable in e-learning platforms, such as quizzes.

The research work I carried out can be summed by the following diagram:

DIFFICOLTA'

ANALIZZARE

CLASSIFICARE

INTERVENIRE

COSTRUIRE

STRUTTURARE

IMPLEMENTARE

SPERIMENTARE

RECUPERARE

Starting from the difficulties of the students, I analyze the situation where their difficulties (errors) arise from. On the basis of the analysis I've done, I'm going to make a classification of the errors; successively I'm planning a recovery intervention, exploiting e-learning's potentialities, such as the use of close-ended questions. The questions that compose quizzes are built from the difficulties encountered, and the quizzes are structured so that we can determine the building of recovery paths, according to the classification of the difficulties. The described methodology has been implemented and validated in a e-learning platform.

On what follows, I'm going to offer an overview of what I discuss in my PhD thesis. In the first chapters I present the main results of the theoretical framework to which I refer. Due to the peculiarity of the thesis's topic, this framework concerns the research both in the e-learning field (from a technical as well as theoretic point of view) and in the field of the mathematics teaching/ learning. In the first chapter I examine the different kinds of computer-assisted assessment, both for the student and the teacher:

summative assessment, formative assessment, diagnostic assessment. I examine the benefits derived from the use of quizzes so that they can be useful resources for the student's learning. The quizzes' keystone is the formative self-assessment they offer. This self- assessment is an integral part of the formative path, and helps to guide, to develop and to correct it.

In order to simplify the quizzes' limits, I've identified some possible solutions that our technological means allow us.

In the second chapter I examine the building of a recovery and self-education path, starting from errors. The starting point is error, taken in Borasi's sense: "a springboard for research" (Borasi 1996). I examine the role of errors to a large extent, from the epistemological, pedagogic and didactic points of view, making references to the leading figures in these fields, who they all point out the importance of errors for knowledge-building. Analyzing errors serves to make a detailed classification of the difficulties encountered, which by themselves represent a very important parameter in the organization of the in supporting/ recovering activities.

In the third chapter I examine the classification of the difficulties that are present in the literature: the dichotomy error/mistake; Math taxonomy; Niss' competences.

In the fourth chapter I present the analysis of linear algebra protocols as referred to students of the first year, trying to understand where these difficulties arise from: cognitive abilities, meta-cognitive and not-cognitive attitudes, etc. All this work has been useful in order to define a classification of the difficulties as connected with the specific causes. In the fifth chapter I'm going to define a methodology for the building of a recovery/ self-education path in the field of linear algebra. The methodology I use is based on constructivism, which depends not only on the distinct activities, but mostly on the fact that they are simultaneously present, as well as on all the possible choices and on their reciprocal connections. The didactic activities have been implemented in e-learning modality in the IWT platform.