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COULD STUDY AND PLAY OF CHESS IMPROVE SOCIAL INTERACTIONS? REPORT OF AN ITALIAN CASE STUDY.

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Abstract.

Aim of this work is to improve the social interactions within a math classrooms (6^{th} grade), introducing a chess activity during the curricula hours.

The theoretical framework upon which this research is based consists of: Vygotsky's Theory of child development (Vygotsky, 1986), the knowledge objectification theory (Radford, 2006) and theory of configural concepts (a personal review of Fischbein's theory of figural concepts).

We will discuss the results of an experimentation that has the purpose to create an appropriate environment where the students develop the abilities to solve and pose problems.

1. Introduction

This work born from the conviction that all didactical proposals, in math education, must consider the relationships within the classroom, and how it's possible enhance social interactions. What we will want observe with this work, is how a collaborative activity (and also individual) in a mathematical context could be improved by a collaborative activity in a chess context.

As proposed by D' Amore (D' Amore, 2004) will be considered 4 situations of thinking:

- Autonomous situation with motivation and volition (SAm);
- Collaborative situation with motivation and volition (SCm);
- Autonomous situation without motivation and volition (SAn);
- Collaborative situation without motivation and volition (SCn).

The choice of chess activity was due to the fact that this discipline create an highly motivating

context in which the students deal with problem solving and problem posing activities. Furthermore, chess elements like geometrical ones, are not purely conceptual or figural elements, but mental elements that sharing similar conflict and difficulties in recognize and handling (Fischbein, 1993).

The motivation to do chess activities don't lies only on game nature of this discipline, but also because it could be a "bridge" between the family and classroom.

In fact, the diffused idea that chess is a great training for the mind, can push parents to encourage their children to participate actively in those activities. This could also be a way for parents to "believe more in the school" and especially to have arguments to share with their children.

Thus, chess activity could be improve the language between parents and students in an age in which this could be very difficult.

2. Chess and zone of proximal development

Entering in the epistemological nature of the game of chess, we want to extend the Vygotsky's paradigm to the learning phases of chess, distinguishing between playing and studying chess.

As mentioned above, the problem-solving activities in a chess context, can be considered a condition in which the students work with motivation and volition.

How this, could help the learning/teaching activities in a geometrical context? To answer to this question, we want to enter deeply in the cognitive activity of a student during playing and studying chess. In this paper we want to summarize some key points on these processes.

Play chess

When an individual play a chess game, he/she will brings knowledge and competences, all studied rules (or create by himself/herself) and all emotional choices that led him/her to promote or exclude certain variations.

For us this is the *actual level of individual cognitive development*.

Fundamental feature of the chess games is that there are two players, and this obvious considerations will allow us to define the zone of individual potential development.

In fact, this can be identified by the meeting of the two zones of actual development. With the term "meeting" of course we aren't referring to the mere union of the two levels of development, but we will re-

fer to what can be produced by the interaction of knowledge, competences and emotions used by the players to win the game.

For example, when a player P_1 (the "strongest") and a player P_2 (the "lowest")[1] play a game, they create a zone of potential development that is valid for both players.

This *zone of potential development* will depends by the actual development zones of the two players, by motivations and expectations of the players that are playing that game (tournament game, friendly game, game between teacher and pupils), by the psychological situation of each of them (presumption, concentration etc.) and also by their age.

The zone of potential development, and also the proximal one, will be generated by the two contenders (peers) that to win the game, they produce knowledge and/or skills that they haven't before, or they had but they didn't know when and how use them.

In this paper we will not dwell on the various dynamics that can exist between the two players and their zones of development during the game, but we deal with those dynamics which include the language as a mediator between the actors, and so the study activities.

Study chess

In this section we consider the collaborative phases in chess studying in classroom activities or between two chess players who have finished a game.

During the chess lessons, similar to those of mathematics, the teachers are attempting to provide knowledge and skills, computational techniques and criteria for evaluating positions. But there is a big difference between the two disciplines, in chess, the concept of "best move" isn't always unique.

In fact, during the game, is usual try to search the best move or best variant, but many times happens that the players restricts his research to find a good move or however a not bad one.

Because this determination is more subjective than objective, how we define the best move during the time of study involving the interaction of many individuals?

We define best move (or best variant), one that is socially and democratically accepted by the collectivity, which is understood by all individuals and that could modify the zone of effective development of them.

[1] It is supposed that P_1 have a greater zone of actual development than P_2

This definition covers the discussed moves during the lesson, but also the not discussed one, which will give safety to every student through the silence of the remaining collective.

So, fundamental moment for a chess player, is the comparison of ideas and analysis not only with the rest of the class or with its game opponent, but also with himself. This is not a "paradox", in fact when a chess player ends a game and analyze it, it's possible that he/she doesn't recognize himself how the moves maker. He / She doesn't understand the reason of certain moves or how he/she does some mistakes. This phenomena depends by the emotional sphere of the game, that doesn't afflict the player during his/her analysis.

In fact, for us, one of the main skills of a chess player is to ask to himself (and to other people) question of a metacognitive type, to accept criticism and thus to extend the reflection activity not only to the game, but also to its analysis and sharing them with the context.

Thus, using the previous considerations we can say that every chess games could be thought as an "anticipated exercise".

3. Case Study

In this section we will discuss an experimentation that have the purpose to create a learning environment in which the students develop the abilities to solve and understand increasingly challenging problems in chess and geometry.

These activities were born from the idea that certain individual skills (like the democratic access to some ideas by the learners, the cognitive abilities or the metacognitive ones) are shareable by similar (cognitively speaking) disciplines.

But, why have we chosen chess? There are 2 great reasons:

a) During chess activities the students do several intellectual and social activities:
   - They compete between them;
   - They pose and solve problems;
   - They create and evaluate strategies;
   - They have funny;
   - Etc…
b) Chess and Geometry are (cognitively speaking) similar disciplines, because they deal with something different by mere concepts or figural

representations, they deal with something that we have defined *Configural Concepts*[2] (Ferro, 2012a; 2012b).

So, in this experimentation, we have proposed a chess activities (6 lessons of 4 hours for each of them) to a math classroom of 6th grade (24 students).

The activities included a progressive synergy between chess and math activities, in which we propose both types of tasks. It provides three steps:

1. Proposing of geometrical tasks in collaborative situations (group of 3 or 4 students);
2. A chess activity that gradually become geometrical activities;
3. Proposing of geometrical tasks in collaborative situations (group of 3 or 4 students).

In line with the theoretical framework of objectification of knowledge[3] (Radford, 2003) we have analyzed the activities using a semiotic approach and then we have video-recorded them.

In first step of experimentation we have observed that students had some difficulties in collaborative activities to solve geometrical problems. In fact, often, there was one students that take the task paper, read it, think and give him/her answers for the problem.

The chess activities provides 4-5 hours for teach the fundamental rules of chess. After, we have proposed autonomous situations in which the students try to solve easy chess problems with the aim to trust in themselves. So, we have proposed collaborative situations to solve chess problems starting from tasks of the previous difficult level (easy) and we have observed that in more cases they don't solve problems that they can solve autonomously.

In fact, when more individual (more than one) look at a position their judgment depend by their perspective about the chessboard (Ferro, 2012a),

[2] A configural concept consists of a networking of knowledge about an object, whose meanings depends on the configuration of its parts, including the relationships that an individual uses to perceive and explain them.
The organization of the parts of a configural concept depends on the objective of the active reflection of the problem; this organization is mediated by artifacts, body, language, and signs.

[3] According to which thinking is above all a form of active reflection on the world, mediated by artifacts, from the body, language, signs, etc..

and so it's possible that they haven't different or conflicting ideas to solve the problems.

To enhance their collaboration we say them that every group find out one answer, and this will compared with the other groups ones. After some lessons (3 lessons and so about 5-6 hours), we have seen that they collaborate actively during the task, but also when they talk about the games that they play in "free time" (in the last hour of every lesson they play free).

Thus, we have gradually expanded the groups (3 – 5 – 10 students per group) and introducing some geometrical task. What we have seen is that they use the same (democratically and respectful) way to discuss about the problems in the geometrical task.

The last two (geometrical) lessons were with one group, the totally of the classroom, in which they try to solve the geometrical tasks with a strong collaboration and a respect for the answers of the other students. Furthermore, to find the answer to give to the teacher, they make a dense network of questions of a metacognitive aspects about their mistakes and results, improving their language and critical thinking.

A last result was obtained from the discussion of the answers, indeed, when the teacher discuss the wrong answers, the students that want to give another answer (maybe the right answer), don't have denied the classroom answer, but at most they were perplex because they don't understood the reason of their changing of evaluation.

4. Conclusions

In this work we have shown an experimentation in which we want to see if chess activities may affect the ability of the student to structure questions of a metacognitive type in other contexts, and in particularly in the geometrical one.

We have chosen chess because it generate a context an highly motivating context, in which the students could improve social interactions through collaborative and autonomous situations.

Thus, it was created a motivating learning environment in which we have focused our attention on the importance of strategy in chess and geometry.

The students have collaborated to find the correct variation (in chess) and the correct construction (in geometry). So, we have enhanced their critical process aging on what Duval (Duval, 1998) calls operative apprehension, that is a cognitive process that involves the operations on the figure (mental or physical) that give "insight" on solving a problem.

In these activities, fundamental is the role of the democratic access to that ideas that the students need to solve the problems.

They learnt that the social interaction between them is a strong feature of the classroom, and in this way they become firstly learners and then citizens.

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