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Evoked Feelings, Assigned Meanings and Constructed Knowledge Based on Mistakes

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ABSTRACT – Evoked Feelings, Assigned Meanings and Constructed Knowledge Based on Mistakes. By means of Piaget's critical clinical method, the study investigated the meanings assigned to mistakes by four students in different activities and interactive situations. The research also analyzed the results of using self-regulatory situations in understanding mistakes initially committed by the students. Data collection instruments consisted of games, video recordings, diaries and interviews. Following intervention, the students were able to recognize their competence, establish positive interactions within the group, and avoid viewing mistakes as obstacles to learning. We concluded that the meanings assigned to mistakes depend on certain variables, among them feelings nurtured by the individuals about themselves, the other, and the object of knowledge.
Keywords: **Jean Piaget. Mistakes. Meanings. Learning.**

RESUMO – Sentir, Significar e Construir Conhecimento com Base nos Erros. Por intermédio do método clínico crítico piagetiano, investigou-se as significações, atribuídas ao erro por quatro estudantes em diferentes atividades e situações interativas. Também foram verificados os resultados do emprego de situações autorreguladoras na compreensão do erro inicialmente apresentado por eles. Os instrumentos para a coleta de dados consistiram em jogos, videogravações, diários e entrevistas. Após intervenção, os alunos passaram a se perceber competentes, estabelecer interações positivas no grupo e deixar de conceber o erro como uma ação impeditiva do aprender. Concluiu-se que as significações de erro são dependentes de algumas variáveis; entre elas, os sentimentos nutridos pelos sujeitos sobre si, o outro e o objeto de conhecimento.
Palavras-chave: **Jean Piaget. Erro. Significações. Aprendizagem.**

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Introduction

Students in the classroom experience various situations that prompt affective reactions. Prominent among these moments are making mistakes. Whether the students are considered bright or not, making mistakes in school work can trigger unpleasant feelings[1] that carry negative meanings. Such meanings can attribute mistakes not only to the situation itself, but also to the incompetence of the individual, instead of considering it as a part of the learning process. This situation raises the following question: What meanings do students assign to their own mistakes in contexts of formal learning?

We raised this question based on research of psycho-pedagogical interventions carried out for over 12 years in public schools in the regions of Assis (SP) and Londrina (PR) with students attending remedial programs, mainly due to learning difficulties in Portuguese and Mathematics. Our research indicated that students tended to assign negative meanings to their mistakes in both subjects, making many of them lose motivation to continue the proposed activities in these disciplines.

Other studies that contributed to formulating similar questions were works drawing on the genetic epistemology and psychology of Jean Piaget, more specifically those related to the author's work on meanings (Dolle; Bellano, 1999; Latansio, 2010; Piaget; Garcia 1989; Ramozzi-Chiarotino, 1991; Vasconcelos, 2007; Bianchini et al., 2009). For Piaget (1973a), everything we think and feel is related to the field of meanings. In this perspective, Dolle and Bellano (1999, p. 27) state that systems of meaning "represent the general semantic memory, conceived as an activity of memorization involving the organization-reorganization of memories in light of the new data that it introduced". The authors explain that the entire structure seeks to assimilate the object through constructed systems of meaning. Thus, "[...] after having been identified, [the assimilated object] takes its place among the available meanings, which, formed in coherent and hierarchically organized subsystems, function as registration and processing systems" (Dolle; Bellano, 1999, p. 25).

Similarly, for Piaget (1973a), human capacity to establish relations is not limited to statements. Such relations are constructed from the earliest age possible, as long as the individual is capable of interacting with the environment.

Piaget (1996) states that there is logic in meanings constructed by the subject. However, this logic is not restricted to operational thinking, but constituted by its own rules and regulations stemming from interpretations developed by the subject in relation to the object of knowledge. These rules provide the interconnection between the schemes by means of inferences, which always operate in an organized manner and establish a continuous and progressive whole of open constructions and reconstructions, which never close.

On this subject, Piaget and Garcia (1989) emphasize that the process of construction and reconstruction constantly carried out by the

subject, which allows him to assign meaning to the world, is rich in endless possibilities of meaning. This is how Piaget's theory, considered an explanatory model of the process of assimilation and meaning, conceives the process that explains how individuals gives meaning to what they actively experience.

According to Piaget (2005), meanings consider energetic elements (interests, values, efforts, mutual sympathies, affections resulting from interpersonal relationships and moral feelings). For this reason,

> [...] there is never a purely intellectual action, as there is never a purely affective act. Always and everywhere, in both object-related behavior and interpersonal behavior, both elements are involved [cognition and affectivity], because the one presupposes the other (Piaget, 1973b, p. 38).

Piaget and Inhelder (2001, p 10) consider that affectivity not only enhances action, but is itself a component of actions. And they stress that "[...] it is interest, and thus affectivity, that makes a child decide to serialize objects and choose which objects to serialize". In other words, without affectivity there would be no interest, and, therefore, no formulation of questions, interpretation and problem-solving.

Ramozzi-Chiarottino (1991), drawing on the studies of Piaget, pointed out that the affective life is entirely comprised of systems of meaning. For the author, affectivity prepares the subject's actions, taking active part in perception, planning, and any type of elaboration performed at verbal and non-verbal level. In addition, she considers it essential to pay attention to the relations between affections and inferences, since the actions performed by the subject when interpreting facts are permeated by inferences. Inference is a personal action necessary for the construction of systems of meaning and of human consciousness itself. Everything making up our consciousness is related to the field of meaning, and therefore includes inference and affections. In the words of Piaget (1973a, p. 63): "consciousness[2] constitutes a system of meanings".

> The important thing to consider is that the human capacity to infer is responsible for the construction of systems of meaning that constitute consciousness. The system of meanings is formed by the implications of these meanings. This ability to establish relationships is broader than the ability to operate (in terms of classifying and ordering) (Ramozzi-Chiarottino, 1991, p. 22).

Another key element in this process is the activity expressed in each interpretation (inference) made by the subject. Piaget (1973a) deems activity as necessary because it is the means by which the subject structures reality and himself. For the author, the subject is self-structuring provided that: a) he has a will to act; b) the environmental stimuli are rich, quantitatively and qualitatively; and c) the environmental stimuli are understood as meaningful.

The acknowledgment of inference as an expression of human activity was one of the aspects that led Piaget (1926) to criticize formal education in his time. For him, it was not concerned with investigating how the individual had reached a certain result, and therefore failed to consider the inferences made by the student, whether the answer was considered correct or not.

Regarding mistakes, Macedo (2000; 2002) stresses that individuals should be allowed to reflect on their actions to the point of formulating new hypotheses, even though they are considered wrong from the adult point of view, that is, offer him conditions to explain the path he has constructed to reach a given result. In this perspective, the teacher's challenge is to help the student produce new meanings. That way the student can continue making mistakes; however, the mistake takes on a positive aspect, because it allows the subject to continue building knowledge by owning the mistake and constructing a new path to overcome it. To this end, the educator must be attentive to what students are aware of and other aspects that are keeping them from transforming the mistake into an observable fact (Piaget, 1977).

Macedo (2005) points out that awareness of incorrect situations produced by students may enable teachers to reflect on their educational action and the condition of the learners themselves. They can then make use of appropriate educational practices to help students assign positive meanings to their mistakes. And, depending on the situation, a mistake can be more fruitful than an immediate hit, for an individual that answers correctly by using only first-degree action is cognitively inferior to one who employs a theory to solve a problem, since the success of the former depended on proprioceptive understanding, while that of the latter was achieved by theorizing and reflection.

For children with learning difficulties, the situation may be compounded when the mistake is viewed merely as a factor to justify the application of punishments (giving a low grade, for example). Many school practices fail to stimulate the construction of knowledge, since these students may become afraid of performing in interactive environments, feeling incapable of questioning the actions of others.

Apprehension, fear, and anxiety are just some of the various feelings experienced by students facing their mistakes. Dolle and Bellano (1999), as well as Ramozzi-Chiarottino (1991), when referring to affections and feelings in similar situations, highlight another important aspect in this process: the role of interpersonal relationships in building knowledge. If we observe the feelings expressed in the field of relationships in a formal educational context, it is not difficult to identify that students share a space of meanings and feelings with whom they interact. This is an important justification for the study presented below.

Another justification for this study lies in the possibility of carrying out subsequent psycho-pedagogical interventions, that is, being aware of the importance of understanding the meanings produced by subjects, especially when it comes to students with learning difficulties.

Research such as that by Dell'Agli (2008) indicates that most of these individuals, besides not acting in relation to formal knowledge, when capable of doing so, usually produce negative meanings regarding this mode of knowledge or even in solving problems of a different nature.

On this topic, there are studies and research showing that meanings produced by teachers regarding learning difficulties are pervaded with culpability concerning the family and the students themselves (Moses, 2001; Osti, 2004; Bianchini et al., 2009; Meira; Antunes 2007; Arevolo Alvarado, 2010). Mattos (2005), for example, criticized severely the teaching-learning process in schools, because students who make mistakes or fail in the proposed activities are generally perceived by the school community and themselves as being cognitively impaired, which ultimately often leads them to be excluded.

Considering the various aspects set forth above, we hypothesized that a change in the negative meanings of these students would require experiences in interactive spaces where students would feel affectively welcomed and repositioned as learners. Experiments and interactions which would enable them to reflect on their mistakes and thus reformulate the previous meanings constructed in a negative way. Only then could they adopt a new attitude towards the peer group, as well as towards the object of knowledge.

To test our hypothesis, we carried out a study with the following objectives:

a) To investigate the meanings assigned to mistakes by students in the 6th grade of middle school attending the remedial learning program;

b) To unveil these meanings in different situations (recreational and educational activities developed in the remedial and mainstream classrooms), considering situations of intra and interpersonal relationships; and

c) To analyze the effects of the use of self-regulatory situations to potentially change students' awareness of their mistakes.

Methodology

To carry out this exploratory study we adopted the critical clinical method of Piaget (1926)[3]. This consists of a combination of observation of and conversation with children during activities, in order to understand how they think. Based on this method, levels of thought are taken into consideration, which, if properly analyzed by the researcher, reveal that what may be considered wrong by the adult may not be so for the child. Piaget considered it essential in this method to clearly delineate the problem and have an initial hypothesis to be investigated.

Piaget's method is different from others in many ways. One of them is that while the clinical method used in medicine aims to obtain a specific diagnosis of a disease and its causes, Piaget was interested in what is common to all (universal), i.e., he studied normally evolving subjects (Delval, 2002). Another aspect is that researchers using this

method are concerned with what underlies the conduct of an individual: "[...] it is a procedure to investigate how children think, perceive, act and feel, which seeks to discover what is not evident in what the subjects do or say, what is behind their apparent behavior, whether in words or actions" (Delval, 2002, p. 67). Piaget's main idea was, based on accurate and systematic guidelines, to understand the child's reasoning. To that end, over and above the answers, he considered the reasons given by the child.

Delval (2002, p. 12) states that Piaget's clinical method "[...] consists of a systematic intervention by the researcher in response to what the subject does and says". The researcher's procedure is flexible in the sense of using actions or questions which are appropriate to each case, to understand how the individual represents or organizes his thoughts. The researcher's actions can also contribute to unsettle the learner and, consequently, prompt him to build knowledge.

Within this methodological perspective, our research sought, through different actions (conversations, games, questions and video analysis), to cause disturbances and therefore help students build inferences that would enable them to change the meanings they assign to mistakes (often negative). Our intention was to design a Piagetian study based on at least two pillars: interaction and higher equilibration.

Research Location and Participants

Data were collected in a public middle and high school in the city of Londrina (PR), which took part in the program of the state of Paraná for students assessed by teachers in mainstream classrooms as having learning difficulties. This institution was chosen because we had previously carried out research there and hence already had contact with its professionals.

The subjects comprised a total of four students out of fifteen enrolled in the 6th grade of middle school, aged 10 to 14 years (of both genders), who at the time were part of the remedial program. We selected only four students of this group of fifteen due to the high turnover of students in the remedial classroom (many of them barely stayed a month in the program). Thus, with a larger group of students we would have faced difficulties to maintain a continuous level of intervention and data collection. However, as the main criterion, we chose students who, in the first stage of the research (observation in the remedial classroom and interview), showed more negative meanings towards mistakes (the individual stages are described below). We noted that these students were not only those with the lowest grades. Thus, we analyzed the students' report cards, choosing two who, at the time, had the lowest grades, and two who had the highest grades, in Portuguese and Mathematics (Brasil, 1996).

Following ethical procedures, our subjects are identified by fictitious names. Therefore, for purposes of data organization, they will be named Alice, Bia, Dan and Caê.

Research Instruments and Materials

The following instruments and materials were used:

a) Video recordings: we recorded on video the actions and interactions of students in all data collection stages. Our intention was to use the videos as one of self-regulation strategies for students to observe themselves and their colleagues. The recordings also helped us review collected data (record forms and notepads);

b) Board games *Quarto* and *Kalah*: these were chosen due to the common characteristic of player mobility, which results in a constant change of observable facts and, therefore, of the procedures employed (such as designing strategies and reviewing moves). Creating a space of intervention through games, in Piaget's perspective, allows the researcher to reveal the subject's internal constructions, as well as to confirm processes of inference and meaning regarding mistakes.

Kalah consists of 36 seeds and a rectangular board containing 14 pits arranged into two rows of six houses each and two larger pits at the ends that serve as reservoirs (oasis). Two players compete and the objective is to capture more seeds than the opponent. *Quarto* consists of a 4 x 4 square board and 16 different pieces, each of which has four attributes: light or dark, round or square, tall or short, hollow or solid. Two players compete and the objective is form a row, in any direction, with four pieces which have at least one common attribute;

c) Record forms and notepad: we considered that the video recordings were not enough to register in detail the students' actions since they moved the pieces around on the board with great speed. Therefore, we also used notepads and record forms prepared in advance, as suggested by Macedo, Petty and Carvalho (2000);

d) Semi-structured interview: designed based on the responses collected in the initial interview (S1) with each student and the interventions (S2), resulting in what we call *Questions to Prompt Feelings and Inferences*. These questions were administered to the four students chosen in S1 to identify more clearly their meanings and feelings following the intervention.

Data Gathering Procedures

Firstly, we submitted the research project to the Ethics Committee for Research Involving Human Beings of Universidade Estadual de Londrina, under CONEP registration No. 268, according to the guidelines of Resolution No. 196/96 of the National Health Council and Complementary Resolutions. The assessment process resulted in approval and the project received opinion no. 172/2011 and CAEE no. 0164.0.268.000-11.

We then visited a school and exposed our proposal to the administration, which accepted it and promptly introduced us to the teachers and students in the remedial classroom. At this point, we explained our goals and allowed students to choose whether to participate in the

research. All of them showed interest, and so we forwarded to their parents and guardians the informed consent form, and all of them gave their authorization.

All stages of the research were carried out at the school. During the interview and intervention, students were taken to an empty classroom containing only the instruments used in each stage. For organization purposes, we divided our description of the data collection procedure into three stages, found below.

Stage 1 (S1): Observation and interview with 15 students from the remedial classroom to choose the four participants

Over a month (twice a week) we observed the daily routine of the students in the remedial classroom to get to know them and their ways of interaction (with colleagues, teachers and knowledge itself). Once these initial observations had been concluded, we set the date for the initial individual interview with each one of the 15 students. The interview included questions that revealed to us the meanings generated when they made mistakes. In all, we asked five adapted questions that could be properly understood by the students. We proposed these questions seeking to know what a mistake is and how students felt when they made mistakes in the presence of the teacher and classmates. When the interviews were over, we listed the feelings that appeared more often (fear, discouragement, shame, envy, nervousness, rage, anger, sadness, joy and guilt) and selected four students following the criteria mentioned above, i.e., students with the most negative meanings regarding mistakes, two with the lowest and two with the highest grades.

Stage 2 (S2): Employment of self-regulation strategies for reflection on the meanings assigned to mistakes

Proceeding with the study, we proposed to the four students playing the board games *Quarto* and *Kalah*. As these were unknown to them, we began the activities with three training sessions for them to understand the components of the games – board, pieces, rules and relations between them. Then we held a tournament among the students so they could interact with each other and we could observe how they reacted to spontaneous mistakes. Seven weekly intervention sessions in total were recorded, each one lasting an average of 40 minutes. The games were held in different modes: singles (one player against another); doubles, one pair against another pair; and in a tournament form, with the four players competing individually against the others.

In addition, we planned self-regulatory strategies based on Piagetian criteria to provoke changes in the students' schemas and meanings. These strategies aimed to cause disruption and self-regulation in the schemes of meaning, such as:

1. Moments to exchange places with a colleague during the game (at the interviewer's intervention);

2. Moments of interruption in the game for students to review their own and their colleague's actions (held between the interviewer and the players).

3. Analysis of students' and their colleagues' performance in video snippets, in moments of both wrong and right moves (individually held between the interviewer and each one of the four students);

4. Circle talk about feelings involved in mistakes (held between the interviewer and the four students);

5. Teaching a game to colleagues in the mainstream school course.

To provoke disruption and self-regulation, we devised a dialogue, suggested by Piaget and Szeminska (1975), which created conflict in the ideas that students had built up so far, at times when the answers were considered as right and wrong. Through questions such as *Why?*, *How do you know?*, *Are you sure about that?*, students were challenged by the researcher at specific moments during the game and were able to compare, check and confront their knowledge, building different relations regarding the proposed situation.

Stage 3 (S3): Administering the semi-structured interview

The feelings revealed by the four students regarding mistakes in the initial interview were presented to them in S3 (Figure 1). They were asked to choose one of the feelings in Figure 1, or point out any other, and then answer each one of the inference-prompting questions.

Figure 1 – Feelings about mistakes

JOY
SADNESS
ANGER
GUILT
RAGE
DISCOURAGEMENT
FEAR
NERVOUSNESS
SHAME
ENVY
I FEEL NOTHING
OTHERS

Source: Developed by the authors.

The prompting questions were important to help the individuals to organize their thoughts about themselves and mistakes. At the beginning of the interviews with students, we noticed that, most of the time, they had difficulty expressing with words and ideas their feelings regarding mistakes.

The questions were chosen based on an analysis of the interviews and the moments of intervention during the games. We observed that issues such as *what my colleagues think/say about me*, *what my teacher says/thinks about me*, and *what I think about myself* emerged in the actions and interactions of students whenever mistakes were present in group interaction, and, based on these data, we formulated the questions for them to answer.

Piaget (1994), when addressing the critical clinical method, considers that the way the researcher conceives a question is important, because it may suggest an idea, or else trigger it. The objective was to trigger the students' ideas, helping them, via the questions, to reflect and reason about their feelings and inferences regarding mistakes. It should be emphasized that after each question, students were asked to explain *why* they pointed out a given feeling. This resulted in the organization of the questions shown in Box 1.

Box 1 – Questions to Prompt Students' Feelings and Inferences

1. When the teacher says I made a mistake, I feel		Why?	
2. When my colleague says I made a mistake, I feel		Why?	
3. When I realize I made a mistake, I feel		Why?	
4. When I make a mistake in a test, I feel		Why?	
5. When I make a mistake in a school assignment, I feel		Why?	
6. When I make a mistake playing a game with my colleagues, I feel		Why?	
7. When I make a mistake in the remedial classroom, I feel		Why?	
8. When I make a mistake in the mainstream classroom, I feel		Why?	

Source: Developed by the authors.

left: closed answer, in which students choose one of the feelings presented by the researchers, based on students' answers in S1

right: open answer

Analysis Procedures

We carried out a qualitative analysis of students' meanings in various situations in which mistakes occurred. The analyzed results were organized based on the interview records, observations and videos. Due to the large amount of collected data, we will present in this work samples of verbal and non-verbal expressions of students that allow us to understand the items related to our research objectives, namely: a) meanings assigned to mistakes; b) meanings, feelings and interactions of students in situations in which mistakes occurred (for example: individually, with the teacher and classmates, and during various activi-

ties); c) reflections on possibilities of change in meanings assigned to mistakes.

Results and Analysis

Meanings Assigned to Mistakes

To know the meanings generated by the four selected students attending the remedial classroom at the time, we began our research by observing this space. During this period (one month) prior to choosing the subjects, despite being together in the same place, the students in the remedial classroom (15 students) did not establish relationships that enabled us to consider them effectively as part of a group, since they did not interact. In particular, the four students which were chosen later, when carrying out any proposed activity, did them alone or at most in pairs. When the educator proposed group activities, the four students showed attitudes of aversion and rejection towards their peers. We believe that one explanation for this behavior is the fact that they only recognized themselves as belonging to the group of colleagues from the mainstream classroom. In addition, group formation was hindered by the abovementioned high turnover in the classroom. Besides, we cannot disregard their difficulty in establishing interpersonal relationships. Even when forced to develop group activities, they would not even listen to their colleagues.

In situations involving mistakes, the behavior of antipathy among them was even greater. On these occasions, they called the colleague who had made the mistake dumb and ignorant, and/or regarded him/her with astonishment, unable to understand how he or she could have got such easy activities wrong.

Regarding the proposed activities, they would complain that they were very easy. However, when the teacher stepped up the difficulty, they would unanimously declare they were unable to do them, or that the activities were boring, or that they did not know how to do them.

It was evident that, in the face of any difficulty, they made no effort, immediately refusing to do the proposed activity. As stated by La Taille (2002; 2006), they lacked willpower. When they did an activity and made mistakes, their attitude was the same, that is, they did not attempt to redo it, but merely copied from someone who knew or pretended to work, waiting for the teacher to correct the exercise on the board. Furthermore, they commonly asked to go to the bathroom and, on the way out – taking advantage of the situation – sought help from colleagues in other classrooms. In short, the effort made by the four students in the activities proposed by the teacher was minimal.

Initially, most of them expressed negative moral meanings regarding mistakes. The four students linked mistakes to a disregard for rules, especially not obeying the teacher, besides not learning or not paying attention to explanations. For them, mistakes resulted from do-

ing something wrong to a colleague or teacher; scoring poorly in a test; directing insults at the teacher or a colleague; talking while the teacher was teaching; or lying about having done homework.

Macedo (1994, p. 65), reflecting on mistakes, believes that society "is marked by guilt, by sin, and by the need to atone for them". It is inferred, therefore, that mistakes are not – nor could they be – perceived by these students as an action that can be reviewed and overcome. The way they interacted in classroom situations generated negative meanings regarding mistakes, and, therefore, they did not follow up on their actions.

A mistake, while an undesirable mishap in an action, nevertheless becomes something positive if the subject owns it, understands it and overcomes it, since it is only when the subject takes action that his schemes can be modified, thus expanding his structure and understanding of reality.

Meanings, feelings and interactions of students in situations in which mistakes occurred with themselves and with colleagues during the games

Regarding feelings generated in situations of mistakes, in the initial interview (S1), the four students felt fear, discouragement, shame, envy, nervousness, rage, anger, sadness, joy and guilt. Macedo (2002) explains that many feelings can be generated by students due to the rigor and severity of society's general attitude towards mistakes. Actions with moral value may be present in a classroom situation, due to the demand for perfection. The perception of mistake is different for adults and children: adults see it as the opposite of a correct action; for children, on the other hand, it is the manifestation of an idea or attitude not necessarily perceived by adults as a mistake.

The students, for having mostly negative meanings and feelings about mistakes, expressed passive and disinterested attitudes. During the intervention periods (E2), they were faced with various situations that promote self-regulation while playing, since games favor an active stand by the subject. As stressed by Macedo (1994, p. 18): "[...] games provide the subject with the opportunity to fill possible gaps through awareness, which in turns enables him to form elements which are responsible for composing the cognitive structure". For the author, this is due to the fact that a new situation may provoke

> [...] a disturbance in the previous mental framework, revealing the inadequacy of the elements already acquired to solve the situation. The subject executes what Piaget called active regulation, by which the individual acquires awareness due to the choices he must make to solve the problem, make corrections and achieve the goal proposed by the game (Macedo, 1994, p. 18).

Regarding ideas about mistakes, when we showed students a snippet from the video in which they or their colleague made a mistake

in the game, we observed that they did not notice at first their move or mistake; their initial interest was to analyze themselves and their colleagues in terms of individual characteristics (beautiful, ugly, desirable or undesirable behavior).

It seemed to us that viewing themselves was no easy task for them, and much less an enjoyable one. It became, in fact, a moment of conflict between what the video showed and what they thought about themselves and their colleagues.

Questioned about their self-perception, they would all emphasize negative characteristics. For example:

> Alice: I seem to be very angry. I'm a bit of a drama queen, really. My colleagues say I shout a lot in class.
> Bia: I don't even know what to say. I don't know what to think about the way I am. I'm always messing things up. My colleague got angry because I made a mistake.
> Caê: That's not me there, miss. I don't know that guy. I'm doing yoga and that rowdy guy can't be me. It's not me. I'll need a DNA test on that guy. There's something wrong with his head. He pays no attention and just keeps messing about in his desk.
> Dan [after laughing a lot]: It's cool to see us, but it's not pleasant. It's embarrassing. I'm not so handsome.

We therefore observed that Alice and Bia, when referring to themselves, pointed out meanings that colleagues made about their conduct; Dan was embarrassed; and Caê refused to admit that it was him in the video. Despite their different origins, all meanings are negative.

Regarding their perceptions of colleagues in situations involving mistakes, Alice and Caê emphasized negative aspects through words, and Bia, through non-verbal expressions: Alice: "Caê is so silly. He talks too much. He never pays attention to anything. He just messes around and laughs at everything. The teacher is always mad at him;" Bia [Laughs softly, looks several times at the researcher, but says nothing. She points to the colleague in the video, mocking and making fun]. Caê began by decrying his colleague and finished by pointing out that he was smart and so should not be in the remedial room: "Paulo, he's ugly. Really ugly. He's a nerd, a swot, brainy. I don't know what he's doing in the remedial classroom. He should only be in the other classroom. That's where those who learn stay". Dan was the only one who emphasized aspects of the game: "He didn't notice he gave me the wrong piece. Good thing". (These narratives are analyzed below).

After the students had expressed their initial ideas, we began to question them about the mistakes and what they thought about their and their colleague's moves.

Regarding their own mistakes, we noticed that Alice, Bia and Dan analyzed their actions in game. For example, Alice watched the video and, at the end of the scene, commented: "I played badly. Wow, I didn't notice. I could've given him that circle, stupid me". Alice and Dan were able to realize what they did wrong. Dan: "I was stupid there. I have to look at the piece I choose. I also have to look at the opponent. I wasn't

angry on the outside, but inside I was. Or rather, [I was] sad, [because] I'm kind of dumb, I'm not good at school". Bia, in turn, insisted there was no other course of action possible besides the one she took: "No, for me there was no other way, I couldn't have done anything else. My head even hurts when I have to pick a piece, because I never know if it's the right one. I get really nervous. I'm just no good". Caê was unable to analyze his move, but attributed his mistake to the fact that he kept thinking about the colleague with whom he was playing. "Wow, I messed up because I was thinking of Alice. When I play with her, I get nervous. When I don't, I keep thinking of her. That's why I play badly".

For these students, the actions taken may not have been understood in that way that could lead to new actions. Understanding or becoming aware of a mistake requires the individual to realize the event that caused him to fail. In Caê's case, he realized the mistake was related to his lack of attention to the game, since his interest was focused on his *beloved*.

The affective aspect, related to self-perception, was highly stressed by the group. Alice, Bia and Dan, after presenting arguments about their action in the game, went back to talking about themselves, as they did when they first saw themselves on video. At that moment, they referred to themselves using adjectives like dumb, messed up, bad. Once again they showed negative self-perception related to making mistakes and learning.

When the subjects analyzed their colleague's mistakes, Alice was able to understand her opponent's mistake based on the analysis of her own action in the game. In other words, she did not put herself in the other's place to assess him.

> I was hoping he wouldn't notice I needed a square piece. I thought: If he gives me the square piece, I'll complete a row by shape. For me, he didn't make a mistake. For me, he made a correct move.

Bia, Dan and Caê did not analyze their colleague's move:

> Bia: I guess she was thinking of something else and gave me a good piece. She should receive a warning.
> Caê: I don't know why he made a mistake. He always gets it right.
> Dan: When my opponent makes a mistake, I'm happy.

When the game was interrupted for them to review their own and their colleague's mistakes, we noticed that Alice and Dan became aware and self-regulated as they started observing their moves in the game:

> Alice: I'm playing well. Actually, giving him the square piece was a mistake. That happened because I was thinking of my own game and so I messed up.
> Dan: I played well. I just didn't realize they were thinking of a row with circles. At that moment I was stupid. But I was paying attention to everything and I'm sure I was the best in the game.

When they realized their mistake, it ceased to be viewed as an inhibition to learning, and, as a side effect, they began to evaluate their

behavior in a positive way, to the point of not regarding the mistake as something that closed their possibilities for further action.

Bia, however, failed to become aware of her mistake. Instead, she pointed out the difficulty she had with the rules, which always imply mutual action, since, when choosing a piece to give to the opponent, one must think of one's own game and also theirs. Consequently, she assessed herself once again as a person who is not *good* at games: "The hardest thing in this game is to hand over a piece and think about your opponent's game. If the rule were different, I would have won".

Caê, always enthralled by one of the female participants, failed to analyze his mistake and said the game was boring: "This game isn't cool. I played the square piece and Alice made a 'quarto.' I didn't try to win because of her". Once again he denied his difficulties (as on other occasions) saying: "I'm good at the game, but I let her win".

They then moved on to activity of analyzing their colleagues' moves. Bia and Dan commented on the behavior of the other two subjects. Bia: "I think he plays well, but sometimes he jokes too much". Caê, moved by his feelings for Alice, first pointed out that Dan played very badly and that Bia was very ugly, but did not explain the reason behind their moves and stressed that Alice (his beloved) was the best in the game: "She's a smart girl. That's why I like her". Alice was unable to analyze her colleague's wrong behavior, for which she herself was responsible, since she gave him an inadequate piece: "He was only able to make the right row because I gave him a wrong piece".

Regarding the self-regulation strategy, when the game was to be played in pairs, they asked to form the groups spontaneously, which were composed of boys against girls. At that time, the team that was winning complained. However, Alice, on analyzing the opponents' game, seemed to have glimpsed a way out and tried to calm down her colleague by saying: *Wait. There's a way.* They held a conference between them and continued. Once again, Alice's self-regulation was decisive. Interested in beating her opponents, she started thinking about the possibilities in the game. And the colleagues who were losing said: Caê: "Oh, no. We don't want to exchange [without realizing that he could lose];" Dan: "Yes, let's exchange, they are winning. Let's think hard, or else we'll lose". In short, the pairs showed a clear effort to solve the problem presented in the game.

Reflection on the possibilities of change in meanings assigned to mistakes

When the game sessions in the remedial classroom were over, the subjects were put in charge of teaching one of the games to their colleagues in the mainstream classroom. We noted that at that moment (S2 – action 5 – "teach a game to colleagues in mainstream education"), their attitude changed. Now they assumed the role of instructors, which included being welcomed by the group and making recommendations about the behavior their colleagues should have in order to *learn*. For

example: "You cannot fool around, or you won't learn;" "Don't worry, there's no need to be afraid;" "You must pay attention and practice, then you won't lose;" "If you need [help], just ask".

Students in the mainstream course, in turn, expressed negative perceptions concerning their colleagues, showing some hostility and being ironic about the fact that they were teaching something: "Here come those dunces to teach us;" "Alice seems rather nervous, poor thing;" "Caê is so rowdy. Now he's telling us to be quiet. He never pays attention;" "Just wait and see them make a mess out of it". These statements reveal mixed feelings: doubt and contempt, for not believing that their colleagues could teach them something; empathy, for realizing they were nervous; and negative expectations and the desire to see them make mistakes. Such was the tension that the teacher had to intervene, asking them to respect their colleagues and informing them that they did not need to play, since the activity was not mandatory. As the students started listening to the four subjects and taking an interest in the game, those who were hostile started paying attention and joining groups to play. As a result, the subjects were seen as people who knew something to teach them. Students from the mainstream course had such a change of attitude that they even expressed interest in joining the remedial classroom. One of the students said he would like to be part of said classroom and another wished to join the group of students who taught the game. A third suggested holding a tournament involving all students in the school.

After the four subjects had taught the game to their colleagues of the mainstream classroom, we administered the questionnaire with the triggering questions (S3).

In the students' statements, mistakes were defined as: "Something a colleague noticed and we did not;" "But I thought what I did was right... then I do it again and get it right;" "My colleague couldn't understand that was the wrong way... he thought it was right and made a mistake;" "When I saw the video, I saw that was the wrong way ... for me it was right ... so a mistake is also right".

We further noticed that as the students start observing situations in which they or their colleagues made mistakes, they move from a level of non-awareness of mistakes to one of awareness. Awareness implies subjects understanding their actions. In this regard, Macedo (1994, p. 135) points out that a mistake can only be analyzed "when it becomes an observable fact to whoever produced it, which involves an understanding resulting from the subject's interpretation of his own action, as well as of the object receiving that action". For the author, becoming aware of action means transforming doing into understanding, two mutually solidary processes. The author also asserts that: "Solidarity between doing and understanding causes two types of mistakes: systematic and functional, the former occurring at a structural level and the latter occurring in the perspective of doing" (Macedo, 1994, p. 77).

Using the Piagetian clinical method as a parameter, we highlight the reactions of the children to the questions we posed. When confront-

ed with an uninteresting situation for them, they formulated justifications without thinking about what they were answering, what Piaget (cited by Delval, 2002, p. 137) calls "non-caring type answers". Regarding situations that aroused their curiosity, they would answer, after much reflection, showing how much they were involved in the activity. In Caê's case, for example, non-caring answers were predominant. So much so that when asked about mistakes pointed out by his colleague or perceived by himself, he claimed not to feel anything. We also observed in his justifications constant references to the teacher due to feelings that he experienced, such as guilt, shame and fear.

Regarding his colleagues, he reported having felt guilty only during game situations. Caê was older (14) than the average of the other students and had failed three years in a row. In the year in which the research was carried out his grades fell consistently over the school year, and within the group he had the most relationship difficulties. Initially, he perceived himself as being *stupid*, besides becoming visibly embarrassed when seeing himself on video, to the point of refusing to look at it. On these occasions, he would say that he was not that boy in the video. We also verified that he had amorous feelings for one of the participants, to the point of commanding all of his attention. When in potential situations of self-regulation, he was unable to reflect on his actions and stated that when he made a mistake, it was to allow his beloved to win. However, when he took part in the experience of teaching the game, we found that he perceived himself differently, as a capable person. This was so evident that a colleague mentioned: "Caê is cool when he's serious".

In general, Alice expressed feelings of guilt, shame and happiness when she realized she had made a mistake or when the mistake occurred in the remedial classroom, as she seemed to maintain a good relationship with the educator in that environment. She claimed she felt ashamed when the teacher in the mainstream course pointed out her mistakes, and felt nervous about making mistakes in tests. She also reported feeling guilty when making a mistake in the game. However, when the mainstream course teacher was not present, she claimed not feeling anything. Initially, this teenager perceived herself as an angry, histrionic and stupid person. However, despite being nervous when teaching the game to her colleagues, after the experience she claimed she felt good, as if she were the actual teacher.

Regarding the teacher and all activities involving the mainstream course, Bia said she felt guilty, angry and nervous. She did not express anything about the educator in the remedial classroom. As to her colleagues, felt guilty when she made a mistake and discouraged when the mistake occurred in other activities. Concerning her self-perception, she felt initially embarrassed at watching herself in the video. Then she claimed that it was someone else messing up the whole time. When teaching the game to the mainstream classroom, what she valued above all were the positive reactions of her teacher. Furthermore, she realized she made mistakes due to lack of attention, and therefore needed to im-

prove in this respect. Among the group of students she showed a friendly, interested and motivated attitude.

Dan, who had been attending the remedial classroom for 18 months, did not improve his grades. He was older than average in his classroom. This student perceived himself as someone devoid of intelligence. The initial data indicated that he felt guilty when making a mistake in the teacher's presence; and felt angry when his colleague or he realized the mistake. When teaching the game to the students in the mainstream classroom, he felt confident. He even compared himself to a colleague that he considered intelligent: "João is so smart, and can you believe he asked me several questions? I was amazed and answered".

To sum up, we observed that the strategies employed to get help them establish self-regulation processes provided moments to review meanings assigned to mistakes, cognitive actions, feelings, self-perception, and perception of their colleagues and the teaching-learning process.

Conclusion

It should be emphasized that the hypothesis of this investigation was to create spaces of interaction where students could feel affectively welcomed and repositioned as subjects of learning, and, in such a setting, be able to act based on reflection of their mistakes. We used the Piagetian clinical method in the context of situations of disturbance, self-regulation and affectivity, to identify the meanings and feelings present in the students' school life.

We start our conclusions with a crucial question that prompted our research: What did the meanings regarding feelings about mistakes in the remedial classroom reveal?

They revealed several aspects, among which we emphasize the intellectual and affective interdependence present in the meanings of students in the remedial classroom. As students became aware of their or their colleagues' actions, they would justify them by ranking them as right or wrong. However, their thought processes followed ideas not only driven by cognition, but also by affectivity, for when talking about how much they find themselves involved in situations of mistakes, they were referring to affection. In other words, the meanings they assigned to mistakes comprised not only cognition, but also affectivity. For this reason, Piaget's studies on the subject are important, as they help us understand that these two dimensions are indissociable.

Another important point relates to how these students perceive themselves in face of mistakes, as it helps us to advance important reflections on education. In this research, we were able to verify the presence of the normative meaning of mistake and the weight of contingency in the students' meanings, deriving from the way the interactions were established in that context (initially guided by coercion, passivity, discouragement and antipathies between the group of students and

the teacher). On the other hand, the situations of reflection on mistakes helped students advance in their systems of meaning about themselves, about how they view themselves regarding the possibilities of action during games, their relationship with their peers, their relations regarding authority and about what it means to learn.

In this sense, it was possible to conclude that the feelings derived from interactions played a very important role in the meanings assigned to mistakes, and the possibility of new meanings arose from the way in which these interactions were established.

In the case of student-student relations, following the reflection activities in the remedial classroom and with the colleagues from the mainstream course, there was enhanced interest and motivation among them regarding mistakes and the learning process. Interactions also became characterized by friendliness, cooperation and self-regulation. The driving force of new meanings occurred especially when students began to express sympathy towards each other and a sense of belonging to the group.

In teacher-student relationships (teachers from both the mainstream and remedial classrooms), on the other hand, coercion and hetero-regulation prevailed, as well as mostly negative feelings and meanings such as fear, guilt, shame, anger, discouragement and sadness.

We also verified that teachers at the school felt insecure about how to develop self-regulatory processes regarding the meanings students build about the object of knowledge. We noted at the beginning of our research (the observation period in the remedial classroom) that what should be self-regulation by students turned into hetero-regulation by the teacher or even colleagues. This is due to the fact that the issue of mistakes in school is so negatively powerful that students don't genuinely interact with knowledge, for there is always an intervention to prevent it, inasmuch as students always try to reach the conclusions favored by teachers. An assessment, for example, could be seen as a possibility for students' self-regulation. But what happens, and what we observed, is that the process is marked by the meanings assigned to grades, by the negative representation of the remedial classroom and of action viewed as either right or wrong.

Thus, what happens in school is contrary to the principles present in Piaget's ideas concerning the construction of knowledge, since, for this author, everything that ceases to be a construction of the student to become a construction of the other prevents the creation of new self-structuring cognitive coordinates that would effectively result in learning, development and new meanings.

We verified in this study, by means of the games, to what extent investing in self-regulation can transform systems of meaning related to mistakes. Games are a rich resource for learning, development and new meanings, as they provide situations where mistakes can become observable facts and the *Ego* can acquire new meanings via the pleasure of feelings present in the experience of self-regulation (characteristic of ludic situations by prompting the subject to constantly act). This is

due to the fact that games are *non-didactic* compared to school actions. Therefore, at school it becomes a challenge to motivate students to take a stand and make commitments as in games.

This research also allows us to consider that the remedial education proposals currently developed in schools do not take into account the affective aspects present in the context. For this reason, conceiving such a proposal in school requires reflecting on the meaning given to this place and what it represents for students with learning disabilities, their peers and teachers.

Meanings assigned to mistake also help us reflect on how many children and adolescents are left out - *excluded* - and that the school has not given them opportunities of meaningful learning. Therefore, these students find themselves devalued for not learning. The research's findings also allowed us to believe that it is possible, from a pedagogical point of view, to change that reality, for we verified that systems of meaning are modified, resulting in different meanings and feelings. It is possible to achieve the reconstruction of schemes and the construction of novelties with these students.

Among the many studies involving individuals with learning difficulties, our proposal attempted to contribute with results focused on education, defending the idea that it is possible to change the meanings of students, many of whom are discouraged by their condition at school. To this end, it is necessary to invest in interventions that integrate affective and cognitive aspects in an interactive way and enable actions that foster the intellectual autonomy of individuals and their place as subjects of learning at school.

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Notes

1 This article does not aim to establish differences between affections, feelings and emotions.

2 This article does not analyze in depth the issue of consciousness and acquiring consciousness, but focuses on meaning.

3 In some situations, for not carrying out individual interviews, we adapted the method. This occurred in situations of conversation in pairs or groups.

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