Colouring with Children: the case of "Happy lanes- Cirkáló"

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ABSTRACT

This paper proposes a workshop for the process introducing 'Happy Lanes' colouring method; a colouring method for design educators for children. It focuses colouring perception in two approaches: from the neuropsychological and neurobiological. While we point on the benefits of the method with help of some special worksheets we analyse the process of solution, step by step, looking at the working of the colouring lanes, as the essence of the method. It stems from Berlyne's motivation theory relating to the active inference theory, especially predictive coding and free energy principle. Through this method as a map, children can map their way between each and every level of the hierarchical brain system and cortical microcircuits. The colouring process includes two ways in parallel with each other in a top-down system; by creative, independent problem solving. According to the motivation theory the goal of this process is the optimal arousal level, which depend on the stimuli of the environment; in this case, children colour the task with the aid of the colouring lanes. This they do without any help from someone.

KEYWORDS: Colouring, Happy Lanes- Cirkaló, cognitive, worksheets.

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Introduction

There is casual structure of brain in our world that the brain distils and embodies in its inferential machinery. Modern versions of Helmholtz's ideas are now among the most popular explanations for message passing in the brain-generally cast in terms of the Bayesian brain hypothesis or predictive coding. These are not abstract or hand waving schemes; the anatomical and physiological evidences available points towards predictive coding as the organizing principle for cortical microcircuits and hierarchical brain system (Bastos, 2012), productive coding in sensory system, and for a related treatment of motor system (Adams, 2012). In these schemes, neuronal representations in higher levels of sensory cortical hierarchies entail hypotheses that provide predictions for lower levels. These top-down predictions are compared with representations at the lower level to form a prediction error (usually associated with the activity of superficial pyramidal cells). This prediction error is then passed back up the hierarchy, to change higher representations (usually associated with the activity of deep pyramidal cells). These changes provide better predictions and thereby reduce prediction error at each and every level of the hierarchy." (Friston, 2013). In other words the process of solution takes place in a dynamic and complex system where memories remain under constant monitoring in order to ensure the right decisions.

In art, especially colouring where children follow various lines, blocks and predictive ideas, the issue of productive coding are followed, resulting in independent decision taken on the basis of the imagination and creative thinking, especially of children. These in turn produce images and stories depending on which method is more easily and accurately applied. This is a very sensitive procedure, which arises as a result of the co-existence of numerous constituents and is carried out automatically but there is the need to analyse more component of the theory that explains how children get the immensely calm, balanced and tranquil psychological state during the solution of the task. This article reports on methods on the "Happy lanes" Cirkáló – a colouring method, that helps children to use their visual sense in colouring as way of measuring their predictive coding. References will be made to the key methodological points of the method in education and development work, with emphasis on

analysing the internal structure of the method. In this this article, we also seek to reveal modern interdisciplinary relationships to provide evidence of the modern approaches of the application and its efficiency. We report on samples of projects undertaken with some worksheets, assisted by the analysis of the work and references to the experiences gathered during the application of the method.

Literature Study

Cognitive development, or growth, is the result of a chain of events triggered by the loosening of the cognitive balance, when discrepancies between incoming stimuli and the information stored in the central nervous system emerge. The conflict ensuing between these two sources motivates curiosity and explorative behaviour patterns; the latter providing the individual with the information that helps attenuate the conflict. The attenuation of the conflict consequently reinforces curiosity, thus guaranteeing that attention will be paid to novel stimuli in the future. It is in relation to this set of stored information that individuals develop their physiological arousal or stimulatory levels, and the new informational input triggers exploratory or avoidance behaviour, depending on whether they increase or decrease the arousal. The goal of the individual is to reach the optimal arousal level all the time, since neither low-stimulus environments nor over-stimulated ones are pleasant. According to the hypothesis formulated by Berlyne, experience of arousal as pleasant or unpleasant is determined by inputs from reward and aversion centres in the brain, which provide a neuropsychological basis for the two different types of curiosity: diversive and specific curiosity.

Basically we observe the process of perception in two approaches: according to neuropsychological and neurobiological approaches. Berlyne's (1960) theory indicate that we always want to find the optimal arousal level: by increasing the novelty, complexity and variety of the stimuli in a person's environment, or by supply information that will reduce the individual's subjective uncertainty and discomfort.

The active inference explains this process based on predictions/ and with couple of the perception and the action. We change our prediction to explain the sensory input through the perception; alternatively we change the sensory input to fulfill our prediction. This is a conflict between the action and the perception.

Thus, when we look at the diversive curiosity about the low stimuli level of the environment then we actually change the input to fulfill our prediction. Why? Because we must create prediction from the "empty" environment to increasing the level of the arousal but we must change the input to fulfill it! Alternatively, when we look at the specific curiosity about the high stimuli level of the environment then we actually change our prediction, that we can explain the input. The reason being that there is so much stimuli and one must create modified prediction to reduce the arousal level that can find and explain the input.

In the following section we present activities of worksheets in a certain sequence. This does not necessarily mean a methodological sequence that has to be followed during the development work. The method may be applied with several aims and according to several methodologies. Later, after this, we analyse some solved worksheets with special, typical mistakes to draw conclusions and to understand more of the colouring process, by step by step "in mirror" of the theory

Methodology

The principle never changes, except the theme of the pictures, the details, as well as the shape, complexity and difficulty of certain details of the pictures. Also their correlation with the colouring lanes, include infinite variation possibilities. It thus renders it possible to create varied worksheets and to also arrange them according to the level of difficulty of the worksheets. The colouring lane operates in a rather complex manner within the system, being able to transform, to generate new worksheets in different ways, without theoretically losing its basic feature. One should not forget, however, that the drawing should also be annexed to it, because the structure of the task can only be determined based on two elements together, on their relationship with each other. So, at first, the colouring lanes generate the task. The

basic principle for arranging the pictures is according to the level of their difficulty. Thus, apart from generating the task itself, colouring lanes is the necessary prerequisite for us to be able to create more and more complex, difficult tasks.

In this study, we report on two groups of worksheets engaged in the process by groups of children. These groups were created on the basis of the development of the way children think. The most basic method is when small children assign information they consider to be related into small groups (figure 1.) When they are faced with new information, they analyse whether it can be assigned into one of the known groups or whether a new group should be created. They create sequences of inter-related information, separate exceptions out of which they create a new group. They arrange pieces of information into an order, highlighting differences – smaller, larger, more, less, etc.

The first group of work sheets presents an opportunity for this kind of reasoning.

Figure 1. The easiest worksheet for the early childhood

The drawings are easy to comprehend, lightly differentiated, and the drawing details include identical, similar and different-, according to their colours - shapes and sizes. Their inter-relations are characteristic; the repetition of the shapes in sequences may be detected. The other group of work sheets (figure 2.) on the other hand offer tasks that help the thinking skills in terms of comprehension of pictures by the help of more complex picture building; the rising number of drawing elements, and the increasingly complex relation of the colouring lanes to these elements.

Figure 2.: Relatively complex worksheet

Of course, these systems no longer facilitate simple sequence creation, although it is interesting to see how the two operate parallel and how they shift from one another depending on which solution is the most practical for children. The shift may often be detected also within a single worksheet. Therefore it is not easy to draw a line between the two large types of work sheets. Instead, we seek to provide children the opportunity to freely make use of both.

We follow with other series, indicating problems of space appearing, as the problems of shape – background, foreground – background. Colouring lanes shift from one shape to another, breaking the parallel character of vertical lines, and they pose quite a task, because behind the colourful spots swirling on the surface, following the system of drawing shapes is a more difficult task for children. Basically, this series of work sheets prompts the question: how does our vision work, which shapes do we see as more dominate than others. On the basis of the example of Rudolph Arnheim, whereby the question arises: do we see a white circle on a black square, or a black square on a white background, which has a white round shape hole in the middle, according to the phenomena of the ambiguous perception or binocular rivalry. We could assume that the colourful shapes, as the system of colouring lanes is more dominant because it attracts our attention more, but this does not happen in every case.

There were worksheets where drawings are more clearly distinguishable, and colouring lanes only feature as reflections of the colours. But we can also find examples where we can hardly

notice the drawings in the background, because the system of colouring lanes almost completely dominates the pictures. There is a series based on a similar principle, meaning the opposite drawing direction of drawings and colouring lanes, but in a special and specific context. The horizontal parallels of the colouring lanes and the crooked spots of waves squeeze against one another, serving to purpose fully develop children's ability to recognise the essence of pictures, as well as their spatial vision and ability to concentrate. The waves can also be seen in the background of the small boat, thereby also posing the problem of foreground – background, shape – background.

This appears in a different shape on the worksheet depicting a balloon where the crooked green spots of hills tower above each other and the horizontal – parallel spots of colouring lanes create the real task. In the case of these tasks, of course, there are more drawing details and more attention must be paid to ensure that the final solution is indeed the complete picture.

The next big step is the symmetry – mirror image series. The solution principle is naturally the same as always, but the tasks help in understanding, practicing and mastering the knowledge of symmetry – mirror image. During the series of tasks, we can eventually find ourselves facing greater challenges, both has a result of the detail in the drawings and the more complicated appearance of colouring lanes. In this case, greater concentration ability, monotony endurance and sharper memory will be required from children.

Following the various approaches of spatial problems, we have arrived at the spatial imagery and understanding of geometrical shapes, with the help of dividing the squares into a number of smaller squares; then to the work sheets with two- or more solutions, where the solution of the same worksheet could be several different pictures. To understand the real essence of the method, first of all we must analyse one or two "incorrectly" completed worksheets in more detail. These errors have a moral for us, because they help give some glimpse into the unique thinking of children and cast a light on the way in which this method provides an opportunity for us to do so.

A 4-5 year old girl coloured this worksheet (figure 3.) in two ways and if she had continued, there would likely have been more and more different solutions. She handled the above problem on the first worksheet in a similar way, but she manipulated with green colour, colouring the area between the two wheels of the car green, so that the green shape of the trailer would have a match on the picture. Thus, she did not consider it necessary to colour the black shape of the rear wheel. The match for the black shapes was already present in the picture, engulfing the green shape, which also had its pair on the trailer.

Figure 3.: An example of the special solutions worksheet

It was interesting to see how, after completing this work, the little girl started to colour the same worksheet once again, though nobody suggested her to do so. We could see that her approach was totally different. She used completely new approaches for this new solution (figure 4.).

Figure 4.: An example of the special solutions

The previous train of thought was no longer of interest to her, she coloured the bottom part including the wheels as she had to, based on the colouring lanes, however, the top half of the

car, which she had had no particular interest in during the first solution and which she coloured correctly based on the colouring lanes in the first solution, was given a whole new meaning. The horizontal division of colouring lanes and their system of building onto one another provided the opportunity of forming series. The interchanging of yellow and blue colouring lanes appears in a completely new form, by the creation of a counter-point. The blue-yellow division of the top colouring lane, moving from left to right appears in her presentation, in the line to be coloured in the blue yellow blue yellow series, if we look at it within the system of windows. But we can also look at this exceptional and genius solution from top to bottom as well. Next the blue of the top colouring lane is followed by a yellow patch in the lane to be coloured, which then is followed by another blue colouring lane.

Discussions

An important characteristic of the method is that it offers a straightforward system of rules for the solution, and the performance of children may also be assessed on the basis of this. On top of this, on a higher level, all this is overwritten, and rules may gain a new meaning, they may be voided and children will have their chance to think in their own „stubborn" ways freely, while we will be given the opportunity to follow this procedure. The worksheets are really tools for this, and no matter what way children solve the tasks, it will certainly be an experience for them and to us.

Diverse curiosity motivates stimulus-seeking, exploratory behaviour, which will increase arousal to an optimal level by increasing the novelty, complexity and variety of the stimuli in a person's environment. In contrast, specific curiosity leads to exploratory behaviour designed to supply information that will reduce the individual's subjective uncertainty and discomfort.

When an individual lacks information about the stimuli which impinge on it, it will perceive specific curiosity as a state of mild discomfort and heightened physiological arousal. Stimuli with relatively high arousal potential that exceed the organism's optimal level may evoke

either specific curiosity and exploratory behaviour or fear and flight, depending on how much novelty, complexity or unpredictability is introduced. Increases in stimulus intensity (arousal potential) were sometimes rewarding and, at other times, such increases generate avoidance responses so that a subsequent decrease in stimulus intensity was rewarding. Small to moderate increases in arousal were often rewarding whereas extreme increases were generally aversive.

Berlyne's figure illustrates the correlation between diverse and specific exploration and the changes in the optimal level of arousal potential, illustrating how lines marking the curiosity-drive and the anxiety drive change in respect to these. This figure is important because it shows that curiosity and anxiety have a combined motivational effect on diversive and specific exploratory behaviour and we shall see how the mechanism contained in my method can be fitted into this theoretical framework, in fact, how it modifies it. The visual nature of tasks, combined with the transfer of cognitive information and the internal mechanism of worksheets creates a system that activates diverse and specific exploration in an almost organic union, since, whenever children face a more complex decision during task solution, their specific curiosity triggers a behaviour of exploration where they must use the help of the colouring lanes to solve the task, this reduces the level of arousal. On the other hand, when they no longer require the help of the colouring lanes, because they clearly see the system of drawing shapes, then the diverse curiosity is the motivator and arousal is lifted to an optimum level. In other words when ones begin the solving, the new information lift up the level of arousal and activate the specific curiosity. After, during the task solving process this arousal level will be reduced and it will activate the diverse curiosity and will lift the level of arousal. When there will be a new problem or information, the level of arousal also will be lifted and the specific curiosity will be activated. Then this process will repeat itself on the higher level of the stored information.

The movement of transfer of information between the lower and higher level of the brain is also continuous, because children must monitor, check the all drawing and colouring lanes shapes and compare them with the details of picture in relation with relationship of shape-

background, foreground-background, part-whole and they must distinguish between the routine picture of the colouring lanes and the real drawing shapes. The figure as illustrates the process, can also be compared to two tornadoes moving in opposite directions (figure 5)
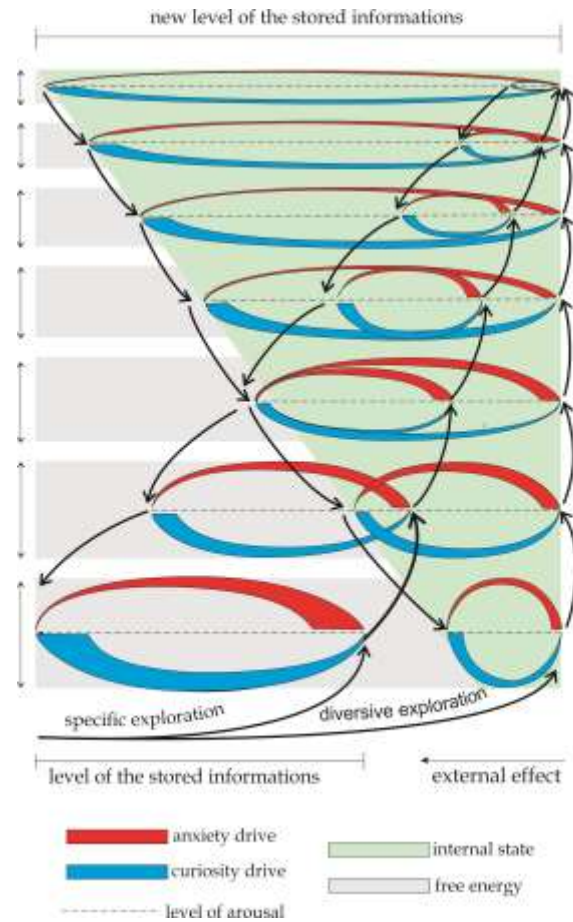

Figure 5.: "Tornado" principle

One can see that the process which starts from the level of stored information shows an upward movement, alongside a spatial, spiral form, always one level up in the correlation of curiosity and anxiety, while the level of arousal decreases and increases, subsequently setting an optimal arousal level; it is at this point that diversive and specific exploration become balanced during task-solving. One can see how it arrives at a broader level of storage where the process starts all over again. One can also observe the decrease in the level of anxiety.

Conclusion

As we have seen in the analyses of errors, the appearance of the colouring lane shapes and their dominance could define vision and during the solution of the task, the loud cavalcade will be dominant and not the drawing structure. This greatly influences the solution, taking into account at the same time that the performance of children is influenced by the complex effects of a number of circumstances. Worksheets, as we have seen, demand increased focus, attention and monotony endurance and perseverance from them. It is no wonder that children solve a certain part of the worksheet by the exact application of the solution principle. They go wrong from time to time, though they understand what the task is. A good example for this is the next worksheet, which shows a typical example. (figure 6)

Figure 6.: Some mistakes that also add up to the solution

In the encircled sections, the little boy had no more patience and endurance to change pencils, though he used the two different shades of blue very cunningly several times during the task solution, however, we can see how by the end of the task, he used the blue colour that he

happened to have in his hand to finish off the colouring of the two different blue shapes. This same phenomenon may be observed in two other encircled area of the picture.

In the next section, in order to make the complexity of the method truly clear, we must analyse its internal mechanism as well as the process of task solution. In the introduction, in relation to the presentation of the method, as well as in the analyses of worksheets, we mentioned the complex function of the colouring lanes and we must continue along this train of thought with the detailed analyse of motivation theory in relationship with the inferential machinery of casual structure of brain and the basic of their progress in parallel with each other in dynamics of forward-backward and top-down. Thus there will be a condition, in which system there will be seen how the checking process of stored, saved routine pictures connect to this system and how can become the vision, which mechanism works based on the free energy formula to interpretative vision during the task solving.

Let us take the already familiar worksheet as an example. The basic starting point is their visual sensitivity and vivid imagination. Children comprehend the picture immediately, regardless of how the colouring lanes seem to "scribble all over it" and hide its meaning. This is followed by the understanding and application of the solution principle, namely; the role of the colouring lanes.

In summary, task solution is characterized by a complex activity that encompasses theoretical and practical action. Continuous and dynamic information transfer – monitoring – forwarding is carried out between the higher and lower hierarchies of the brain, dynamically shifting among the levels of shape following and creative thinking, with the automatic movement of the arousal level, as a result of which it can always remain in the optimum – rewarding phase.

All this ensures a focused, integrated and balanced task solution process, as well as the balanced, peaceful psychological state. This is a significantly focused activity on its own, but we must remember that it is accompanied by practical activity as well. There are several coloured pencils in front of children scattered on the table or collected in small boxes. We

have tried several methods but the end was always pencils all over the table for easier access. This is important because in addition to the focused mental activity children must also pay attention to selecting the right colour pencil, putting it back to a safe place from where it does not fall off the table and others can also reach it, giving the pencils to their peers when they need them; in other words, children must organize their work properly, which continuously divides their attention.

The essence of method are the so-called "colouring lanes", which I drew and coloured into the pictures showing the colour of the picture's details. It is on the basis of and with the help of these that the children colour and complete the picture with the appropriate colours. The children can only see the whole original pictures, when the task has been completed punctually and correctly. The first step in solving a task always is that children have to colour the incomplete parts with the appropriate colours based on, the help of the colouring lanes. All they do is to advance by following the rules but they do not have to necessarily observe anything. But the task offers the children far more than this. Each and every picture portrays displays something happening. Seeing this, they no longer need the help of the colouring lanes every time, because they already see the whole picture, identify the form and they understand, what happens in the picture. For example, the car is blue, the windows are yellow, etc.; they see the spatial relations, the foreground-background relation, recognize the forms and are able to follow them. Then they advance in their work creatively and independently, and no need the help of the colouring lanes. Where there is uncertainty, the colouring lanes that are integrated in the task help in providing directions. However, if they are able to advance without that, they can ignore it. The children are able to work independently and no need the external help and assistance of the teacher. Children are not put off the work, but they continue the colouring work in intense and balanced state.

Summarizing the above, one can see that on the one hand colouring lanes generate the task. By complicating them and making it more difficult, it is possible to arrange the tasks according to level of difficulty. The colouring lanes, being the clue to the task, help children

to find the solution. However, if they are not needed at a certain point, they can be ignored, while still being available for use at a higher level.

It is obvious that the worksheets arouse the curiosity of children because they are visually sensitive and can only see the original picture after they correctly and completely colour it first. The image is built gradually, detail by detail as children carry on colouring, and this sustains their motivation

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