EARLY IDENTIFICATION OF STUDENTS AT RISK OF SUCCESS/FAILURE IN PRIMARY EDUCATION: NEEDS, CHALLENGES AND GOALS OF A LONGITUDINAL ASSESSMENT

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Abstract

Currently, educational institutions are challenged to define strategic and intervention plans aimed at promoting success and preventing failure, which requires relevant information to support enlightened decision-making. In this context, it becomes central to know who the students (intrapersonal assessment) are and how their performances are influenced by their personal and family characteristics (interpersonal assessment), as well as the way they interact with the school context (transpersonal assessment). Based on the recent trends of Educational Psychology approach and in the light of national and international educational policies, this study intends to understand the reality of Portuguese schools, with special focus in primary education. The main goal of this study is, therefore, to contribute to the understanding of the phenomenon of success and failure in primary school, from a longitudinal perspective. In order to achieve this goal, firstly, there was the need to identify and to understand the core variables that explain this success/failure. On the other hand, it was also essential to recognise the students at risk in a timely manner and to outline the intervention strategy best suited for each student, considering the personal, social and contextual features. As a result, the aim is to identify predictable success or failure profiles, creating an early detection system that works as an efficient decision-making support system, enabling school managers to identify risks and opportunities. An intentional and early intervention is the central goal of all research effort. For this purpose, a technological tool will be developed that can be made available to school centres, allowing school managers to intervene early in the promotion of success and prevention of school failure.

1 INTRODUCTION

To recognise which variables best explain students’ learning and academic achievement is a central concern on Educational Sciences and Psychological research [1, 2]. Despite the extensive scientific literature that focuses on this issue, the challenge of achieving a consensual definition of educational attainment and failure remains [3]. This hindrance may be due, on the one hand, to the multiplicity of factors that influence school achievement, their quality, and students’ academic performance and consequent success [4]; and, on the other hand, to the way the several dimensions interact and relate, converting each school trajectory into a unique biography. Indeed, the multilayered nature of the concept of school success and the manifold personal and contextual factors involved, require a comprehensive and systemic sight that encompasses not only students, but also their families, educational agents (teachers, school) and their belonging community as well.

In the literature there is a wide set of studies on the subject, focusing on the different levels of analysis. While some focus on the intrapersonal variables of students, such as their previous learning achievement, social-emotional skills, performance beliefs, cognitive skills, and motivational dimensions [e.g. 5, 6]; others focus on the variables associated with the family, such as sociodemographic variables, parental engagement and parental educational styles [e.g. 7, 8, 9]; finally, others focus on the variables related to the school and teaching effect, namely: school climate, pedagogical practices, classroom structure or the support systems and resources used [10, 11]. In fact, all these features have an effect not only on learning, but also on its quality. Thus, the academic performance of a student at a given moment in his/her educational career could be seen as the product of a set of processes, variables, agents and dynamics that reciprocally interact [12], and which explains school achievement.

Some systemic and comprehensive studies allow to understand school success. Lee and Shute (2010) [13] conducted a theoretical review of the literature analyzing studies in the field of school, social and cognitive psychology. In this analysis, twelve explanatory variables of school performances emerged, grouped into four categories: (i) student engagement and (ii) learning strategies (as personal variables), (iii) school climate and (iv) family and social influences (as socio-contextual variables). Despite the
systematization effort, these authors point out that this categorization is artificial. Indeed, even if conceptually the variables distribution into groups is significant, their interaction and interrelation should also be considered. In fact, student engagement and learning strategies, despite the differences are intrinsically related variables: students highly engaged with the school tend to know and apply learning strategies more appropriately. On the other hand, the effective use of these strategies tends to potentiate higher levels of parental engagement [14]. The same dynamic occurs among contextual social variables, since, for instance, parents' engagement with the school may give rise to different teachers' expectations regarding their students [15, 16]. Personal and social-contextual variables are also interrelated. Parents who value school achievement transmit these values to their children, which promotes a greater engagement. This positive attitude of the children towards school leads to even more engagement from the parents [17]. Despite the limitations presented by the authors, this study illustrates that it is the combination of motivational and cognitive factors with affective, social and family ones that best explain students' learning and school success.

Understanding school success also implies adopting a temporal outlook. To meet the inherent temporality of the school pathways, Lee (2010) [18] recommends the use of longitudinal studies. The use of repeated measures of school performance makes it possible to locate the starting point of each student on their route and, therefore, to understand the real value that school education adds to their development. In other words, locating the starting point of each student makes it possible to perceive the evolution of this student during schooling. Voelkle, Wittmann and Ackerman [19] also recommend the use of repeated measures of school performance, since previous school performance explains 30 to 60% of the variance in subsequent school performance [20, 21]. Lemos, Abad, Almeida, & Colom [22] report that the ability to predict school performance increases when this variable is considered alongside other psychological and contextual variables.

Lucio, Rapp-Paglicci, & Rowe [23] also state that school failure is a process that begins in early stages of schooling, gathering and settling itself over time. Consequently, it is necessary to carry out research at early school levels, in order to understand what factors were present at the first warning signs, which also reinforces the relevance of conducting longitudinal studies. Those allows also the definition of preventive strategies, avoiding students from failing [24].

Taking into account the importance of longitudinal studies to the earliest detection of learning disabilities, as well as the existence of a multiplicity of personal, family and contextual variables that influence school learning, this study intends to face school success in a comprehensive way, emphasizing the impact of psychological and familiar dimensions on the learning development. Intrapersonal variables (e.g. cognitive, socio-social development, moral development, creativity and academic self-concept variables), family variables (e.g. sociodemographic variables, parental engagement with the school, parental educational styles) and contextual variables (e.g. school climate, educational practices, classroom management styles) were included. The influence of those variables will be considered in a temporal perspective. Accordingly, this research project intends to follow a sample of students throughout the 3rd and 4th years of primary education, trying to establish not only the differential impact of these variables in academic performance, but also to understand how these variables influence each other, in a longitudinal perspective. Thus, the emphasis is put not only on school outcomes, but also on the processes that sustain them. As a result, the aim is to identify predictable success or failure profiles, creating an early detection system that works as an efficient decision-making support system and enabling school leaders to identify risks and opportunities. An intentional and early intervention is the central goal of all research effort. For this purpose, a technological tool will be developed that can be made available to school centres, allowing school leaders to early intervene in the promotion of success and prevention of school failure.

2 METHODOLOGY

2.1 Project design and Implementation

2.1.1 Project design

The goal of this study is to contribute to the understanding of the phenomena of success and failure in primary school in a longitudinal perspective. As a result, it is intended to identify predictive profiles of success and failure, validated not only empirically, but conceptually. To this end, it is intended to create a clear and efficient decision-making support system that allows school managers to identify risks and opportunities for intentional and early intervention to promote success and to prevent school failure.
In order to achieve this goal, it is necessary, firstly, to identify and understand the factors that explain this (in)success; secondly, to be able to identify students at risk in a timely manner and, finally, to define the proposal of the intervention strategy that best suits the situation of each student. This investigation will focus essentially on the first two points: (i) identification of explanatory factors of school failure and success and (ii) proposal for an early warning system to identify students at risk of failure.

The accomplishment of the first phase of the project, identification and understanding of the factors that potentiate situations of (in)success in school, will be carried out firstly at a more macro level, that is, with focus in finding the explanatory factors of school failure using the academic characteristics of the student, and then with a more micro-vision, in which regional and school-level factors will be taken into account. For this task, we will use the Data Mining tools, which combine knowledge of different areas, such as Statistics and Machine Learning, and enhance the automatic discovery of regularities and relations between the variables in the data set.

To carry out the second part of the project - building an early warning system - we will use techniques such as Logistic Regression, Decision Trees and even Supervised Neural Networks. All these tools constitute excellent complements to the risk assessment carried out by the teachers. Based on the characteristics presented by each student and its school and family environment, and regional characteristics, it will be possible, using this type of tools, to build a robust system that classifies and prioritizes the set of students of each school, thus allowing access to an action plan to improve learning at an early stage of the study cycle.

2.1.2 Project Planning

The variables that characterize the performance (results in the previous 4th year exams), socioeconomic conditions and geographical location of the schools will be stratified and a sample of schools, with a predicted N of 2000 students of the 3rd year of the primary school, will be selected.

For each participating student, it is intended to explore the factors (students, family, teacher and school effect) that work by themselves, or in interinfluence, as good indicators of risk factors of failure and protective factors of success. Thus, students, their parents, teachers and primary schools' coordinators will be constituted as participants of the present research, being a set of instruments adapted to the target population. At the initial moment of data collection, teachers will be asked to provide the previous grades of all the participating students, as well as to indicate students at risk of failure that justify their signalling for monitoring due to learning difficulties. Considering the great variability of the retention rate among primary schools, which probably reflects different retention policies, we believe that it is important to have an instrument which allows the comparison of academic outcomes of the students from the different schools. Thus, the school performance of the participating students will be analysed through a final test, common to all students in the sample, which will happen at the end of the 3rd year of primary school and again at the end of the 4th year of schooling.

Based on the characteristics presented by each student, their families, teachers and primary schools' coordinators, obtained through the application of various data collection instruments, a robust system that classifies and prioritizes the risk of failure of each school in the sample will be developed.

Subsequently, an APP that can be used as a decision-making support tool will be developed. After completing the study, this tool will be available to all participating schools.

In short, the present study crosses the knowledge of several scientific areas, being therefore a multidisciplinary work that integrates perspectives of the Economy, Psychology, Education and Information Science. This interdisciplinarity will allow us to identify academic characteristics that can be used as input in the Machine Learning algorithms that will be considered for the development of an early identification system of students at risk of school failure. On the other hand, we intend that the use of the early detection system can function as an efficient decision-making support system that allows school managers to identify risks and opportunities for intentional and early intervention to promote success and to prevent school failure.

2.1.3 Data collection

The data collection process will be preceded by the identification of the schools that will constitute the sample and all the logistical preparation that entails its implementation, namely the previous contact with the schools, obtaining their acceptance to participate, as well as the collection of informed consents by all participants. The voluntary nature of the participation is highlighted, as each participant can integrate the research in whole or in part (being it possible to withdraw at any time, or not answer to part
of the data collection protocol). Confidentiality and data protection, as well as the anonymity of the participants and all their collected data, will be assured.

In the choice of data collection measures, it was considered their suitability for the variables being measured, as well as their adaptation to the Portuguese population. Thus, data will be collected through measures applied to children, in the classroom context, their parents, teachers and primary schools' coordinators. The data collection protocol applied to the various participants is presented in table 1.

Table 1. Psycho-pedagogical evaluation protocol.

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<tr>
<th>Student effect</th>
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<tbody>
<tr>
<td>Sociodemographic questionnaire</td>
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<tr>
<td>Raven's Coloured Progressive Matrices</td>
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<td>My classroom [25]</td>
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<td>Emotional Knowledge Assessment Scale [26]</td>
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<td>Self-Concept Scale for Children and Pre-Adolescents [27]</td>
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<td>Moral Development Level Assessment Tool - Children's Version [28]</td>
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<td>Dictation</td>
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<td>Error detection test</td>
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<td>Questionnaire on Parents' school engagement - Children's Version [29]</td>
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<td>Scale of Parenting Styles - Children's Version [30]</td>
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<th>Family Effect</th>
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<tr>
<td>Sociodemographic questionnaire</td>
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<tr>
<td>Questionnaire on Parents' school engagement - Parents Version [29]</td>
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<tr>
<td>Scale of Parenting Styles - Parents Version [30]</td>
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<tr>
<th>Teacher Effect</th>
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<tbody>
<tr>
<td>Sociodemographic questionnaire</td>
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<td>Classroom management questionnaire [31]</td>
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<tr>
<th>School Effect</th>
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<td>Semi-structured interview about school climate</td>
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In order to analyse the student effect, the following measures were used: (a) sociodemographic questionnaire constructed for the present study; (b) CPM-P: Raven's Coloured Progressive Matrices, which measure the subjects' ability to produce relations; (c) My Classroom [25], which is a self-report questionnaire that evaluates the creativity climate in the classroom through 5 factors: (1) teacher support for student's expression of ideas, (2) self-perception of the student in relation to his/her creativity, (3) student's interest in learning, (4) student's autonomy, and (5) teacher encouragement of the production of new ideas by the student; (d) Emotional Knowledge Assessment Scale [26], which is the Portuguese adaptation of the Assessment of Children's Emotion Skills [32] and evaluates the emotional knowledge of children. It is composed of three sub-scales: facial expressions, emotional situations and emotional behaviours. In each of the subscales, it is intended to evaluate the child's ability to correctly associate each stimulus (facial expression, situation or behaviour) with one of five possible feelings: joy, sadness, fear, anger and "neutral"; (e) Susan Harter's Self-Concept Scale for Children and Pre-Adolescents [Adapted by 27], which is the Portuguese adaptation of Self Perception Profile for Children [33], and evaluates the characteristics or attributes of the self that are consciously perceived and described by the individual through language [34], distributed in five domains: academic competence, social acceptance, athletic competence, physical appearance, and behaviour. It also evaluates the perception of global self-worth or self-esteem; (f) the Moral Development Level Assessment Tool - Children's Version [28], which assesses the moral level of children between the ages of 5 and 10, using stories/scenarios pointed out by Piaget (1954) [35] as fundamental to the construction of morality; (g) an elaboration of a dictation (text from the 2nd year schoolbook, previously selected); (h) an error detection test (text from the 2nd year schoolbook, previously selected); (i) Questionnaire on Parents' school engagement - Children's Version [29], with the goal of evaluating the communication between
the school and the family, the engagement of the family in activities at school and the engagement of
the family in learning activities at home. It consists of two factors: the first factor reveals an association
between the engagement in home-based learning activities dimension and the school-family
communication dimension and the second factor studies the parental involvement in school activities.
This questionnaire includes a version for children and another for parents, and in the present
investigation both versions will be used; and finally, (j) the Parental Styles Scale [30], which was
constructed based on the four parental styles proposed by Baumrind (1966) [36]: democratic or
authoritative, indulgent or permissive, authoritarian and negligent. This scale has a version addressed
to parents and another, descendant from the first, addressed to the children, where they reflect about
their perception of the education practiced by their parents. In the present investigation the two versions
will be used. At the end of the 3rd year, students will still be subject to a final test of knowledge that will
be replicated at the end of the 4th year of schooling.

In order to analyse the family effect, the following instruments will be applied: (a) Sociodemographic
questionnaire constructed for the present study; (b) Questionnaire on Parents’ school engagement -
Parents Version [29]; and Parental Styles Scale - Parents version [30].

The following instruments (a) Sociodemographic Questionnaire constructed for the present study and
the (b) Classroom Management Styles Questionnaire [31], which aims to identify the style of
management used by the teacher in the classroom between four styles - authoritarian style, persuasive
style, permissive style and indifferent style - will be used to analyse the teacher effect.

Finally, the school effect will be analysed by conducting a semi structured interview on school climate
that will be held with the coordinators of the primary schools. The school climate can be understood as
a set of perceptions of the different members of the school community about the quality of the
interpersonal relations present in the institution. Consequently, it emerges from the entire school
community and influences all its members. For Thapa et al. (2013) [37], based on the National School
Climate Council, a positive and desirable climate is one that provides learning, and in which people feel
secure and available to establish positive interpersonal relationships. Research has shown that a
positive school climate has clear benefits in different aspects of the school context, particularly in
academic performance [38, 39, 40, 41].

3 CONCLUSIONS

The present study aimed at presenting a research that intends to contribute to understand academic
success and failure in primary education, in a longitudinal perspective. Considering academic success
as a multifaceted and multi-determinate concept and as a result of the combination of personal and
contextual factors [42], it was intended to design a study that included individual, socio-family and
contextual predictors, in order to uncover the interrelationships that could occur between them, fostering
new understandings about school achievement in the early times of schooling. Additionally, a
longitudinal study was designed, trying to understand the changes that occur along the students’ school
paths.

Thus, the decision to longitudinally design this research, as well as the systemic perspective included
in it, gives it an innovative feature, allowing to analyse the dynamics and processes established between
the variables explored in a temporal perspective. On the other hand, it will also let us to understand how
a set of variables traditionally related with learning could be linked between them over time, whether
direct, indirect or mediated way. Thus, several perspectives on school success can be complemented,
namely a broader view and another focusing on the participants' idiosyncrasies.

The decision to include intrapersonal, family and contextual variables was due to the conception that
there are multiple influences that determine learning, not only at the level of the individual, but also at
the level of contexts, in which parents, peers and teachers are understood as social agents with
influence in the teaching-learning process, since human development results from the interaction
between social and psychological relationships and processes [44]. Thus, in the present investigation it
will be possible to analyse the direct, indirect, mediated and reciprocal effects that are established
between the various social agents and contexts with influence on school (in) success.

In truth, it is considered that understanding school success as a multifaceted process implies an
educational change, and so the present study aims to contribute to the multiple personal, social and
contextual dimensions of the learning process, to be included in the achievement of school success. In
addition to school grades, used almost exclusively for the definition of school success, the motivational,
behavioural and cognitive dimensions, in conjunction with parental attitudes and behaviours and family characteristics, contribute, in equal measure, to this construct.

The multidimensionality of school success emphasizes the need for an ecological and contextual perspective of learning. As such, instead of explanatory models of purely cognitive-motivational learning, contextual variables such as family, school or peers must be equated in the intervention [44, 45]. These should meet the unique characteristics of the students, parents, teachers, schools and communities.

The present research intends to contribute to understand the multidimensional and multidetermined nature of school success, recognizing predictive profiles of success and/or failure. Its goals also are endorsing the paradigm shift of educational agents and contributing to the definition of educational strategies that are truly oriented towards particularities of students and their contexts.

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