



## CHECK MATE! Improving logic by teaching and practicing chess

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**Resumo:** *Abstract: This paper presents a project at XXX to improve academic achievement by teaching chess and promoting its practice amongst the students of engineering and high school level technical courses, all in the electric, mechanical and computer areas. It aims to improve logic reasoning and improve learning, focus, discipline, ahead thinking, all aiming to get better academic results, improving their grades and lowering dropout rates, especially after more than a year and a half of distance learning forced by the global coronavirus pandemic of 2021 and 2022. The way the project was implemented is described, as well as preliminary and expected results.*

**Palavras-chave:** *Chess, Academic Achievement, Dropout rate*



## CHECK MATE! IMPROVING LOGIC BY TEACHING AND PRACTICING CHESS

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**Abstract:** This paper presents a project at XXX to improve academic achievement by teaching chess and promoting its practice amongst the students of engineering and high school level technical courses, all in the electric, mechanical and computer areas. It aims to improve logic reasoning and improve learning, focus, discipline, ahead thinking, all aiming to get better academic results, improving their grades and lowering dropout rates, especially after more than a year and a half of distance learning forced by the global coronavirus pandemic of 2021 and 2022. The way the project was implemented is described, as well as preliminary and expected results.

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### 1 INTRODUCTION

Logic reasoning is extremely important in learning engineering, so it is necessary to search for ways to improve it. This article describes a project at IFMS that aims to improve logic reasoning through the teaching and practice of chess, relating it to interdisciplinary teaching possibilities to the other engineering topics. This also meets the motivation needed to avoid students dropping out, which in Brazil increased due to the coronavirus pandemic in 2020/2021, that required distance learning for a while (Tenente & Santos, 2021).

Chess has been studied to improve academic achievement by several researches, with beneficial aspects being noticed like increase in focus, self-esteem, self-control, discipline, amongst others. (D'Lucia, 2009; Moraes, 2014; Nascimento, 2011; Sá, 2006; Sá, 2012; Silva, 2021; Silva, 2012; Silva, 2010; Silva, 2011).

Also, sports are generally a motivational instrument, and their practice improves the feeling of belonging to the institution. This paper is a byproduct of a project at the school, named "Check Mate!: university chess project and its learning possibilities at the technical courses of IFMS", which was based in chess classes in the Introduction to Electrical Engineering class in 2021, and started to the rest of the school in February of 2022, with positive preliminary results already by May of the same year, just a few months into the project. The teams that were formed even became city champions in May of 2022. The researchers also apply now the experience acquired teaching chess in Introduction to Engineering at UCDB (Pereira, 2006) and from advising a master's thesis in the subject (SILVA,2021).



By implementing the project, students from engineering and high school level technical courses of IFMS are expected to improve their logic reasoning as well as its soft skills. Some of specific goals are:

- Acculturation through the practice of interdisciplinary chess;
- Provide for moments to learn chess in its ludic and recreational aspects;
- Develop competencies and skills of the students and their protagonism to successfully succeed in engineering and technical courses of the institution, carrying these skills to the market place.

## 2 MOTIVATION

The study of technical topics in engineering and high school level courses have always been challenging to the average student. There is a lack of focus, determination and logic thinking required to study topics like Math, Physics, Electronics, Thermodynamics and such other topics. This results in high dropout rates, and those who don't quit in general take longer than standard required time to graduate. The situation worsened during the 2020/21 global pandemic, due to extensive use of distance learning, which requires even more self-control and determination.

For example, it is common for students to take on an electricity problem by start developing calculations without thinking ahead if that path will lead to the desired solution. Applying the planning and thinking ahead, which players use in chess, trains the student to think before writing, like planning a trip mentally using a road map, before actually driving it and hitting a road-block.

To fight these problems, amongst others, educational and interdisciplinary actions were developed, proposing a view of an expanded curricula, based on the daily analysis of the campus students. In informal talks, it was perceived certain level on tension amongst the students, resulting in mental and physical tiredness. It was noted that several of them practiced chess during class interval, but in an unsupervised way, resulting just in entertainment, a hobby.

But starting with these students who already knew how to play and liked, and by teaching new ones and helping all of them practice under supervision, we expect to help the logic of regular courses and foment their improvements in the game itself, as well as increase their focus on classes and people interactivity. Knowing knew people helps to overcome shyness.

Academically, for example, it could help them plan ahead the solution of math, physics and technical problems, in their mind, before to start writing anything, avoiding waste of time in wrong solution paths, before doing any actual calculations. This way, and by promoting people interaction and mutual help, this project increases academic achievement and lower dropout rates.

### 2.1 Chess and its contributions to the cognitive improvement of students

According to Almeida (1988 apud Santos 2009), in the cognitive point of view, the analysis centers in the tasks and internal cognitive processes used to solve problems, while reasoning would be defined by:

1. Identifying the elements of a task or problem.





2. Drawing logic conclusions of the supplied and processed information;
3. Understand their formulation;
4. Conceive alternative forms to solve it;
5. Assess different solution alternatives;
6. Assess the adequacy of the answer to the given problem, considering the specificity of the situation and its consequences (SANTOS, 2009).

Therefore, one could say that reasoning is a cognitive mechanism used to solve problems in different content forms (numeric, verbal, spatial, abstract and mechanic). According to Andriola&Cavalcante (1999 apud Santos, 2009), specifically dealing with abstract reasoning, it can be said that it is characterized by the capacity to solve problems composed by abstract symbols. We agree, we noticed that students that have difficulties in exact sciences present common characteristics related to bad performance, like lack of concentration, forgetfulness, anxiety, difficult to think logically, and creativity and abstract reasoning underdeveloped.

Studies published by Becker (1948), identify chess:

- As a game: it is an intellectual sport, competition, expectation, creative challenge, leisure, mental hygiene, rest.
- As a science of strategy (tactical and technical), study, research, imagination, discovery, perfection ideal.
- As art: it is harmony, beauty message, spiritual charm, emotion, culture pleasure, happiness. (BECKER, 1948, p. 320)

From this, we can identify several contributions of the game of chess regarding its applicability and educational process of pedagogic value, linking to an educational proposition that allows the development of attack and defense strategies aiming the mobilization of cognitive structures. D'LUCIA (2009) also points out the importance of chess teaching for children education. Silva, (2011) also cites the way the mind is improved by playing chess.

### 3 METODOLOGY

Playing chess is more than fun, it can be studied under different learning theories, in this case the form that our mind finds mechanisms to think the context of technical and non-technical classes. The multilateral formation and the interdisciplinarity expected in the epistemological basis of professional education can make possible chess to be inserted in the curriculum. (CIAVATTA, 2014). This project intends to assess the real contribution of systematic chess practice, as well as its pedagogic contributions in the teaching learning process.

There are three levels, beginners, intermediate and advanced. Beginners learn the basics of the game, like pieces, rules and openings. For those in the intermediate level, there are improvement activities, like famous game analysis, game style studies, study of advanced techniques like blind chess e studies with materials like learning books. On advanced level there are, besides studies, also practice, because previous experience of those in this level allows a certain freedom towards the chess practices. In all three levels there are internal competitions to experience real games.

During the project beginning, the participants were presented to the basic rules and pieces of chess, developing its habits to practice in the university environment, to amplify

the cultural baggage and increasing their reasoning capacity, inherent to chess practice. Different ways to play were presented.

Later, they improve their game, perfecting their fundamentals for attack and defense plays, forming teams to participate in city, state and nationwide tournaments. This way, reasoning is developed, as well as their concentration, focus and self-esteem.

IFMS has engineering courses, but also high school level technical courses in the electrical, mechanical and computer areas, all integrated with regular high school classes, so we decided to extend the program to all students as well. They got so motivated that teams formed to compete in city and state championships conquered top positions in both after just a few months.

The condition is that students do not skip classes, and that they could somehow evolve in the game, both technically and tactically. This benefits both students and the project teachers, who proposes practices to be incorporated in their formation, this way developing skills needed after graduation.

Assessment will be done by applying logic reasoning test and/or concentrated attention test (CAT) at the start of the project and at the end of the semester, to check for participant evolution concerning their cognitive skills measured in the test.

According to Gil (1999), exploratory research has the basic goal of recognizing the causes that determine or contribute for the occurrence of a given phenomenon. Also he considers that exploratory research main goal is to develop, explain and modify concepts and ideas.

#### 4 PRELIMINARY AND EXPECTED RESULTS

New students are expected to develop an interest in the game, but mainly also expected is the increase in focus and academic achievement. Statistics before the start of the project, and after will be collected periodically, every end of semester. Better focus, discipline and logic reasoning obtained from the practice is expected facilitate the studies of the students, increasing their grades and resulting and lower dropout rates, with students graduating in the right time, as seen in previous universities (Pereira,2006). In recent city and state championships we already got positive results, with students with just few months of practice (since February 2022) obtaining championship in male and female city tournaments, and with first and second places in state ones.

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