

# **Analyse d'une approche sensorielle à l'alphabétisation des jeunes enfants**

**L'approche sensorielle de l'alphabétisation établit-elle  
de meilleures attitudes d'apprentissage chez les enfants de 4 à 8 ans ?**

L'analyse porte sur l'étendue de la concentration de l'écoute et sur l'endurance à l'exercice, ainsi que sur le comportement social et les connaissances acquises.

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Le projet «Alphabet-Vivant-et-Vécu» 2016-1-FR01-KA201-024256 a été financé avec le soutien de l'Union Européenne. Toute communication ne reflète que l'opinion de l'auteur et la Commission ne peut être tenue responsable de l'utilisation qui pourrait être faite des informations transmises.

## Résumé

Des corrélations ont été établies entre le développement des structures neurocorticales et l'utilisation qui en est faite. Il a également été établi que le même stimulus, appliqué à un âge différent, a un effet différent sur le développement de ces structures. De plus, des études montrent que l'application accrue des cours d'alphabétisation actuels augmente proportionnellement l'analphabétisme fonctionnel.

Le dénominateur commun dans les études actuelles et passées est, que les acquis des élèves reflètent directement l'impact que les stimuli sensoriels appliqués effectuent sur l'apprentissage, comme le suggère la corrélation entre les stimuli appliqués et les résultats.

En réfléchissant davantage aux changements que pourraient apporter ces observations à l'alphabétisation, il est nécessaire de distinguer l'importance des influences externes (par exemple, au cours des études longitudinales) et l'importance des différentes caractéristiques des stimuli appliqués en tant que tels.

Bien que l'impact différent d'un même stimulus à des âges différents soit bien établi, les facteurs qui influencent le progrès de l'alphabétisation restent actuellement nébuleux.

Le but de la recherche rapportée ici est, de déterminer l'impact de stimuli auditifs et visuels, auxquels on donne une place précise dans le temps et dans l'espace qui correspond aux fonctions neuronales mnémotiques scientifiquement établies.

Pour ce but plus que 400 enfants ont reçu des cours d'alphabétisation ABCDirekt pendant plus que 50 heures des cours filmés et analysés au regard de l'effet que l'approche effectuée sur le comportement des enfants en comparaison avec les cours de l'approche traditionnels qu'ils reçoivent.

Le caractère émotionnel des stimuli auditifs et visuels a été identifié comme une indication de l'impact qu'ils ont sur la durée de la concentration d'écoute et sur l'endurance au cours de l'exercice. La place donnée aux stimuli auditifs et visuels dans le temps et dans l'espace a été identifiée comme une indication du progrès de l'alphabétisation qui en résulte.

# Resultats

## 4.6. Résultats

Les caractéristiques démontrées par la documentation film des leçons sont:

### - **Attention versus distraction**

- o Les enseignants ont perçu une meilleure attention des élèves pendant les cours ABCDirekt.
- o La nécessité de rappeler aux élèves d'arrêter les distractions et de se concentrer sur le sujet des leçons ne s'est pas produite.
- o Au lieu de chercher la distraction, les visages des élèves ont montré une émotion allant jusqu'à l'empathie attirée par le sujet traité.

### - **Bonnes émotions contre mauvaises émotions**

- o Les élèves regardaient l'affiche pendant les pauses en disant qu'ils n'avaient jamais rien vu d'aussi beau. C'était surprenant pour le professeur d'art, qui venait de faire des suggestions au consortium pour améliorer la conception des images qu'il s'attendait à ne pas être assez attrayante pour attirer l'attention des élèves.
- o Des élèves plus âgés sont entrés pendant la récréation dans la salle de classe où le poster était affichée en grand format au mur. Ils ont continué à poser des questions jusqu'à ce qu'ils aient entendu toute l'histoire. C'était surprenant, car la simplicité de l'histoire est conçue pour les jeunes enfants. Ces deux expériences confirment les conclusions des Études Blue's Clues (2. Recherche en alphabétisation), selon lesquelles les caractéristiques de l'image et des événements qui provoquent l'ennui chez les adultes peuvent susciter la fascination des enfants et inversement, ce qui semble fascinant aux adultes peut diminuer l'intérêt des enfants.

### - **Eagerness versus saturation**

- o Tous les élèves étaient concentrés faisant preuve de zèle lors de l'exécution des exercices sur le papier.
- o Des élèves qui avaient terminé l'exercice tenaient leur papier devant eux ou commençaient à parler avec d'autres en se montrant leurs papiers.
- o Certains ont essayé, de leur propre initiative, de tenir plusieurs crayons à la fois, afin de rendre l'exercice aussi impressionnant que possible.
- o Quand il n'y avait pas d'autre cours après l'activité, les élèves restaient souvent dans la classe, certains rendant leur papier plus beau, d'autres posant des questions et discutant de l'activité avec l'enseignant.
- o Une élève issue de l'immigration avait refusé toute participation depuis son arrivée pendant une année entière (catégoriquement elle n'avait jamais prononcé un mot de la nouvelle langue, ni participé à un exercice quelconque d'apprentissage des lettres). L'exercice ABCDirekt elle a suivi apparemment sans s'en rendre compte. Sa main continuait à dessiner avec beaucoup de couleurs la ligne de lettres, pendant que sa bouche répétait continuellement la phrase en langue étrangère que l'enseignant avait prononcée lors de la présentation de l'exercice. Quand la leçon était finie et que tous les élèves étaient partis, elle continua ainsi pendant une demi-heure jusqu'à ce que sa mère est venu la chercher. Elle a insisté pour démontrer cette activité à la mère avant d'accepter de rentrer chez elle. Ces cinq expériences répondent tous au besoin neuronal d'approche sensorielle à l'âge de l'école primaire et en-dessous (2.1. Phases Sensibles)

**- Comportement communicationnel**

- o Il n'était pas nécessaire de demander aux élèves de commencer, ni de leur rappeler de se concentrer.
- o Les élèves s'étaient engagés immédiatement à exécuter les tâches et à contribuer aux discussions.

**- Intégration sociale:**

- o Au cours de l'exercice, il y avait des élèves qui ont commencé à discuter de l'exécution de la tâche en indiquant du doigt des endroits spécifiques sur leurs papiers, qu'ils se montrent mutuellement, exprimant leur estime mutuelle et se donnant des conseils.
- o Des élèves ont commencé à sauter rythmiquement avec joie en groupe à plusieurs, en montrant leurs papiers.

**Complément d'enquête:**

Dans une classe, presque tous les élèves bâillaient extrêmement toutes les quelques minutes au cours des 20 premières minutes de cours. Plus tard, cela s'est arrêté et leur attitude n'était pas différente de celle des autres groupes. Rien de comparable ne s'est produit dans aucun des autres groupes. Cela donne lieu à des recherches plus approfondies sur la question, si l'approche sensorielle ABCDirekt implique un effet relaxant lorsque la condition personnelle est tendue et stressée.

## ACKNOWLEDGEMENTS

This investigation was supported by the European Commission for Education and Culture. In the name of all beneficiaries I wish to express sincere thanks to Dr. Celine Choquet of the University Lymière<sup>2</sup> Lyon, for sharing expertise and providing valuable guidance and encouragement. I also take the opportunity to express highest gratitude to Regula Signer for enabling this venture and Musik-Union e.V. for developing and providing the material and approach that is offering the opportunity of this investigation. For their exemplary support in organizing and carrying out this evaluation on innovative approach, we are immensely grateful to Birutė Tilvikienė and the staff of the schools Vilniaus Vilnios pagrindinė mokykla, Grigiškių gimnazija, Grigiškių pradinė mokykla and Grigiškių Šviesos gimnazija in Vilnius, Lithuania, as well as Alessandra Colombo and the staff of the schools Semeria, Manzi, Don Milani, Collodi asa and La Quercia in Matera, Italy, as well as Doinita Costachescu, Elena Dobrovolschi, Anca Buzila, Elena Bischin and the staff of the schools number 5 and 15, the UCOS Foundation and the Kleine Riesen Akademie in Sibiu, Romania, and also Elena Průchová and the staff of the Základní škola and Mateřská škola in Polevsko, Czech Republic. For the tireless translation of all the material, correspondence and the courses to and fro between the English, French, German, Czech, Romanian, Italian and Lithuanian language our Special thank is due to Edita Taleikytė, Maria Lorenz, Gabriella Antezza, Alessandra Colombo, Maria Theresa Paolicelli, Anca Mutaen,

I also place on record our sense of gratitude to one and all, who directly or indirectly, have lent their hand in this venture.

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# 1. INTRODUCTION

Until this century the neuronal functions of learning remained in darkness. The Nobel Prize 2003 for Medicine was awarded for the invention that enabled for the first time in history to witness without abusive intrusion the processes under the skull (the Functional Magnet Resonance Imaging, fMRI).

The discoveries made, led scientists from terms such as “discovering a new continent” up to expressions like “discovery of a new universe”. The common equation of all is: processes have been found very different from what was believed before.

Economical enterprises hurried to seize newly available insight beneficiary for their competition on the market. Not so did general education, as it is bound to established curricula and not subject to competition.

Comparing methods and results of more than 60 countries, the PISA Studies then revealed the impact different school systems have on the pupils’ achievements and invited countries to not necessarily compete, but rather benefit from each other’s experience and to mutually serve the general progress by sharing their curricular principles, which seem to make all the difference.

In 2003 the OECD then has set the improvement of literacy tuition to be first educational goal worldwide. Embarrassing was the result of the Leo Leve One study in 2011, which assessed on a large scale in Germany the progress made since the pursuit of this goal: functional Illiteracy seemed to have almost doubled. Whether there is a common equation of this result and the reinforced literacy tuition during the passed 8 years, or whether external influences or study design have to be held responsible for this, remained an issue to be clarified.

By 2007, the OECD Secretary-General, Angel Gurría, had called **quality education** “the most valuable asset for present and future generations”. Australia rapidly had advanced to making education their 3<sup>rd</sup> biggest export factor, while Europe kept handling education under its costs and the world known Scientist Prof. Manfred Spitzer recalled: “We cannot afford any longer to pretend that we don’t know the functions of our most precious resource. Postindustrial Europe’s remaining resources are its brains”.

Following this advice, Musik-Union e.V., institution for neurodidactic approach, made an accidental discovery in 2010 by applying with engineerial precision neurological understanding to the development of educational means for literacy: not only the 6 year olds that where addressed, but the 4 year old siblings’ interests got caught by itself and memorizing letters via mere sensory input seemed to be no obstacle at this age. After this had been tested it in different places with the same result, the European Commission for Education and Culture decided in 2016 to support further testing of ABCDirekt in 7 European countries, which is now subject of the study in hand.



## 2. RESEARCH IN LITERACY

On the base of the established correlations between the development of neurocortical structures and the use that is made of them, our search for definition of the respective requirements for literacy first focussed on the established phenomenon of the so called Critical or Sensitive Phases, which shows that the same stimulus applied at a different ages, has a different effect on the development of these structures and that this difference can lead up to almost contrary effect, for example with regard to their likes and dislikes and to what attracted the attention or makes them express boredom. (The Blue's Clues Studies)

The use of the material developed under this aspect then drew attention to implications that are due to the established Center Surround or Mexica-Hat-Effect, which suggests that the eye needs to seize broad perspectives first in order to develop sustainable neuro-cortical structures also for details.

The use of the posters, which were developed under this aspect, then revealed another aspect possibly to be even more indicative: the Central and Lateral Storage. The two previously considered functions are primarily cortical functions. This aspect of Central and Lateral Storage lead down into the centre of the brain and the impact the limbic system has on mnemonic functions.

### 2.1. Sensitive Phases

Only axons insulated by the myelin sheath are of efficient use. Although the head of a baby has approximately half the size of an adult's head, it contains already all neuronal cells and almost the double amount of axons compared with the adult. But these axons are not yet myelinated, so they are not insulated, and therefore very slow. The increase of the cranial volume is due to the myelin sheaths. In not myelinated axons the electrical impulse of "action potential is processed with approximately a maximum of 3m per second" whereas a thick myelin sheath "raises the speed of the axon up to 110m per second." For the infant myelination begins with the auditive cortex in the lateral lobe and the primer visual cortex in the occipital lobe, as well as the areas for touch and execution of basic movements in the post-central-gyrus of the parietal lobe. Successively during childhood the secondary areas follow and only from puberty onward the "most highly developed cortical areas of the frontal lobe will begin to connect fully with the rest of the brain. (Spitzer 2003)

Konrad Lorenz first made the behavioral observations of the existence of time windows, when specific brain circuits are particularly receptive and need signals for their normal development, a focus of scientific research (Lorenz 1977). Spitzer calls this "Areas go online" The CPH (critical-period-hypothesis) states that any connection not frequently used at its myelination period will disappear and the relevant "capacities will not be learned for the rest of the life," which means "use it or loose it".

As an alternative to the Sensitive Phases had been proposed, that a blind born woman, who received treatment at the age of twelve, twenty years after her surgery was able to discern between separate objects and localize faces (Pawan 2003) But partial acquisition of functions over an extended amount of time can neither be compared with the perfection, nor the speed and ease when acquiring visual skills during the postnatal critical period of the visual cortices. This example therefore does not contradict the Sensitive Phases but supports the theory of neuroplasticity, which suggests that the brain is adaptable: "Injure an area of the brain, and another area can be encouraged to take over its functions". (Doidge 2007) Neuroplasticity has been proved on rats (Kis 2007) and on humans (Acosta

2002) at any age (Doidge *ibid* 259-278). It also has been established that neuronal survival, growth and improvement of synaptic connectivity patterns at axonal terminals depend on afferent electrical impulse activity (Asanuma 1990). It is the action potential frequency, which proportionally increases areal growth, mitochondrial enzyme activity, micro vessel density, sodium/potassium pump activity and 2-deoxyglucose intake (Purves 1993). The importance of afferent activity for each of these aspects has been demonstrated (Mattson 1988). Absence, expert or inexpert use of cognitive functions causes respectively atrophy (Wolfe 2007), growth (Spitzer 2003) or deformity (Polizei Basisgewerkschaften 2006) of neuronal tissue. The basic equation on the cited studies is the statement that afferent electrical impulse activity is for neuronal tissue as indispensable as nutrients for metabolic organs and that during critical periods the myelinating areas therefore express their need for nurture by driving the individual towards external releases for the relevant electrical circuits. It therefore has been suggested that phenomena such as attention-deficit-disorder might be no illness to be treated with Methylphenidate (Ritalin) but “only transcribes the fact that a pupil is concentrating on something different” (Langer 1998) in coherence with neuro-developmental needs. As these “disorders” are mainly pertaining to boys it follows that boys might myelinate cortical areas in a different order than girls. As for boys 40% of their body is muscle fibre compared to only 24% for girls, boys have almost the double amount of neuronal connections concerned to myelinate in the primary areas and accordingly may start pre-central myelination later (Birkenbihl 2005). As “80% of all learning-disabled children are boys” (PT Magazine 2007), this could be due to the current syllabus during primary school addressing precentral areas, which for boys at that time are not sufficiently available yet. If so, than boys would need a maximum activation of primero-motorcortical areas in order to not loose basic potential during their critical period.

The Sensitive Phases suggests possible answers to the fact that more boys score A-levels with distinction than girls in contrast to the 80% of boys in special schools: Boys, who benefit from family backgrounds which are able to compensate the mentioned disadvantages of the current curricula by extra-curricular activities, will develop a larger post-central neuronal basis than girls for their pre-central intellectual development after puberty. It has been established that, due to the amount of testosterone present at specific moments during foetal development, cortical structures can be more or less ‘male’ or ‘female’ biased, independently of the person’s actual gender (Birkenbihl 2005). This could explain the fact that not all boys or girls uniformly comply with the described characteristics

## 2.2. Centre Surround Effect

By the Centre-Surround-Function, a neuron, when activated, inhibits other more distant neurons (outside the radius of its Mexican-Hat) whereas it activates close neurons (within the radius of its Mexican-Hat) Hereby the content stored in close neurons automatically comes to mind whereas content of distant neurons cannot be remembered. As the way content is arranged in space generates a neuronal miniature copy of this arrangement on the ‘hard disc’ of our brain, the arrangements our eyes look at while learning decide on whether the content is stored closely in well organised dense neuronal maps or is distantly scattered. When turning pages, for example, the eye loses contact with the content of the previous page (Spitzer 2003) and the following content will therefore be stored randomly and eventually in more distant places. It is hereby possible that different pages of a grammar book do not come to mind but inhibit each other. This is well-known as ‘black-out’. As in certain circumstances this can generate panic, another cross-cranial inhibitory process is subsequently generated leading to further failing. The resulting educational rule is: From the entirety to the detail. For example mind mapping is a practical tool for storing different elements close together: if a broad scheme is examined before going into any details, this neuronal map becomes an organizer, which will store the different elements in a well sorted and logical manner among other elements. Being thus stored closely to each other, all relevant details automatically come to mind by the natural emission of electrical impulses as soon as one element of the subject is mentioned.

### 2.3. Central and Lateral Storage

Comfortable emotions lead to storing the accompanying experience central in the cortex. Uncomfortable emotions lead to storing the accompanying experience lateral in the cortex, in the temples. (Kringelbach 2005).

Central storage guarantees increase of emission of neurotransmitters and herewith improvement of intellectual performance. The importance of lateral storage dates from evolution. The lateral storage of a difficult experience involves the emission of stress-hormones which inhibit neuronal interconnectivity and the cognitive functions. Introducing something new by known elements allows to enter the process more confidently and newly added elements will have a good chance of being stored close to the neurons already active in the middle of the forehead. Thus the activation of these cells automatically produces transmitters which support neuronal connection and learning ability.

Uncomfortable emotions such as panic generate via the limbic system and the amygdale glucocorticoides, especially cortisol, which inhibit the intake of glucose in neurons and hereby also the intercortical connectivity. This signifies impairment of neocortical functions such as memory and reasoning. Finally a chronic panic-state even leads to death of neuronal cells.” (Spitzer 2003) This appears to be a certain incompatibility of neo-cortex and stem-brain, which phylogenetically is much older: “While our intellectual functions are carried in the newest and most highly developed part of the brain, our affective behaviour continues to be dominated by a relative crude and primitive system, the limbic system in the trunk brain, whose fundamental pattern has undergone but little change in the whole course of evolution from mouse to men.” (Koestler 1978) It “facilitates quick execution of simple routines”, which is useful in primitive prehistoric situations ruled by fight or flight; but “it impairs creative association” e.g. learning (Spitzer 2003) notably required for problem-solving in civilisations the neocortex has generated!

When significantly surpassing the normal emotional state, the biochemistry of both, the comfortable and the uncomfortable emotions, can increase the mnemonic capacities of the brain (Spitzer 2003).

### 2.4. Conclusion of the research in literature

The sensitive Phases suggest, that abstract signs such as letters, which are not associated with physical functions such as for example spoons or forks have, are operated by a part of the brain that has not matured at the age of primary school, like for example the sexual organs are not yet developed at that age. This means the neuronal connections in this part are extremely slow and generate emotional discomfort when being used. This could explain why the natural autodidactic learning of the younger child turns into a must the child needs to be forced to, when starting school.

The Centre-Surround-Function suggests that confusing details such as the differences between resembling letters, can be prevented, when meeting the letters first as a context in which each of them has a single and logical part and function and a place that is not interchangeable.

The Central and Latera Storage suggest, that, the stronger accompanying positive emotions are, the more readily the brain processes intellectual input. However, it also suggests, that also uncomfortable emotions have their place when increase of the mnemonic biochemical activity in the brain is the goal.

## 3. Experimental research: developing ABCDirekt Material

### 3.1. Neuro-Engineering

The ABCDirekt approach transfers abstract content of the pre-central cortex to post-central areas (2.1 Sensitive Phases) supported by deep brain rooting (2.3. Central and Later Storage). Topics, which have no tactile existence, are stored in tactile areas of the brain by synchronisation with spatial tactile as well as emotional elements. This applies to the two areas of the brain, which are able to generate sustainable memory:

- the emotional components link with the central parts of the brain and the hormonal condition.
- by synchronized body movements the pre-central content is rooted in post-central areas.

In practice this means action and emotion meet at a single moment and a single place by point-to-point synchronisation of speech, imagination and movement. This is a classical conditioning (Pavlov) which takes further on a human level, what is known in animal education as “Clicker Effect” already. The teacher trains this motor synchronisation with the pupils during the lesson.

### 3.2. Reading a letter

The ABCDirekt material makes the sound and the shape of letters available to a larger scale of experience than the mere visual and auditive perception fostering the neuronal activity during the learning process also with motor and tactile input.

Letters were presented not only as real-world figures of a coherent story-line from A to Z with rhyme and music and the option to mime or dance the action. But these figures were incorporating in themselves already the sound and the shape of the letter in one. For example “palm tree” represents the sound of the P and the shape of the letter P as a Figure designed as the stem and the crown of the palm tree. Furthermore the storyline combines its emotional curve with the expression letter sounds have as exclamation.

For developing this in the languages of the participating countries respectively, developers of each country had undergone residential training followed by correspondence and guidance throughout one year of creating, testing and improving their county’s version.

#### 3.2.1. Writing a letter

Writing a letter is usually done by repeating it as a 'garland' in a row in succession: at the beginning of the line is the model and next to it begins the first attempt. The letter is new to the child and after the first line it stops and looks at the model again to find out, how to continue. Overall, some curves are not yet what they should be.

In the brain, however, everything the hand does becomes neuronal growth. If the hand stops, the brain grows eth connection "stop here!"; if the hand draws a straight line crooked, the brain grows the connection "make this crooked". This is now the default when the child starts the second attempt. Improvement thus becomes a constant fight against the bad templates that have been created.

Figure skaters therefore avoid wrong attempts. Before the first attempt of a new trick, skaters watch it until the mirror neurons have captured and stored the correct movement.

ABCDirekt therefore investigates on training the writing movement “in place” on a pattern, where no error is possible, until the movement and shape of a letter are established in the brain.

### **3.2.1. Knowing a letter**

English video samples and test sheets were created that show teachers how to test the pupil’s knowledge of letters. Pupils were asked to choose on a sheet of paper among 3 letters the letter they hear pronounced by the teacher.

## **4. Experimental Research: using ABCDirekt material**

### **ABCDirekt approach versus current literacy tuition**

#### **4.1. Context**

The study was conducted in 15 schools in 4 countries: Vilniaus Vilnios pagrindinė mokykla, Grigiškių gimnazija, Grigiškių pradinė mokykla and Grigiškių Šviesos gimnazija in Vilnius, Lithuania; Semeria, Manzi, Don Milani, Collodiasa and La Quercia in Matera, Italy; school number 5 and 15, the UCOS Foundation and the Kleine Riesen Akademie in Sibiu, Romania; Základní škola and Mateřská škola in Polevsko, Czech Republic . The tuitions of took place 18th to 25th November 2017 Sibiu, 20th to 29th May 2019 in Vilnius, 3<sup>rd</sup> to 7<sup>th</sup> June in Polevko, 17<sup>th</sup> to 22<sup>nd</sup> June 2019 in Matera. The applied material is to be found in the appendix. The results were presented and evaluated in public November 29<sup>th</sup>.

#### **4.2. Participants**

The sample consisted of 412 pupils of different learning abilities aged 4 to 9. The pupils were selected at random and consequently presented the different types of pupils in a class from strivers to low performers as well as children that principally used to refuse participation in learning activities, as their usual teachers reported.

#### **4.3. Design and Procedure**

Testing conditions were established as follows. With written agreement of their parents the children were filmed from 2 sides during the lesson. A native speaker of their language and teacher they are familiar with and who is qualified for the ABCDirekt approach was holding the lesson in the classroom the children were used to. A colleague, also familiar with these pupils, assisted the lesson and wrote down remarks the pupils expressed with regard to the tuition. The cameras took the image of the whole classroom during the entire lesson in one continuous film document without interruption. The videos were analyzed under the guidance of Dr.Céline Choquet on the base of her experience in the study she analyzed and coauthored in the bestseller “Un college saisi par les arts”.

Before the data collection and evaluation will be discussed in detail, the methodology used in class shall be described to the reader.

The pupils were taught letters by the ABCDirekt approach. This method makes learning an experience for all or almost all senses including seeing, hearing, touching, moving and feeling. This means to feel the sounds and contours of letters while simultaneously being in a tactile contact with the environment (feet stampers, taking shapes, moving hand, drawing in the air, etc.).

Important is the synchronization of seeing, watching, hearing, speaking, touching, moving, imagining by the orientation in space (physiological aspects under 2.1 Sensitive Phases).

Therefore, in addition to the material on paper, auditive support applied the synchronization of pictures, sounds and movements playing along a story that integrated all those movements in a coherent choreography that has an emotional aspect the test persons can understand and have a feeling for (biological aspects under 2.3. Central and Later Storage).

Coming back to the procedure of the class this approach was applied accordingly. The pupils received the coloring book with the design of the emotional scenery and the exercise book with then design of the letter as space movement. Their teacher was ABCDirekt qualified and provided stimuli that activate several senses (Filmdocumentation under 4.3. Design ns Procedure). Therefore they received tuition for reading a letter through the emotional sound of the letter as exclamation (biological aspects under 2.3. Central and Later Storage) and tuition for writing a letter by space orientation through motor control of the entire body (physiological aspects under 2.1 Sensitive Phases). Additionally they were provided a poster with the entirety of the storyline as panorama (physiological aspects under 2.2 Center Surround Effect). The tuition was conducted the following way:

1. Experiencing the emotional aspect through the storyline at the poster (2.2. Center Surround Functions)
2. Personalizing the emotional aspect by drawing on the coloring sheet one situation of the story line. (2.3. Central and lateral storage)
3. Seizing the letter shape by InPlaceExercise in the air and on the exercise sheet. (2.1. Sensitive Phases)

In cases, where this was the last lesson of the morning or afternoon, pupils were allowed to continue the exercise, if they wanted to.

#### **4.4. Data Evaluation**

The education of scientific topic gave „hand on learning” already an established position. Comparable to this, ABCDirekt temps to challenge usual literacy tuition now by pushing tactile, visual and auditive pursuite of neuro-engineerial aspects one step further than the usual haptic literacy toys that are available.

Primary research was therefore suggested to investigate the assumption that multisensory approach enables better achievement at the age of the target group, than tuition focused on intellectual input.

The objective of this experiment is to investigate also on the additional assumption that intellectual tuition combined with physical activity not only improves the efficiency and effectiveness of the learning process but also increases the motivation and wellbeing of the pupils.

The analysis of the film documentation scored pupils on the following factors:

- Attention versus distraction
  - o Duration of constancy of the focus of their attention.
  - o number of changes of the focus of their attention.

- Good emotions versus bad emotions
  - o Number of smiles during the execution of what has been asked from them.
  - o Number of expressions of boredom or dislike (facial expression and body language).
- Eagerness versus saturation
  - o Number of obvious increased thoroughness during the execution of what has been asked from them.
  - o Number of a pupil individually interrupting the execution of what has been asked to do.
- Communicational behavior
  - o Number of immediate responsiveness to the teacher's questions and demands.
  - o Number of reminding pupils of what had been asked.
- Social integration:
  - o Number of supports offered by a pupil spontaneously to another in pursuit of what the teacher had asked.
  - o Number of dismissiveness shown by a pupil towards another in terms of outperforming, intimidating and discouraging their mate.

#### **4.5. Limits of feasibility**

With regard to the complexity of the people needed for the data collection (including the need for written permission of each parent for film documentation of the tuition) and the absence of a budget for paying test persons, ethical reasons obliged us to not divide pupils in test and control groups. Each family had to have the right to receive the benefit of being introduced to the new approach in exchange to the educational time their child has spent in the testing procedures.

Initially planned were 5 minutes of film documentation par group, taken in the frame of the classroom door while the pupils leave the classroom at the end of the lesson.

Extending this to more than 50 hours of film documentation of the entire classes during the entire lessons, is a clear increase of reliability of the evaluation compared to the 'price' paid by renouncing to separate test and control groups.

#### **4.6. Results**

The features showed by film documentation of the lessons are:

- Attention versus distraction
  - o Teachers experienced the pupil's attention more undivided during the ABCDirekt tuition.
  - o The need for reminding pupils to stop distractions and to focus on the topic of the lessons did not occur.
  - o Instead of seeking distraction, the pupils faces showed emotion up to empathy drawn to the topic dealt with.
- Good emotions versus bad emotions
  - o Pupils kept watching the poster during break time saying they had never seen anything so beautiful. This was surprising to the art teacher, who had just made suggestions to

the consortium for improving the image design, which he had expected to be not attractive enough to catch pupil's attention.

- Elder pupils entered a classroom during break time wanting to watch the poster displayed in large size at the wall. They kept asking questions until they had heard the entire story. This was surprising, because the simplicity of the story is tailored for young children.

Both comply with the findings of the Blue's Clues Studies (2. Research in Literacy), that features of image and happenings, which cause boredom in adults, can cause fascination in children and vice versa, what receives adult's fascination can decrease children's interest.

- Eagerness versus saturation

- All pupils concentrated showing zeal during the execution of the exercise on the paper.
- Pupils that have finished the exercise keep holding and watching their paper or start talking with others watching each other's paper.
- Some tried by their own initiative to hold several pencils at once, to make the exercise as impressive as possible.
- When there was no other lesson after the activity, pupils frequently staid in the classroom, some making their paper more beautiful, others asking questions and talking to the teacher about the activity.
- A pupils with migration background, had refused since her arrival for an entire year any participation (she had categorially never pronounces a word of the new language, nor participated in any exercise of learning letters). The ABCDirekt exercise she followed, apparently without noticing that she did. Her hand kept drawing with lots of colors the letter line again and again, while her mouth was repeating continuously the sentence in the foreign language, which the teacher had spoken when showing the exercise. When the lesson was over and all pupils had left, she kept doing this for half an hour until her mother came to pick her up. She insisted to demonstrate this activity to the mother, before agreeing to go home.

All five comply with the neuronal need for sensory approach at the age of primary school and below (2.1. Sensitive Phases)

- Communicational behavior

- Pupils did not need to be asked nor reminded to focus.
- Pupils engaged in tasks to execute and in discussions immediately.

- Social integration:

- During the exercise time, pupils started discussing their execution of the task together by pointing with their fingers on specific places on their papers, which they show to each other, expressing mutual esteem and giving advice to each other.
- Pupils started rhythmically jumping with joy as a group, several together, showing their papers.



Further investigation:

In one class, almost all pupils kept yawning extremely every few minutes during the first 20 minutes of the tuition. Later this stopped and their attitude was not significantly different from the other groups. Nothing comparable had occurred in any of the other groups. It gives raise to further investigation on the question, whether the sensory approach ABCDirekt implies a relaxing effect when the personal condition is tense and stressed.

## 5. Discussion

Coming back to the initial question of whether teaching approaches can affect different results, the answer the film documentation provides is yes. To which extend and in what areas and disciplines would still be the points to discuss.

The scientific findings on the operation mode of the brain show, that so called “normal learning processes” – especially in the case of skills – from a neurological point of view are to be considered as deviations, which creates unnecessary neuronal obstacles: the pupil gets some explanation and has to translate this into action. Hereby the pupil inevitably passes through mistakes. By doing this, neuronal synapses for these mistakes are created including the synapses for the involved motor execution. These synapses can only reproduce what they have been created by. On a neuronal level, the following correction by the teacher asks the pupil to destroy the synapses the pupil just created with a lot of effort. But they can only be destroyed and be replaced by correctly working synapses, when strictly not using the already existing wrong ones anymore. This is almost impossible once they have been created. This is the biological basis for the frustration correction causes and for the sustainability of pupil’s mistakes in current teaching processes. Another aspect to be considered is the maturation stages of the brain: the neuronal areas for seizing explanations of abstract signs such as letters, are not available before puberty, whereas the post-central cortical areas for sensory input and imitation have to be used extensively at an early age. Post-central parts not used at this age will be destroyed (neuronal rule : “USE IT OR LOOSE IT” 2.1. Sensitive phases). It was expected, that, respecting these functionalities makes learning a different process and generates a different success. The extent to which the collected documentations confirm this, can be explained by the related bio-chemical processes (2.3. Central and Lateral storage): a mistake in the first place creates stress hormones and receptor blockers which inhibit the learning process and make further learning automatically more difficult and thus continuously generates lower the results. A successful first try triggers the emission of reward hormones and neurotransmitters which automatically generate more success and thus continuously raise the success curve. The latter is a main feature of the ABCDirekt approach. Instead of working towards success by asking for increased effort, it starts with success to increase the biochemical processes for zeal and effort.

In brief: **WORKING BY SUCCESS TOWARDS EFFORT READINESS!**

The ABCDirekt approach is not adding a supplementary element to what exists already. Its principals are diametrically opposed to the habitual teaching approach, which addresses mainly the frontal lobe and force the learner to then link the contents with the areas behind his central sulcus in order to remember them. This works when talking to adults, as their frontal lobe is available. As described, for children it leads to faulty trying instead of the content being taken in directly via the senses. The results therefore suggest that the ABCDirekt approach indeed addresses primarily post-central areas via the senses, and that this is the reason for its success.

## 6. Conclusion

The basic equation between the established findings and this study can be summarized by: whether they are successful or not, learning processes always result in physical transformation of the neuronal tissue. Neuronal patterns grown by unsuccessful learning inhibit later success by their wrong configuration as well as by the emission of receptor blockers. The neuronal patterns grown by immediately successful learning accelerate the learning process because they are useful as such and support the emission of neuronal transmitters. While the latter provides the biochemical basis for motivation, the first leads to the experiences of not being able to.

Working first with perception (post central areas) instead of instructions (frontal lobe) avoids the deviation via faulty neuronal representation. This also implies, that moving image has decisive potential for the education of the 21st century at large.

We can conclude that considering these aspects shows potential of improvement also for the domain of literacy. In particular with regard to the educational and societal needs of the postindustrial Europe, these findings can be considered as essential information for educational, cultural and economic future development.

ABCDirekt proves to be an invention with the potential of creating a new market. Its effects are: - increase of attention, focus, motivation, endurance, social attitude and performance.

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## APPENDIX

In the appendix teachers find the following test sheets & video and links to video recording for test in English and links for embedding these videos in online test:

- 26 multiple choice test question for recognizing letters Level 1 TEACHER Version
- 26 multiple choice test question for recognizing letters Level 1 Pupil Version
- 26 multiple choice test question for recognizing letters Level 2 TEACHER Version
- 26 multiple choice test question for recognizing letters Level 2 PupSI Version
- 26 links of test videos in English language for letter recognition & Links for embedding the videos in the own online test
- 21 multiple choice test questions for recognizing english words Level TEACHER Version
- 21 multiple choice test questions for recognizing english words Level Pupil Version
- 21 links of test videos in English language for word recognition & Links for embedding the videos in the own online test
- 20 English sentences for dictations level 1
- 20 links of videos of sentences in English language level 1

+

1

H C P

2

O A U

3

W Q J

4

Y S R

5

B C W

6

V K X

7

K T Q

8

L P F

9

B M U

10

M

R

D

13

E

J

K

16

Y

D

F

11

R

E

M

14

I

N

Z

17

P

O

Y

12

S

R

V

15

T

K

W

18

X

H

**R**

**G**

**O**

**19**

**22**

**25**

**S**

**L**

**I**

**G**

**H**

**N**

**R**

**Y**

**G**

**20**

**23**

**26**

**T**

**Q**

**F**

**P**

**Y**

**W**

**H**

**J**

**R**

**21**

**24**

**Y**

**Z**

**R**

**A**



School	Group	Age	Testing teacher	Pupil n°
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**Pupil**

Test sheet level 1

page 1 of 3

**1** H C P

**4** Y S R

**7** K T Q

**2** O A U

**5** B C W

**8** L P F

**3** W Q J

**6** V K X

**9** B M U

School	Group	Age	Testing teacher	Pupil n°
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**Pupil**

Test sheet level 1

page 2 of 3

**10**  
M  
R  
D

**13**  
E  
J  
K

**16**  
Y  
D  
F

**11**  
R  
E  
M

**14**  
I  
N  
Z

**17**  
P  
O  
Y

**12**  
S  
R  
V

**15**  
T  
K  
W

**18**  
X  
H  
R

School	Group	Age	Testing teacher	Pupil n°
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**Pupil**

Test sheet level 1

page 3 of 3

**19** S G R

**22** L H Y

**25** I N G

**20** T P H

**23** Q Y J

**26** F W R

**21** Y R G

**24** Z A O

School	Group	Age	Testing teacher	Pupil n°

<p><b>1</b> U  <b>W</b>  <b>V</b></p>	<p><b>2</b> L  <b>J</b>  <b>I</b></p>	<p><b>3</b> Z  <b>S</b>  <b>E</b></p>
<p><b>4</b> D  <b>B</b>  <b>P</b></p>	<p><b>5</b> T  <b>K</b>  <b>X</b></p>	<p><b>6</b> E  <b>F</b>  <b>C</b></p>
<p><b>7</b> Q  <b>O</b>  <b>G</b></p>	<p><b>8</b> Q  <b>O</b>  <b>C</b></p>	<p><b>9</b> V  <b>O</b>  <b>U</b></p>
<p><b>10</b> B  <b>O</b>  <b>D</b></p>	<p><b>11</b> N  <b>Z</b>  <b>M</b></p>	<p><b>12</b> Z  <b>S</b>  <b>E</b></p>

**13** X K E  
X K E

**14** Q O G  
Q O G

**15** M V W  
M V W

**16** F T E  
F T E

**17** I A Y  
I A Y

**18** Z N M  
Z N M

**19** J T L  
J T L

**20** B P R  
B P R

**21** Y I A  
Y I A

**22** N H Y  
N H Y

**23** I J L  
I J L

**24** K P R  
K P R

**25** Q G O  
Q G O

**26** I L J  
I L J

School	Group	Age	Testing teacher	Pupil n°

<b>1</b> U W V	<b>2</b> L J I	<b>3</b> Z S E
<b>4</b> D B P	<b>5</b> T K X	<b>6</b> E F C
<b>7</b> Q O G	<b>8</b> Q O C	<b>9</b> V O U
<b>10</b> B O D	<b>11</b> N Z M	<b>12</b> Z S E

**13** X  
K  
E

**14** Q  
O  
G

**15** M  
V  
W

**16** F  
T  
E

**17** I  
A  
Y

**18** Z  
N  
M

**19** J  
T  
L

**20** B  
P  
R

**21** Y  
I  
A

**22** N  
H  
Y

**23** I  
J  
L

**24** K  
P  
R

**25** Q  
G  
O

**26** I  
L  
J

Kanal : <https://www.youtube.com/channel/UChcGvWGFIT9tnORkx2tFw3A>  
Da sind sie aber nicht sichtbar. Da sind nur 3 Buchstaben mit Viola im Poster  
Name of playlist "1."

1: C + start <https://youtube.be/K9a5ayjQ6sY>  
<iframe width="560" height="315" src="https://www.youtube.com/embed/K9a5ayjQ6sY?rel=0&amp;showinfo=0" frameborder="0" allowFullscreen></iframe>

2: A <https://youtube.be/JsgAUzLKmY>  
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3 J <https://youtu.be/8VwE8V-Hf00>  
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4 S <https://youtube.be/wk-i70evoJm>  
<iframe width="560" height="315" src="https://www.youtube.com/embed/wk-i70evoJm?rel=0&amp;showinfo=0" frameborder="0" allowFullscreen></iframe>

5 B <https://youtu.be/aEdu0inuV48>  
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6 K <https://youtu.be/nosu2pVMh0A>  
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7 T <https://youtu.be/evmiaZQ22ZM>  
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8 L <https://youtu.be/8HNSZABIS-g>  
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9 U <https://youtu.be/oyRm8paGR30>  
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11 M <https://youtu.be/JxIYNuUMU3A>  
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12 V <https://youtu.be/nubvXWf3D0>  
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14 N <https://youtu.be/tQaL8qaY03s>



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21 Y <https://youtube.com/watch?v=RyBSvmDD-1>  
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22 H <https://youtube.com/watch?v=fYpNF36IKtQ>  
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**Words to hear and chose**

- |                      |                       |
|----------------------|-----------------------|
| 1 Mom / none / gone  | 2 dog / frog / tock   |
| 3 fast / last cast   | 4 pig / dig / big     |
| 5 pet / bed / get    | 6 boy / toy / day     |
| 7 top / stop / got   | 8 her / here / him    |
| 9 me / she / he      | 10 on / one / out     |
| 11 hot/ lot / got    | 12 car / cat / cart   |
| 13 six / sit / kit   | 14 ten / when / then  |
| 15 come / cow / came | 16 ball / call / fall |
| 17 book / but / box  | 18 say / may / day    |
| 19 dad / did / bid   | 20 come / gun / done  |

## Words to hear and chose

- |                      |                       |
|----------------------|-----------------------|
| 1 Mom / none / gone  | 2 dog / frog / tock   |
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| 13 six / sit / kit   | 14 ten / when / then  |
| 15 come / cow / came | 16 ball / call / fall |
| 17 book / but / box  | 18 say / may / day    |
| 19 dad / did / bid   | 20 come / gun / done  |

## Words to hear and chose

Mom / none / gone                      001.2001                      <https://youtu.be/XNcCM9xqYr5k>  
<iframe width="560" height="315" src="https://www.youtube.com/embed/XNcCM9xqYr5k" frameborder="0" allowfullscreen></iframe>

dog / frog / tock                      001.2002                      <https://youtu.be/moYb5Mq2yVY>  
<iframe width="560" height="315" src="https://www.youtube.com/embed/xr8ww2U9SMg" frameborder="0" allowfullscreen></iframe>

fast / last cast                      001.2003                      [https://youtu.be/z6Pu5w7V2\\_l](https://youtu.be/z6Pu5w7V2_l)  
<iframe width="560" height="315" src="https://www.youtube.com/embed/z6Pu5w7V2\_l" frameborder="0" allowfullscreen></iframe>

pig / dig / big                      001.2004                      [https://youtu.be/9vPyqY\\_ZnU](https://youtu.be/9vPyqY_ZnU)  
<iframe width="560" height="315" src="https://www.youtube.com/embed/9vPyqY\_ZnU" frameborder="0" allowfullscreen></iframe>

pet / bed / get                      001.2005                      <https://youtu.be/6MJ23ORk47c>  
<iframe width="560" height="315" src="https://www.youtube.com/embed/6MJ23ORk47c" frameborder="0" allowfullscreen></iframe>

boy / toy / day                      001.2006                      <https://youtu.be/PUUb3kF1lba>  
<iframe width="560" height="315" src="https://www.youtube.com/embed/PUUb3kF1lba" frameborder="0" allowfullscreen></iframe>

top / stop / got                      001.2007                      [https://youtu.be/zpON\\_wcBNMs](https://youtu.be/zpON_wcBNMs)  
<iframe width="560" height="315" src="https://www.youtube.com/embed/zpON\_wcBNMs" frameborder="0" allowfullscreen></iframe>

her / here / him                      001.2008                      <https://youtu.be/NJzvOLOXROU>  
<iframe width="560" height="315" src="https://www.youtube.com/embed/NJzvOLOXROU" frameborder="0" allowfullscreen></iframe>

me / she / he                      001.2009                      <https://youtu.be/tcWQrbVgbiY>  
<iframe width="560" height="315" src="https://www.youtube.com/embed/tcWQrbVgbiY" frameborder="0" allowfullscreen></iframe>

on / one / out                      001.2010                      <https://youtu.be/IH9eSiMdWyg>  
<iframe width="560" height="315" src="https://www.youtube.com/embed/IH9eSiMdWyg" frameborder="0" allowfullscreen></iframe>

hot / lot / got                      001.2011                      <https://youtu.be/moYb5Mq2yVY>  
<iframe width="560" height="315" src="https://www.youtube.com/embed/moYb5Mq2yVY" frameborder="0" allowfullscreen></iframe>

**car / cat / cart** 001.2012 <https://youtu.be/ODmaAGgkPpk>  
<iframe width="560" height="315" src="https://www.youtube.com/embed/ODmaAGgkPpk" frameborder="0" allowfullscreen></iframe>

**six / sit / kit** 001.2013 [https://youtu.be/IO1\\_N7gLGnS](https://youtu.be/IO1_N7gLGnS)  
<iframe width="560" height="315" src="https://www.youtube.com/embed/IO1\_N7gLGnS" frameborder="0" allowfullscreen></iframe>

**ten / when / then** 001.2014 <https://youtu.be/rYCWY-rTDdc>  
<iframe width="560" height="315" src="https://www.youtube.com/embed/rYCWY-rTDdc" frameborder="0" allowfullscreen></iframe>

**come / cow / came** 001.2015 <https://youtu.be/RIEz57JbpY8>  
<iframe width="560" height="315" src="https://www.youtube.com/embed/RIEz57JbpY8" frameborder="0" allowfullscreen></iframe>

**ball / call / fall** 001.2016 [https://youtu.be/uDu\\_dAxnkjA](https://youtu.be/uDu_dAxnkjA)  
<iframe width="560" height="315" src="https://www.youtube.com/embed/uDu\_dAxnkjA" frameborder="0" allowfullscreen></iframe>

**book / but / box** 001.2017 [https://youtu.be/t7u7\\_x58jVg](https://youtu.be/t7u7_x58jVg)  
<iframe width="560" height="315" src="https://www.youtube.com/embed/t7u7\_x58jVg" frameborder="0" allowfullscreen></iframe>

**say / may / day** 001.2018 <https://youtu.be/SKvnlfmfNfE>  
<iframe width="560" height="315" src="https://www.youtube.com/embed/SKvnlfmfNfE" frameborder="0" allowfullscreen></iframe>

**dad / did / bid** 001.2019 <https://youtu.be/JtWHw2YTMAA>  
<iframe width="560" height="315" src="https://www.youtube.com/embed/JtWHw2YTMAA" frameborder="0" allowfullscreen></iframe>

**come / gun / done** 001.2020 <https://youtu.be/ArgxcKwkFb8>  
<iframe width="560" height="315" src="https://www.youtube.com/embed/ArgxcKwkFb8" frameborder="0" allowfullscreen></iframe>

# Dictation Test

1. Dad came home.
2. I go to see him at the car.
3. He has a red hat.
4. We will go and look for our dog.
5. He is a boy.
6. Oh no, what did he do?
7. He ran out with the big ball.
8. He likes this toy.
9. We see six pigs and ten hens.
10. Two old cows sat with a man.
11. But our dog is not here.
12. may now be at home.
13. It was a hot day.
14. So we ride on and stop at the top.
15. We run and play in the sun.
16. We had good fun.
17. Now let us go to bed.
18. My fat cat sits on a box.
19. He looks at my pet rat.
20. Mom comes in with one big book.
21. Yes, she is the best.

# Dictation Test

1. Dad came home.  
<https://youtu.be/qq2PYBL1WQM>  
<iframe width="560" height="315" src="https://www.youtube.com/embed/qq2PYBL1WQM" frameborder="0" allowfullscreen></iframe>
2. I go to see him at the car.  
[https://youtu.be/b0SujlYe7\\_c](https://youtu.be/b0SujlYe7_c)  
<iframe width="560" height="315" src="https://www.youtube.com/embed/b0SujlYe7\_c" frameborder="0" allowfullscreen></iframe>
3. He has a red hat.  
<https://youtu.be/LyjbTAqeOIo>  
<iframe width="560" height="315" src="https://www.youtube.com/embed/LyjbTAqeOIo" frameborder="0" allowfullscreen></iframe>
4. We will go and look for our dog.  
<https://youtu.be/8r4gR7i4y28>  
<iframe width="560" height="315" src="https://www.youtube.com/embed/8r4gR7i4y28" frameborder="0" allowfullscreen></iframe>
5. He is a boy.  
<https://youtu.be/v19HAA1u0go>  
<iframe width="560" height="315" src="https://www.youtube.com/embed/v19HAA1u0go" frameborder="0" allowfullscreen></iframe>
6. Oh no, what did he do?  
<https://youtu.be/e0dJYg-DdLc>  
<iframe width="560" height="315" src="https://www.youtube.com/embed/e0dJYg-DdLc" frameborder="0" allowfullscreen></iframe>
7. He ran out with the big ball.  
<https://youtu.be/FyGnMaYv6Kw>  
<iframe width="560" height="315" src="https://www.youtube.com/embed/FyGnMaYv6Kw" frameborder="0" allowfullscreen></iframe>
8. He likes this toy.  
<https://youtu.be/XffNfw39nei>  
<iframe width="560" height="315" src="https://www.youtube.com/embed/XffNfw39nei" frameborder="0" allowfullscreen></iframe>
9. We see six pigs and ten hens.  
<https://youtu.be/ak5taC4xFtM>  
<iframe width="560" height="315" src="https://www.youtube.com/embed/ak5taC4xFtM" frameborder="0" allowfullscreen></iframe>
10. Two old cows sat with a man.  
<https://youtu.be/zbuDGBP8xnY>  
<iframe width="560" height="315" src="https://www.youtube.com/embed/zbuDGBP8xnY" frameborder="0" allowfullscreen></iframe>
11. But our dog is not here.  
<https://youtu.be/ghurpSH0ohs>  
<iframe width="560" height="315" src="https://www.youtube.com/embed/ghurpSH0ohs" frameborder="0" allowfullscreen></iframe>
12. may now be at home.  
<https://youtu.be/kKR0ZDzO5gA>  
<iframe width="560" height="315" src="https://www.youtube.com/embed/kKR0ZDzO5gA" frameborder="0" allowfullscreen></iframe>

13. It was a hot day. <https://youtu.be/1asAAXCQqh4>  
<iframe width="560" height="315" src="https://www.youtube.com/embed/1asAAXCQqh4" frameborder="0" allowfullscreen></iframe>
14. So we ride on and stop at the top. <https://youtu.be/FutGoXhVg3Q>  
<iframe width="560" height="315" src="https://www.youtube.com/embed/FutGoXhVg3Q" frameborder="0" allowfullscreen></iframe>
15. We run and play in the sun. <https://youtu.be/Z7SQ1y1edIU>  
<iframe width="560" height="315" src="https://www.youtube.com/embed/Z7SQ1y1edIU" frameborder="0" allowfullscreen></iframe>
16. We had good fun. <https://youtu.be/V28m7STfQgA>  
<iframe width="560" height="315" src="https://www.youtube.com/embed/V28m7STfQgA" frameborder="0" allowfullscreen></iframe>
17. Now let us go to bed. <https://youtu.be/fpUKR8yX8OA>  
<iframe width="560" height="315" src="https://www.youtube.com/embed/fpUKR8yX8OA" frameborder="0" allowfullscreen></iframe>
18. My fat cat sits on a box. <https://youtu.be/s7KpVXW9r3E>  
<iframe width="560" height="315" src="https://www.youtube.com/embed/s7KpVXW9r3E" frameborder="0" allowfullscreen></iframe>
19. He looks at my pet rat. <https://youtu.be/sDUmYVNDIo4>  
<iframe width="560" height="315" src="https://www.youtube.com/embed/sDUmYVNDIo4" frameborder="0" allowfullscreen></iframe>
20. Mom comes in with one big book. <https://youtu.be/BDdwXFzPmY>  
<iframe width="560" height="315" src="https://www.youtube.com/embed/BDdwXFzPmY" frameborder="0" allowfullscreen></iframe>
21. Yes, she is the best. <https://youtu.be/aQRxxWMmqhs>  
<iframe width="560" height="315" src="https://www.youtube.com/embed/aQRxxWMmqhs" frameborder="0" allowfullscreen></iframe>