

A SURVEY ABOUT EXPERIMENTS ON NOTIONS OF TIME IN CHILDREN K-1 AND K-2

Vânia Silva, MA Student.

Department of Educational Sciences of the University of Azores, Portugal

João Cabral, PhD

Department of Mathematics of the University of Azores, Portugal

Abstract

In this paper we explore the importance of analyzing the exercises that the manuals have in Mathematics study, because the difficulty of identifying some errors on them can interfere with the capabilities of children. We work with some exercises related to the theme of temporal notions, based on a survey of textbooks from the 1st and 2nd grade (K-1 and K-2). Our concern is to alert about the importance of reflecting on the content of the books, in order to promote a teaching-learning process tailored to the needs of children. The activities present in the manuals should allow children to develop their logical- mathematical reasoning, for later be able to understand and apply mathematics. To this end, we present some reflection about the exercises of manuals, and we give our opinion about what is the correct and incorrect. Also, some activities are suggested, among which were implemented with children of the 2nd grade, K- 2, along the experiments that support our work.

Keywords: Reflection; children; logical- mathematical reasoning and temporal notions

Introduction

The study in question focuses on the analysis and reflection of present exercises in textbooks of the 1st cycle of basic education. It has been proposed as part of the course Fundamentals and Applications of Elementary Mathematics, belonging to the master's Pre-School Education and Training of the 1st Cycle of Basic Education of the University of the Azores, Portugal, orientated by João Cabral, PhD. The importance of this study takes place in the context of learning to be critical, to doubt that not everything that is exposed in textbooks is quite correct, because some failures can emerge in

edition process due to the author's interpretation of a certain topic or printing process.

Our experiments, about the temporal notions, targeted the K-1 and K-2 level, based in manuals used on the years from 1995 to 1996 in Portuguese schools. Our goal was to explore the concept of time, evaluating the temporal notion that children can have. So, with the presentation of various exercises, we analyze some textbooks.

The temporal notion is difficult to define because it is related to something abstract where the child cannot manipulate, observe and verify. "The time is not perceptible as such, unlike the space or the speed, since it is not perceptible by the senses. Only takes perception of the consequences of its action, its speed and its results." (Piaget, 1963, cited by Sousa, 2012). For example, a child who in the course of a race know who was in 1st or 2nd initially did not have the notion that the first took less time than the others, only you realize that was the first to arrive.

Also for adults the time accuracy it is not always easy, if it was not the aid of the clock hardly humans know how many seconds, minutes or hours passed. Note that when love is an activity looks like the "Time Flies" and when you do not like it seems that time "Takes Forever". Now, the same happens to children, the only difference is that they do not already have responsibilities and so do not care about the passing hours. Hence it is important to explore the temporal notions with children, so that in the near future they learn to value time. They must realize that time does not stop, or go back in order to get the most out of life and know how to live.

Notes about notions of time

In figure 1 and figure 2, are presented some exercises associated to temporal notions that we can find usually on textbooks of K-1 and K-2 levels.



Figure 1: page 87 of K-1 (Monteiro,1995)

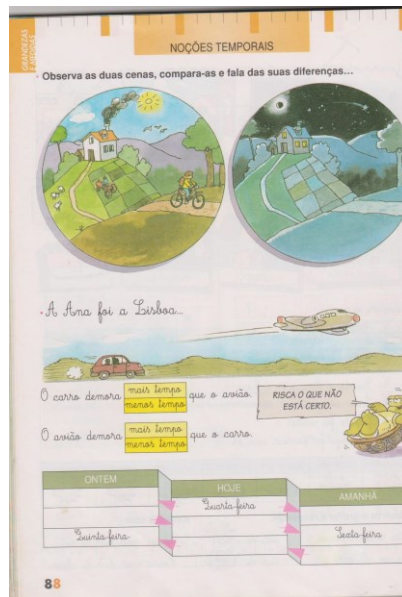


Figure 2: page 88 of K-1 book (Monteiro,1995)

From the five exercises presented in Figure 1 and Figure 2, in our view, two of them are well achieved: the first of page 88, asking to see a picture of the day and one of the night and compare, and the exercise of "Ana went to Lisbon." In the first, it is important that children realize that in the morning until dusk there is a timeline. In the second exercise, the child must realize that the use of transportations can decrease or increase travel time.

The remaining exercises, in our view, have some mistakes that can induce the child in error. In the first exercise, we start by criticizing the order of the days of the week, Figure 1. If in fact the first day of the week is Sunday, the exercise should start on Sunday. The child must associate second to second day because the truth is that this is the first exercise associated to time and it is intended that the child realizes how many and what day of the week. After at least until Wednesday, the tasks that are presented are tasks that occur every day. We think it would be more interesting if each student at the end of the class write about the events that they liked on that day. Starting to apply and explain to the day of Sunday - "What else do you liked to do yesterday?" - And end what they liked to do on Saturday.

The following exercise, on the same page, can also confuse the child, because imagine that, for example, during the week it rained every day. The child believes in what they see and the exercise would not make sense. One solution would be to explain that that year was a weather forecast for next

week - interdisciplinary talking about the weather - and later in the week indicated review and correct exercise.

The last exercise was well done, if the day "today" had not represented in order to student complete the correct day.

Overall, since this is the first time that the temporal notion is presented, we find that the exercises are not well achieved on quality, quantity and if there were any children with special educational needs would be difficult for them to solve the problem. The child begins to learn through body movement, handling objects and only later through the written representation and abstract. Therefore, none of these exercises is interconnected with practice and much less with the five basic senses to the learning process.

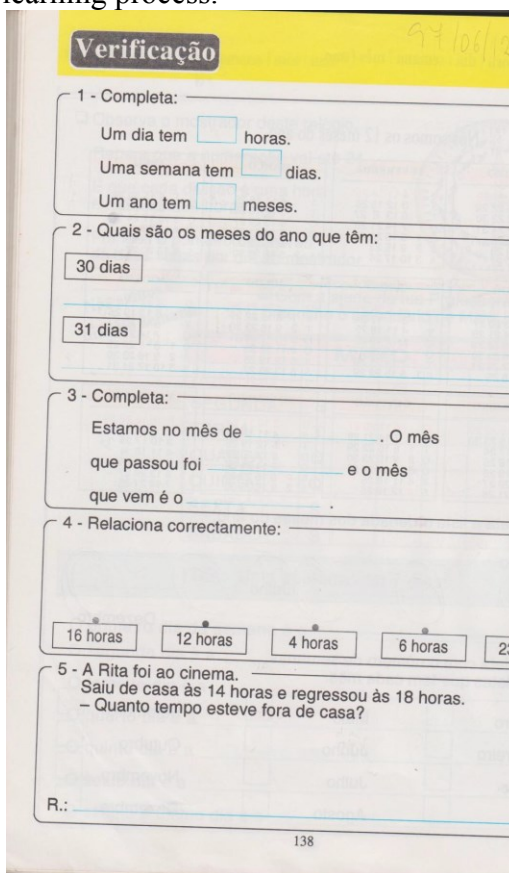


Figure 3: page 138 of K-2 (Freitas, 1996)

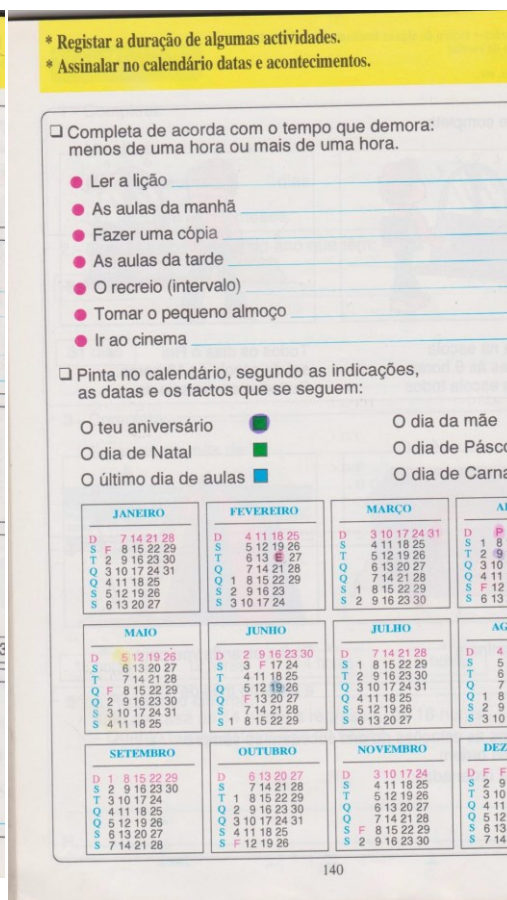


Figure 4: page 140 of K-2 (Freitas, 1996)

In the 2nd year, K-2, we observe an increase of exercises in order to relate the hours, days, weeks and months. In our view, the activities are accessible, at least on the manuals that we checked, very similar to (Freitas,

1996), but nevertheless, they are all mixed. The teacher should respect an order of learning teaching the child in very well organized step by step activities. For example, first the clock should have been presented and then the activities related thereto; then the days of the week and so consequently.

The first exercise of page 140, figure 4, in our view, is not well explored. Each child may interpret the exercise in a different way and in addition each has its rhythm. "Read the lesson"; "Make a copy" and "Take breakfast" are activities whose time have various duration from child to child. "The morning classes" and "Afternoon classes" will certainly be the points whose answer is unique (over an hour). This criticism arises because as we all remember, the exercises are done and corrected at once, and usually teachers only accept one answer. As for the other points, "Recess" and "Go to the movies," are poorly formulated, because if we consider the time-break in their entirety certainly goes beyond an hour and a trip to the movies as a child may consider the total time or just the time the film occurs.

Activity implementation

To better understand the child's perspective, various activities was been implemented with two children of level K-2. First, we applied the verification form that we can see in figure 3 (summary of all the matter present in manual) to try understand what the child knows or does not know. In our opinion, the children will have difficulty answering the questions of form, because we think the exercises are associated with memory and not the reasoning and understanding. Then an exercise of the same manual will be implemented (1st exercise on page 140, see figure 4) which we think is not well managed. It is intended, therefore, to understand whether children's responses are consistent and if the exercise is explicit. Finally, it will be implemented some activities that, in our opinion, are accessible to all children, especially for children with special educational needs. These activities are not associated with time, whereas in K-2 only is worked the notion of "hour" and not the minute, but we think at this stage tasks using minute and second are already accessible to children (should be explored on the order second, minute, hour and not backward). The practical activities are not limited to the use of pen and paper, but the exploitation of one's body and dramatic expression. With these activities, described below, it is intended that the child has the perception of the length of certain tasks and develop his mathematical logical reasoning.

So, using the structure proposed by (Sousa, 2012) we propose the following practical activities to work the notion of time:

- 1- Ask students to imitate: the walk of a baby, a young and an old person;
- 2- Imitate an ice cream melting in the sun and then melting on the shade;
- 3- To imitate a stone falling and then a feather;

- 4- Replicate the water coming out of a faucet and then the water to evaporate;
- 5- Ask a child (without having with no clock) to leave the room and, after 1 minute, re-enter. Those in the room register time to check if the time elapsed are larger or smaller than anticipated;
- 6- Request to build paper airplanes or teach how to build and ask to throw us into the air, all at once, to see what is what remains in the air longer.

Implementation results

The implementation was held on 02/02/2015 with 2 children and these are presented throughout the work as a child A (6 years old) and the child B (7 years), both girls, and attending the 2nd year of primary education, but revealed that not worked the theme of hours. In figure 5, figure 6, figure 7 and figure 8, we present the resolution of the exercises taken from the manual. The practical activities, proposed in the previous section, were observed and filmed for a better reflection.

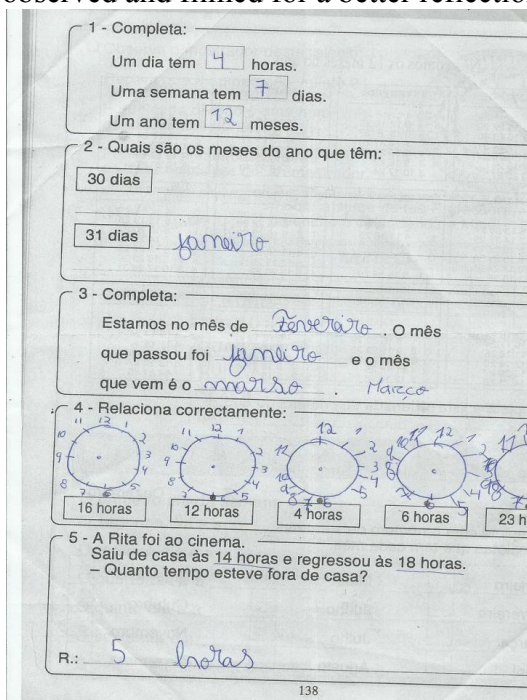


Figure 5: Resolution page 138 – Child A

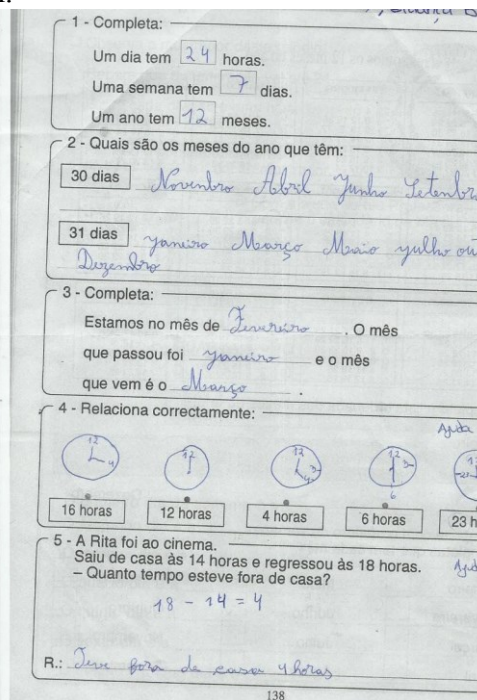


Figure 6: Resolution page 138 – Child B

* Registrar a duração de algumas actividades.
* Assinalar no calendário datas e acontecimentos.

Completa de acordo com o tempo que demora: menos de uma hora ou mais de uma hora.

- Ler a lição *menos de uma hora*
- As aulas da manhã *menos de uma hora*
- Fazer uma cópia *menos de uma hora*
- As aulas da tarde *mais de uma hora*
- O recreio (intervalo) *menos de uma hora*
- Tomar o pequeno almoço *menos de uma hora*
- Ir ao cinema *mais de uma hora*

Figure 7: Resolution page 140 – Child A

* Registrar a duração de algumas actividades.
* Assinalar no calendário datas e acontecimentos.

Completa de acordo com o tempo que demora: menos de uma hora ou mais de uma hora.

- Ler a lição *mais de uma hora*
- As aulas da manhã *mais de uma hora*
- Fazer uma cópia *menos de uma hora*
- As aulas da tarde *mais de uma hora*
- O recreio (intervalo) *mais de uma hora*
- Tomar o pequeno almoço *mais de uma hora*
- Ir ao cinema *mais de uma hora*

Figure 8: Resolution page 140 – Child B

In the check form, figure 5 or figure 6, with 5 exercises, according to our interpretation both children have not mastered the hours. In addition, exercises that are correct are most associated with memory than to the application of logical-mathematical reasoning. The maturity of the older child, child B, stands out along the work, it responds correctly to the first 3 exercises. The child A, do not have the notion of time and replies that the day has 4 hours. However, we believe that answers to four hours because the "resort to memory" should remember that you've heard anything that ends in 4 (24 hours). In the 2nd exercise, this child only identifies the month of January, certainly because it was the month that just passed and still remembers. Both children respond correctly the exercise 3.

In the following exercise, the child A said she did not know how to draw the clock, so voluntarily we drew the first two, and after the drawing was asked if she knew represent the required hours, but she did not. The other child managed to draw the clock format, but did not know how to represent the hours. Because we were busy with the child A, child B called for help and the teacher did not hesitate to go help and give answers to it. Because we were near, we realize that the child did not know how to place the hours.

In the last exercise, both children had immense difficulties. Without counting the child A, automatically answered that they were 5 hours (wrong answer). The child B, once again, got help from the teacher who was still at his side and said "then you do not know which is $18 - 14$?". We did not want to ask to the teacher to leave or wanted to pry, but we tried to be attentive to the child's reaction and noticed she stared at the exercise without realizing it because of that account and no realize the final result.

Therefore, it was found that both children are unaware of the clock and the representation of hours. In addition, the last 2 exercises should not arise in page 138, because the clock is only explained in detail in next year's primary and these are not the appropriate exercises to work the time. So the manual of the K-2 level explores something that only is explored in K-3

level in Portugal, giving some wrong directions to the teacher that only follows the manual blindly.

Next we talk about the exercise that we considered wrong, figure 8 or figure 9. On this was asked the children to identify the tasks that lasted about an hour. As we expected, the responses were not consistent and these differ in the following paragraphs:

"Read the lesson"; "The morning classes"; "Recess" (the child B associated time the total recreational time, as said "When I go out to the three I'm still in school!");

"Making breakfast" (child B said it took a long time to eat). That is, there are activities that allow the child to distinguish over 1 hour, example, when your child says it takes a long time to eat does not mean that exceed 1 hour.

However, three of the points were marked with the same answer: "Make a copy"; "The afternoon classes" and "Go to the movies." A child who does not yet realize the temporal notion has difficulty identifying the duration of one hour. By asking to differentiate more or less time than an hour, the child only associated with the activity that takes more or less time. So, we, therefore, consider that this activity is dispensable. The child does not learn anything new and exposes only on paper their ideas because exercise does not create any rational problem. Even after correcting the exercise, for example the teacher says: "Note that breakfast lasts always less than a hour." we believed that the child got confused as it is something abstract.

Finally, a number of practical activities, which we believe allows the development of logical-mathematical reasoning, were presented. They allow the child to explore the space around her and have free body movements. The video was used as observation instrument, allowing a better reflection of what happened.

The first activity was merely exploratory and enabled children be themselves for a while, but on the following activities has always asked something about the exercise.

The children joined very well to exercise and they were educational. We realized that we should have had more attention in the formulation of questions and they should already be outlined as the way the question is raised is very important and can induce the child in error. After the observation of the video, we noticed that we kept too focused approach in diagnostic evaluation. One of our goals was to understand what the children knew or not, and tried not to provide answers, not to influence the results. However, if you opt for an interactive assessment, exploration of practical activities, we believe we would have achieved better results.

We consider that practical activities allow teaching-learning process and will take advantage of these in the near future: the kids loved; allow develop reasoning; explore the dramatic and body language and are accessible to all children (can easily be adapted to children with special educational needs).

In order to improve the practical activities: removed the point that asked to mimic the water to evaporate; add more activities appropriate to the level of education concerned and would be more careful in formulating the questions, trying that were already planned.

Conclusion

According to (Sousa, 1996), "The teacher does not teach; motivates, encourages and stimulates the student to self-discover, to search, to experiment, to invent and create. ". It is therefore important to bring the child's reality and present exercises that have some relation with their day-to-day. Know how to identify what is the time pointed by the pointer is important, but children have a lifetime to be able to tell what time it is. In primary education, it implement activities that somehow "unlock" the reasoning of the child, so that later help in learning and understanding mathematics.

More than decorate, the child must learn to reason. For example, in the future should have the concept of the day of the week for reasoning and not by walking constantly consult a calendar. It is important to live and learn to respect the time because this is always present in life and is untouchable.

In our opinion, on the books that supports the 1st cycle of basic education: the exercises do not differ much from each other; do not allow the child to explore, search and create. They are not dynamic and are not accessible to all children. We can found on them boring and repetitive exercises that do not allow a gradual evolution, or the development of logical-mathematical reasoning.

We are human and so we all falter, therefore, teachers should have a large capacity and at ease to criticize and revise the exercises presented to them. If focus is only on what's on paper surely that much of the information is missing in the teaching and student learning process.

In short, those who work day to day with children learn to identify the best method and rate to be used for these, hence it is necessary that the teachers themselves create and adapt exercises to their needs and difficulties.

Acknowledgement

The authors are grateful to the referee for a careful checking of the details and for helpful comments that improved this paper.

References:

Freitas, M., and Letra, C. *A Matemática do Pequeno Mestre*. Gaia: Gailivro, 1996.

Monteiro, A., and Rocha, C. *Fio-de-prumo 1 – Matemática*. Porto: Livraria Arnado, 1995.

Neves, C., and Costa, R. *Descobrir... Os Números 3 – Matemática*. Porto: Porto Editora, 1997.

Sousa, A. *Atividades para o desenvolvimento do raciocínio lógico-matemático*. Coimbra: Almedina, 2012.