



**PROFESSIONAL BACHELOR IN SECONDARY
EDUCATION**

Bachelor's Thesis

**Mathivate:
motivated mathematical sport
activities**

PROMOTOR
ANNIEK ORYE
PEDAGOGIE

MARIEKE DE BATSELIER
LICHAMELIJKE OPVOEDING - BIOLOGIE
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Foreword

This bachelor's thesis is established in scope of my education 'Professional bachelor in secondary education with a specialization in physical education and biology'. The topic 'How can you combine sport activities with mathematic exercises for street children, 6 to 8 years old, in Zambia' applies in the school Unisport in Makululu.

I am very glad that I had the opportunity to complete my internship and my research at Unisport. Therefore I want to thank Geoffrey who is the founder of Unisport and who gave me the opportunity to teach at Unisport. I also want to thank the organisation 'steunwielekes4Zambia' who sponsor Unisport and who made it possible for me to have sport equipment. Thereafter I also want to thank my teacher trainers Arjan Goemans and Anniek Orye who supported me before and during my internship, who gave information and who helped to arrange my internship. At last I am so grateful for my family and friends who where there every time I needed them and who supported me from the beginning to the end.

Thank you for your part in my journey.

De Batselier Marieke

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Introduction

The 9th of January 2018 was the day that my big adventure started: I went to Zambia for my internship to teach physical education at the school Unisport. Unisport is a school in Makalulu and aims to bring the street children together through sport. Moreover, the street children have a lack in financial support. Therefore, Unisport gives them a chance for free basic education. So they have the possibility to learn mathematics and English. Contrary to their aims, the current classes were quite static during my observation. Therefore, my challenge was to investigate how you can combine sport activities and mathematical exercises for street children, 6 to 8 years old, in Zambia. At first I needed to explore the prior knowledge of the children where I quickly realised that I needed to start teaching them the basics. The exercises I used are based on the progress of the children in the previous class. All the exercises I used are collected in the book "Mathivate". Unisport has still the possibility to reuse and improve my exercises. The difficulty of the exercises in the book is gradually built up. The exercises are overall useable within different learning levels. Every exercise contains the beginning situation of the children, the objectives, an error analyse with the remedy and the description of the exercise. The exercises are mentioned in annex A.

1 Zambia in a nutshell

1.1 History of Zambia

The nomadic San hunter-gatherers were the original inhabitants of Zambia. In the 4th century, the Bantu settlers started arriving and were the first people to introduce agriculture and copper mining.

Dr David Livingstone became in 1855 the first British explorer to visit Zambia. He discovered the Victoria Falls, named in honour of Queen Victoria, on his exploration of the Zambezi River. The town Livingstone was named after him and served as the capital.

In the last quarter of the 19th century, Cecil Rhodes arrived at the age of eighteen in Kimberley where he started his career as an entrepreneur. His two companies, De Beers Consolidated Mines and Gold Fields, dominated the South African export of diamonds and gold. Rhodes' ultimate wish was a continuous strip of British empire from the Cape to the mouth of the Nile. Mzilikazi's son, Lobengula, grants Rhodes the mining rights in part of his territory in return for money and armed steamship. Thanks to these arrangements, Rhodes sent the first group of colonists north from Bechuanaland in 1890.

Because of the developments in transport, the population of settlers increased rapidly. This territory has been given name to its colonial founder. Rhodesia is known from the region up to the Zambezi. (Verrijp & Willems, n.d. ; World Travel Guide, n.d. ; Historyworld, n.d.)

Many of Lobengula's tribe tried to expel the intruders. In 1893 the war against Lobengula is declared. Lobengula fled when Rhodes easily fought his way to Bulawayo. Thereafter Rhodes had the entire region up to the Zambezi under full control. In 1890 Rhodes arrived in Barotseland. After an agreement with Lewanika, Rhodes' company had administered the region from the Zambezi up to Lake Tanganyika which represents these days' Zambia.

From 1900 onwards, Northwestern and Northeastern Rhodesia was born and were separately administered by Rhodes' company.

In 1902 lead and zinc were found at Broken Hill (now Kabwe). Northern Rhodesia was rich of minerals. The border between Northern Rhodesia and the Belgian Congo contained the world largest reserves of copper. This region is known as the Copper Belt.

By 1950 the political future of the African colonies is under discussion. The European population of the two regions assume that Northern and Eastern Rhodesia will merge to a single independent nation. In 1953 the British government imposed a compromise with Rhodesia to be a self-governing colony with its own assembly and prime minister. Rhodesia has been a self-governing colony from three decades with no African suffrage. In the 1960's the African politicians win more power in their legislative councils. The British government admitted independence of the colonies in March 1963. On December 1963 the federation is formally dissolved. Northern Rhodesia was in 1964 renamed to Zambia. Kenneth Kaunda is the president of the new nation who begins a career of three decades. (Verrijp & Willems, n.d. ; World Travel Guide, n.d. ; Historyworld, n.d.)

The mineral rights now accrue to the Zambian state. Due to this the economy grows and the price of the copper rises dramatically. This was largely due to the needs of the Vietnam War. There was a major decrease in the price of copper in 1975. Zambia has known many difficulties. These difficulties cause Kaunda to impose a state of emergency. The parliament was responsible for innovations, which led to a state of normality.

In the elections of 1991, Kaunda had less than one sixth of the seats in the national assembly. MMD (the Movement for Multiparty Democracy) won the massive majority. Frederick Chiluba, the trade's union leader, easily defeats Kaunda in the battle for the presidency. Chiluba couldn't change the constitution to allow him to stand for the third time. Michael Sata quit the MMD when he wasn't selected as the MMD presidential candidate. Sata formed the PF (the Patriotic Front). Sata wins the elections of 2011. However, Sata died in office in October 2014. In January 2015 a by-election was held where Edgar Lungu won

and he is still the current president. (Verrijp & Willems,n.d. ; World Travel Guide,n.d. ; Historyworld,n.d.)

The Zambians attach a lot of value to the president. Every building contains a portrait of the president and most of the women wear shitenzes with a portrait of the president on. Subsequently it is very important for a foreign teacher to show respect towards the president.

Unisport (Makululu) is found next to the centre of Kabwe. The influence of the copper mines in Kabwe is enormous for the inhabitants. The majority of the inhabitants contain an overdose of copper in their blood. Due to the closing of the mines, a lot of people lost their job and became even poorer. As a result the mortality rate increases as well as the disease rate.

1.2 Geography of Zambia

Zambia has his name due to the Zambezi River. The river runs across the western and southern border, forms later on the Victoria Falls and flows into Lake Kariba and on to the Indian Ocean.

The butterfly-shaped boundaries are the result of the European fight for Africa's natural resources in the early 1900's.

Picture 1: Geography of Zambia



(Geography of Zambia,n.d.)

Lusaka = the capital

Lake Kariba

Zambezi River

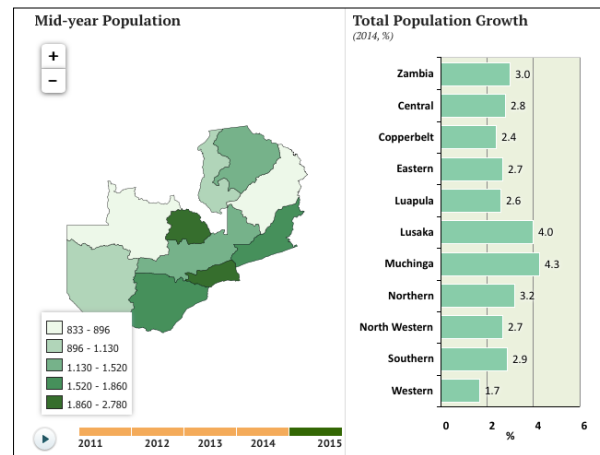
Bordering countries are the Democratic Republic of Congo, Tanzania, Malawi, Mozambique, Zimbabwe, Botswana, Namibia and Angola. Zambia doesn't have a sea border but contains large freshwater lakes like Lake Tanganyika, Lake Mweru, Lake Bangweulu and Lake Kariba, which is the largest man-made lake in Africa.

Zambia contains high plateaus, large savannahs. The highest altitude is in the Muchinga Mountains at 1828 meters. (FOX,n.d. ; Verrijp & Willems,n.d.)

1.3 Demographics

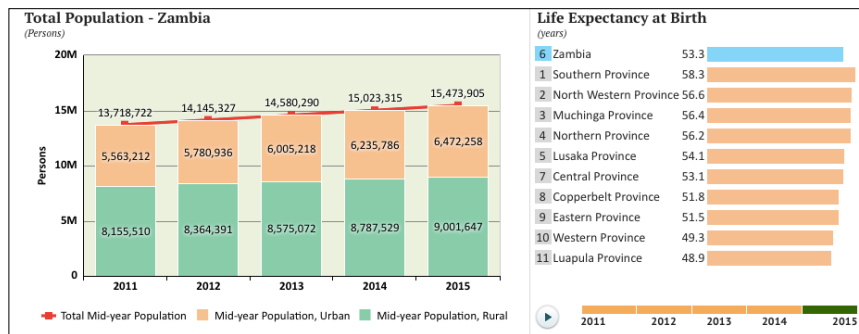
The biggest concentration of people live in the capital Lusaka, Muchinga and along the Copperbelt where the country's major source of income is established. Therefore, a lot of families migrate to urban areas looking for employment. Contrary, families who live in the rural areas face a life of mainly low-yielding subsistence farming. This leads to a high immigration to the urban areas. There are around 16,4 million people living in Zambia. The population is almost equally divided into males and females. Zambia's population density is 22.5 people per square kilometer as of January 2017. The following graphics (a, b and c) present an overview of the population growth. (Worldometers, 2018)

Picture 2: Demographics a



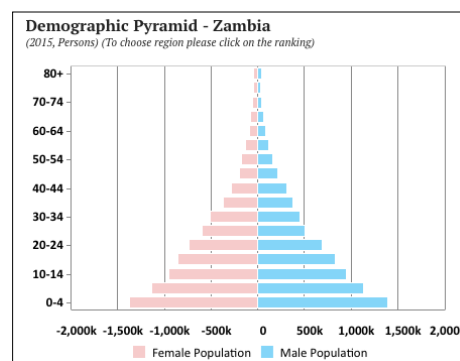
(Central statistical office, 2018)

Picture 3: Demographics b



(Central statistical office, 2018)

Picture 4: Demographics c



(Central statistical office, 2018)

The largest part of the population consists of seven main tribes and a collection of seventy-five minor tribes. The main tribes in Zambia are Bemba, Ngoni, Lozi, Chewa, Chowke, Lunda, Luvale, Tonga and Tumbuka. Zambians may consider their tribe better than another tribe, but there is an overall sense of unity across all groups. In the cities, there is a strong interaction between the tribes. Some people choose to marry out of their own tribes, which strengthens the ties between the different groups. Because of this, Zambia has become more homogenized.

There has been a large influx of refugees because of the conflicts in the border countries of the Democratic Republic of Congo and Angola. Most common are Asian, Indian and European.

There is also a strong national identity despite of that the people retain strong ties to their tribe or clan. From 1500 to 1700, Zambia became a settling ground for many migrating tribes, who create a crossroads of culture in the country. These tribes have lived in peace with each other for decades. The first president, Kenneth Kaunda, introduced the slogan "One Zambia, One Nation." This was a strong symbol of the national identity. (Historyworld,n.d.)

1.4 Language

English is the official language as the country was once an English colony. Zambia has over 70 local dialects but the most spoken tribal languages are Bemba, Lozi, Luanda, Luvale, Nyanja, Tonga and Tumbuka. Each of the seventy-five tribes living in the country has its own dialects and language. (Nederlands Instituut voor Zuidelijk Afrika,n.d. ; Project Luangwa, 2011)

Picture 5: Language in Zambia



(Sinkolongo, 2008)

For example, the following terms are used to describe the days of the week in Bemba.

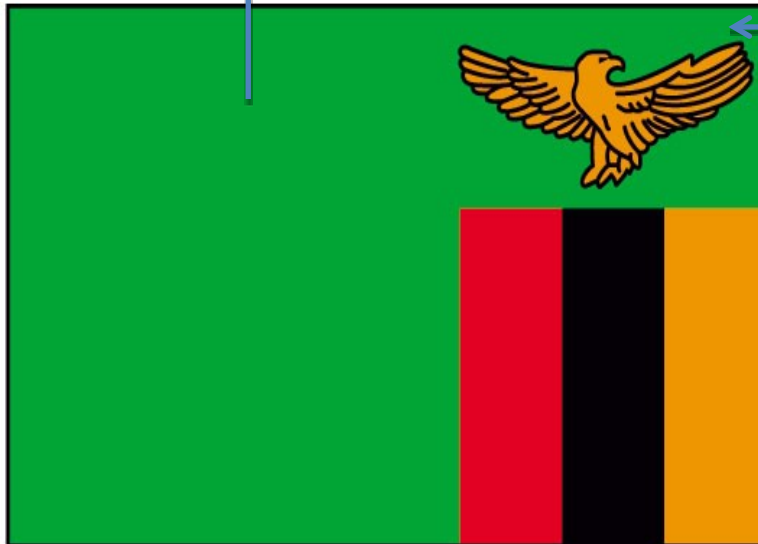
The prefix "Pali" means "On", "On Monday", except for Saturday and Sunday when "Pa" is used. (JS,n.d.)

Monday	Pali Cimo
Tuesday	Pali Cibili
Wednesday	Pali Citatu
Thursday	Pali Cine
Friday	Pali Cisano
Saturday	Pa Cibelushi
Sunday	Pa Mulungu

1.5 The national flag

The green background is symbolic, it stands for of the country's natural beauty. (Our Africa,n.d.)

Picture 6: National flag



The copper-colored eagle symbolizes the country's ability to rise above its problems.

(maize,n.d.)

Red stripe is symbolic, it stands for the country's struggle for freedom.

Black stripe is symbolic, it represents the majority population.

Orange stripe is symbolic for the country's copper riches and other mineral wealth.

1.6 Food in Zambia

The availability of food supplies depends on season and location. The main staple is nshima, which is made of maize. In rural areas meat is not eaten on a regular basis. Nshima is served with beans, vegetables or dried fish. (Our Africa,n.d.)

Picture 7: Nshima



(Goal Zambia, 2014)

More seasonal foods are peanuts, sweet potatoes and cassava. Fruits like bananas, mangos, paw paws and pineapples are more current. Most Zambians don't have refrigerating equipment. Moreover, a lot of food is dried to extend its shelf life. In the big cities, there are plenty of fast-food establishments that serve quick Western food.

Every tribe has its own tradition. For example, in the Bemba culture it is taboo for a bride to eat eggs because it may affect her fertility. The newlywed receives a pot of chicken whose bones are replaced in the pot. Those bones are given to the bride's mother. (Nederlands Instituut voor Zuidelijk Afrika, n.d. ; Our Africa, n.d.)

1.7 Socio-economic situation

Industrial manufacturing is limited, especially daily products are produced in the country like nshima. Most people in the smaller urban areas have shops or stands in the local marketplace, where they sell products or provide services such as watch repair. As mentioned in "1.3 Demographics" are job opportunities in the larger urban areas the main cause for migration in the country. The Zambian economy has grown fast over the recent years but the poverty remains a problem. The country depends of the copper, which makes it vulnerable for low copper prices. In 2010 Zambia has known a high record for copper prices and a bumper maize crop that helped Zambia to quickly rebuild the economy. Despite the growth of the economy there were still high poverty rates caused by a high birth rate and relatively high HIV/AIDS burden. The majority of the population is poor and 2/3 earn less than a dollar per day. There is a big difference in poverty between the urban and the rural population, with 34% urban poverty and 80% rural poverty.

Zambia has started a gender ministry to address issues related to gender and development. However, this progress is moving slow. Marriage is legal at the age of 16 for statutory marriages and the parents still need to sign when their children marry under the age of 21. Unlike customary marriages, wherein it is legal to marry a girl who has attained puberty. As a result of early marriages many girls will be prevented to go back to school caused by traditional cultural and social factors.

Therefore, the challenge for Zambia is to address the lack of enforcement of the law and culture of impunity for perpetrators of violence against women. Zambia had an active women's movement leading major reforms. Only 25,7% of adult women and 44,2% obtain a secondary or higher level of education. (Viruos, n.d.)

1.8 Health issues

Zambia knows a high burden of disease caused by transmittable diseases like malaria, HIV (Human Immunodeficiency Virus)/ AIDS (Acquired Immune Deficiency Syndrome), STD (Sexually Transmitted Disease), TB (Tuberculosis) and high child morbidities and mortalities. There are also a lot of non-transmittable diseases like mental health, diabetes, cardiovascular diseases and violence. The lessons about sexual education are very useful as an intervention to contribute to the reduction of mortality and morbidity. The past years the health sector recorded significant progress in the most areas of health service delivery and health support systems. (Commonwealth health online, n.d. ; Our Africa, n.d.)

1.9 Justice and human rights

Most inhabitants of Zambia do not know their human rights. Moreover, even if they do know, they still have no access to legal assistance to enforce or protect their rights in case of legal conflicts. Access to justice remains a big challenge for the people and violates the human and democratic rights. (Nnoko-Mewanu, 2017)

1.10 Education in Zambia

The Zambian education system is divided into three levels: primary school, junior secondary school and university for undergraduate degrees. The system has a 7-5-4 structure, meaning 7 years at primary school, 5 years at junior and higher secondary school and 4 years at university. Pupils are expected to complete primary education at the age of 13. It is common that the pupils complete it at the age of 14 or 15 due to insufficient school places in grade 1. In order to obtain their primary school diploma and to be admitted to secondary school, pupils need to pass an examination at the end of grade 9. At the end of grade 12, the students need to pass an examination for selection for the university.

The primary language of instruction in Zambia is English but children in public schools are also required to learn an additional local language, depending on their provincial district. The school year in Zambia runs from January to December.

The Zambian education system has three types of schools: public school, private school and international school. Parents who have no access to quality education for their children consider home-schooling as an option. (Dickens, 2016 ; Classbase,n.d.)

1.10.1 The public school

The public school is free until grade 7 but the parents still need to pay the additional costs like uniforms and books. The price can reach from 7 euro until 40 euro per year. Those costs are for some parents too high to pay given the fact that they earn an average monthly wage of 300 euro causing the school attendance to drop. (Expat Arrivals, 2017 ; Classbase,n.d.)

1.10.2 Private school

The private schools operate independently of the Zambian government and have more flexibility in curriculum, language of instruction and procedures. These schools are run by a particular church and operate according specific religious denominations.

There are also private schools, which are run by a community. Those schools are often small rural schools with limited resources and they were build to fit the needs of the local community and do not charge high or any fees.

Private schools, particularly those in Lusaka, offer better facilities and opportunities for students. But those schools can have high fees. Therefore they are out of reach of many ordinary Zambians.

Private schools in Zambia can follow the Zambian curriculum, but mostly they are based on the American or British schooling system. (Expat Arrivals, 2017 ; Classbase,n.d.)

1.10.3 International school

The international schools are mostly based in Lusaka. There are about nine international schools and are mostly based on American or British curriculum. The school year runs according the academic year of their home country. For example, the American schools run from August to mid-June in the following year. The fees at the international school can reach up to USD 20 000 per year. (Classbase,n.d. ; Dickens, 2016)

2 Implemented theories

2.1 21st century skills

The 21st century skills are skills that the students need to have to participate successfully in the society. The society changes due to technology and digitization from an industrial to a knowledge – network society. The computers and the machines do more and more the work that used to be done by people. The youth need to develop the different skills to prepare themselves for the labour market. Computers can do tasks like algorithm but we still need people for tasks to interpret complex patterns. Different jobs are based on tasks where the present of skills are required.

There are 11 21st century skills (classified in learning, literacy and life skills):

Learning skills	Literacy skills	Life skills
Critical thinking	Information literacy	Flexibility
Creative thinking	Media literacy	Taking initiative
Collaborating	Technology literacy	Social skills
Communicating		Productivity
		Leadership

During my classes, I created the exercises with a focus on developing different skills, for example taking initiative to help the other children during the games. As the group is very diverse, the older children take more responsibility and leadership. In case of problems I let the children communicate and facilitate in solving the problems themselves. The children are getting an opportunity to work together and create materials like a handmade football. (Pijpers, 2017 ; Voogt & Roblin, 2010)

The focus of the exercises is based on the 21st century skills as well as on physical and mathematical skills.

2.2 Self-determination theory

The self-determination theory is developed by Edward L. Deci and Richard M. Ryan. This theory describes that motivation depends on three needs: competence, relatedness and autonomy. Competence means that the child needs to have confidence in what he/she is doing and that he also has the feeling that he/she can do it. Relatedness deals with the desire to interact with, be connected to and caring for other people. Autonomy means that the child has a sense of free will when doing something.

The three needs are congenital and essential for the functioning of the human. The more we can meet on these three conditions, the less the need of natural development will be interrupted. People are by nature focused on growth and development, but mostly in interaction with each other. (Positive psychology program, 2017 ; Van den Broeck, Ferris, & Chang, 2016)

During the class I try to achieve these objectives. The lessons are free for the street children. The children can participate when they want. In the class I explain the purpose and the importance of the exercises. I give the children the chance to express their preference and let them think with me about the exercises. Hereby I try to appeal the autonomy of the children. The exercises are arranged in a way that children with a different start level can participate. Children get the opportunity to learn according their level. The more advanced children help the children with a lower level. This has the consequence that respect and support will occur between the children in which they dare to fail and grow. With the previous examples, I work on the competence and relatedness of the children. Through this method I encourage them to come to the classes, as a result that they are motivated intrinsic.

There are 2 types of motivation: intrinsic and extrinsic motivation. Ryan and Deci define intrinsic motivation as: *“Doing of an activity for its inherent satisfaction rather than for some separable consequences”*. So intrinsic motivation is when you are doing something because you like to do it. Extrinsic is defined by Ryan and Deci as: *“a construct that pertains whenever an activity is done in order to attain some separable outcome”*. The motivation is found in external factors like punishment and rewarding of something. (Zelfdeterminatietheorie, 2011) By creating a positive environment, I try to appeal their intrinsic motivation to come to the lessons. (Positive psychology program, 2017 ; Van den Broeck, Ferris, & Chang, 2016)

2.3 The importance of sport for children

A cooperation of different values will result in a well functioning of the general body. As first it is known that physical training is good for the body and the mind. Especially when you are young it will influence your mood and memory, the strengthening of the bones, clearing bad cholesterol from the arteries and decreasing the risk of high blood pressure and diabetes. The brain will also release chemicals like endorphins that can give euphoria feelings. Physical training has also an effect on social behaviour. For example learning to trust and depend on others, accept help, give help and working together to a common goal. School sport participation will also reduce the chance on a depression and your self-confidence will increase. In all of these examples, the coach has a very important role to guide the children towards these values.

Sport and physical training do have enormous advantages.

There are 6 core values where you can see those advantages

1. Physical value
2. Emotional value
3. Social value
4. Personal value
5. Intellectual value
6. Financial value

These 6 core values are connected to each other. If there is a change in one of them you will notice it in the other core values (Gezonde school, 2016 ; Bisseling, 2018)

2.3.1 Physical value

Sport and physical training have a positive effect on life expectancy. Sport will reduce the chance on diabetes, cardiovascular disease, cancer, etc. The earlier you learn the value of physical training, the longer you'll have the advantage of this value, so it is important to start with sports at a young age. (Gezonde school, 2016 ; Bisseling, 2018)

The physical activity of the street children in Kabwe is limited. As a result that the prevalence of the previous mentioned diseases is common. Most of the inhabitants of Kabwe don't realise the importance of physical activity.

2.3.2 Emotional value

Physical training will influence your emotional condition. Here it is mainly about self-confidence and self-esteem. Physical training has a positive effect on emotional disorders and mood disorders. Physical training will help you manage fear and stress better. The role of the coach is very important. How the coach will cope with winning or losing a game and how he/she will encourage the children will determine if the emotional value of sport is positive or negative. For example it will influence the thinking of the children. If the coach puts fun over winning, the children will focus on the fact to have fun during a competition. The opposite is that the child will focus on winning during a competition if the coach puts

winning over fun. Both groups will interact in a different emotional way. The children with the focus on winning experience more the feeling of worry, doubt and fear. (Taylor, 2017)

Most of the street children experienced one or more traumas for example the loss of one or both parents. Physical training helps the street children to cope with their traumas'.

2.3.3 Social value

When sports and physical training activities are organized in a structured and respectful way for all members, they can contribute to the development of social skills. It will reduce and even prevent asocial and criminal behaviour amongst young people. In some cases street children find it difficult to communicate with other people and to express themselves.

There is a social climate during sports where children can develop social skills. They will learn how to make friends and whereby community arises. Children with different (social) backgrounds with a shared passion have the opportunity to learn more about each other. During the sport activities I let the children interact with each other. I lead and coach them within these interactions. For example: in one of my first classes I noticed that the children always slapped each other on the head. I appealed them and explained what was wrong and showed them another way to interact with each other. If someone did it in the following classes, the other children explained the child that slapping is not allowed. (Gezonde school, 2016 ; Bisseling, 2018)

2.3.4 Personal value

Sports and physical training can influence someone's character. It has an effect on, for example, assertiveness, self-control, enthusiasm and social skills, teamwork, communication skills, taking decisions, problem solving ability, responsibility, empathy and resilience.

The personal effects will be greater due to coaches, teachers and the social environment where the activities take place. I found personal value very important during my classes. Every child has its own qualities and talents, which I tried to appeal. I gave the children a task wherein they had the freedom to take a decision, solve problems and work with other children... This gave the children the opportunity to develop responsibility and self-assurance. (Gezonde school, 2016 ; Bisseling, 2018)

Sports and physical training can influence someone's life experience and lifecycle.

2.3.5 Intellectual value

Physical activity leads to an increase of blood supply in the brain, which makes you more alert and stimulates brain development.

When we study the brain more in depth with electroencephalograms (EEGs), we can notice that the performance of cognitive tasks does indeed appear to be influenced by physical activity. The following applies: the more you sport, the better you can perform cognitive tasks at an older age.

2.3.6 Financial value

Regular physical training has an influence on the income of people. This can be explained by the fact that movement leads to the acquisition of different values that ultimately make people more responsible, competitive and productive.

The financial value is therefore the result of the physical, emotional, individual, intellectual and social value of sport and physical training. (Gezonde school, 2016 ; Bisseling, 2018)

2.4 The importance of mathematics for children

When you think about daily life, we use mathematics all the time. When we lay the table, you ask yourself how many forks or knives do I need? When you have a look at the menu chart in a restaurant, you notice the price next to the dishes. Everything in life has a certain value, and thus is a certain number. In case you haven't learn how to count, you see only a number, but you don't know which value the number has. The education of number comprehension to children is priceless. The chance for a job and thus a better future is small without this knowledge.

At the age of 2 children start to recognize different quantities. Children understand that different numerals indicate a certain quantity, but can't make the correct connections between the numeral and the quantity. The children learn in the beginning of the learning process to recognize small quantities. They know that every quantity is connected with a numeral at the beginning, but they will make mistakes when they must connect the correct numeral to a certain quantity. As a second step the children start to count aloud. They say random numerals. Children imitate songs or verses where numerals occur.

After imitating songs, the children start to count objects. If they're able to count and point out the correct amount of objects, we speak about synchronized counting.

Thereafter the children start to order objects in the correct order when they're counting.

During this structured counting errors like counting twice the same object will be omitted.

The children will move objects away once they've count them, they can also start to count by 2 at a time (two, four, six, eight, ...) From then we speak about resultative counting. During this phase the children know that they have to start with '1' and that every object can only be counted once. The last numeral will indicate the total quantity. As last step the children become aware that there are faster ways to determine quantities. The children recognize in a values in quantities, eg. 5 and start from five on with counting, they know that numerals are connected with each other. (Lerarenredactie, 2017 ; Prof. van Luit, 2009)

This theory helped me to understand the mathematical learning methodology. The children already knew some songs to learn how to count. I made a general paper (Annex A: general paper), which helped me to teach them the different numbers and the meaning of a number. As the classes progressed, the level of the activities became more difficult. The younger children still used the general paper but the older children did the exercises without the general paper.

3 The project

3.1 Unisport.

Unisport is a school founded by Geoffrey Msiska who is a former football player at the Kabwe United for eight year. Unisport is situated in Makalulu, Kabwe. In this district are living a lot of street children. Those street children cannot afford to go to school. Geoffrey wants to give the street children an opportunity of basic education. The teachers in Unisport are volunteers and have mostly no teaching education. This gives Unisport the power that they don't need to charge money from the street children.

Unisport is supported by a Belgian organisation 'steunwielekes4zambia'. This organisation collects money for the infrastructure of Unisport.

<http://www.steunwielekes4zambia.be>

The progress of Unisport during my internship in Zambia:





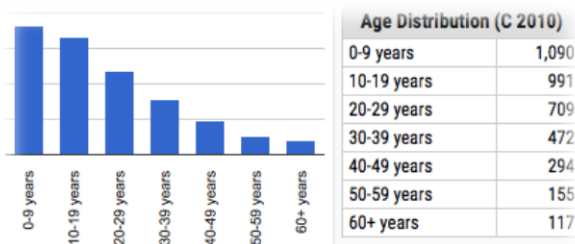
3.1.1 Makululu (Kabwe)

Makululu is located in the urban centre of Kabwe. Kabwe is Africa’s most toxic city and is ranked as the world’s fourth most polluted site, according to a survey published by the Blacksmith Institute, a New York-based organisation monitoring pollution in the developing world. However, for many people their income depends on the sales of the scrap metal sell by the roadside.

If those people don’t sell by the roadside, then they cannot feed their children. They have barely enough money to buy food causing that education for their children is not an option.

Due to those circumstances the maximum age of most people is around 60 years.

Picture 8: Age distribution



(Makululu population,n.d.)

However, many people die at a really young age. This makes many children orphaned. Some children are taken care by the family but other children end up on the street. Those children are very vulnerable and are obligated to become mature very quickly. They need to search food or work to survive. Going to school is not an option for them because the time that they need to be on school is wasted time to find food or money. (Namugala, 2006) (IRIN, 2006)

“It is obvious that the respondents regard returning to school as an important means of assisting street children. Perhaps it presents more than just access to education and reflects a desire to be part of the larger group and to do what children are “supposed to do”.

(Namugala,2006, p.52)

3.2 The research

Practical (classroom, material, teacher)

The lesson took place on a field in Makululu. The state of the field depended of the rainfall from the previous days (big mud puddles after heavy rainfall). Most of the children don't wear shoes causing the mud puddles are dangerous for the children to get infected.

The material below was available to use.

Material	Quantity
Tribord	2
Tennisracket	2
Tennisball	8
Discplays	4
Badmintonrackets + net	4 (1x net)
Shuttles	5
Skipping rope	5

I also made cones and collection trays from recycled material that was useable for different exercises. There is a lot of garbage on the street like I mentioned in '3.1.1 Makululu'. I showed to the children that garbage can be still useable if you try to use your creativity. The children also made a football of old plastic and newspapers.

The teachers are volunteers of the community and thus do not have a teaching diploma. During the observation I could note that they teach with a lot of love but that they make a lot of mistakes on the chalkboard.

Participant (interrelationships, behavioural problems)

The closure of the mining industry made the poorest people poorer. A lot of families didn't had the money anymore to finance the school of the children. The people couldn't take care anymore of their family. They couldn't afford medical support which increased the disease rate as well as the death rate. With the result that a lot of children became orphan. Most of these children leave with family or on the street. Street children cooperate together. Every child has its own task within the ranking system.

Prior knowledge and experience

The street children don't have the money to go to school. The prior knowledge they have is the knowledge they learned on the street. Most of them can't write, read or calculate. They know the existence of it but not its use. The older street children learn each other the basic things like the numbers until ten and the different letters of the alphabet.

Objectives

The children can cooperate.

The children help each other to perform an exercise correctly.

The children can throw a ball in a goal-oriented manner.

The children can catch a ball with both hands.

The children get a task and perform this task in a game.

The children can write a coarse version of the numbers.

The children can recognize the numbers up to ten/twenty/thirty.

The children can count up to ten/twenty/thirty.

The children can indicate the correct amount with the corresponding number.

The approach

The main thing during the first lessons is to get to know each other and the prior knowledge of the children in physical possibilities and mathematics. Discovery games are a playful way to get to know these things. During these games, the teacher can notice if the children communicate in English or Bemba (local language) with each other. Most of the time the children will use Bemba because they didn't learn how to speak English. Moreover, creating confidence with each other is also one of the most important things to work on during the first classes with street children. The street children suffered from traumas. Most of them lost one or both parents or other friends and family. The street children are open to the teacher if they really trust the teacher.

The following lessons are based on a combination of the notes of the discovery games and the mathematical learning theory explained in '2.4 The importance of mathematics for children'. A useful tool is a general paper upon which you write the numbers in ascending order with the corresponding amount next to the numbers (visual support) and the notation of the numbers. This is a sustainable tool, which can be completed depending on the level of the lesson (example in annexe A). During the first uses of the general paper, the teacher puts the finger of the children on the figures (visual support) and count together with them. Subsequently the children try to use the paper without support of the teacher during the exercises.

The lessons are structured qualitatively but most of the exercises are useable within different levels. Every lesson is based on the evolutions of the children in the previous lessons. The physical exercises are motoric more difficult. The numbers in mathematical exercises become bigger and the calculation exercises more difficult.

At first the teachers start to teach the children the numbers in ascending order from zero up to ten/ twenty/ thirty... After getting to know the numbers, the children learn how to count in ascending and descending order, the children can recognize the different numbers and they can indicate the corresponding amount with the correct number. The teacher adjusts the exercises depending on the evolutions of the children.

Main achievements

After a few lessons I noticed that the children really value the activities that I did with them. Every morning when I arrived they were already waiting and ran while laughing and shouting 'Mzungu' (white man). Mostly I started with a group of 6 to 9 children and ended with a group of 40 to 50 children. My group was very various, the age of the children started at 3 up to 16 years old. I gave the older children also the responsibility to take care and help the younger ones. Hereby I guide them to develop their responsibility and independency. The children realised very quick how they need to use the general paper. If they needed support during an activity, they always asked for the paper. Due to the combination of the physical activities and the mathematical exercises it was easier for the children to understand the meaning of the different numbers. After a few lessons they could already count to five/ten. At the end of my teaching practice most of the children could count from zero up to thirty and some even further.

4 Conclusion

The purpose of this research was to investigate how can you combine sport activities with mathematic exercises for street children, 6 to 8 years old, in Zambia? Because of the young age of the pupils and the language barrier I let the pupils get acquainted in a playful way with mathematics. These exercises are based on the evolutions of the pupils during the lessons. The challenge was to make exercises which were achievable for every pupil. I made general exercises which I could differentiate depending of the level of the pupils. The language barrier caused that sometimes the pupils didn't understand my explanation from the first time. In order to conquer this, I gave the pupils who understand a little bit of English the task to explain the purpose of the exercises in Bemba. In this way I could teach the pupils how to handle with a certain manner of responsibility as one of the competences of the 21st century skills. I let the pupils participating in the organisation of my exercises, as the pupils know the environment much better than I did. They already know certain solutions on problems that can occur such as mud puddles and suddenly heavy rainfall. With this I allowed the pupils to experience certain autonomy in which they have the freedom to speak, think and create. In this context it was very important to create general exercises in which there is still freedom to challenge the children to think with you.

This project had also an effect on my personal and professional evolution. I became more social and confident in teaching and making decisions. I dared to explore my limits, which showed me that I could do more than I expected. My creativity had the chance to reach further than I'm used to with the result that I am very proud on the exercises that I found. I proved myself that I don't need to have tools to make good lessons. The lessons do not depend on the tools but on the atmosphere and the relation between the teacher and the pupils. If a teacher really feels the capability of the pupils, he/she can make general exercises that are based on the level of the pupils.

*Imagine with all you mind.
Believe with all your heart.
Achieve with all your might.*

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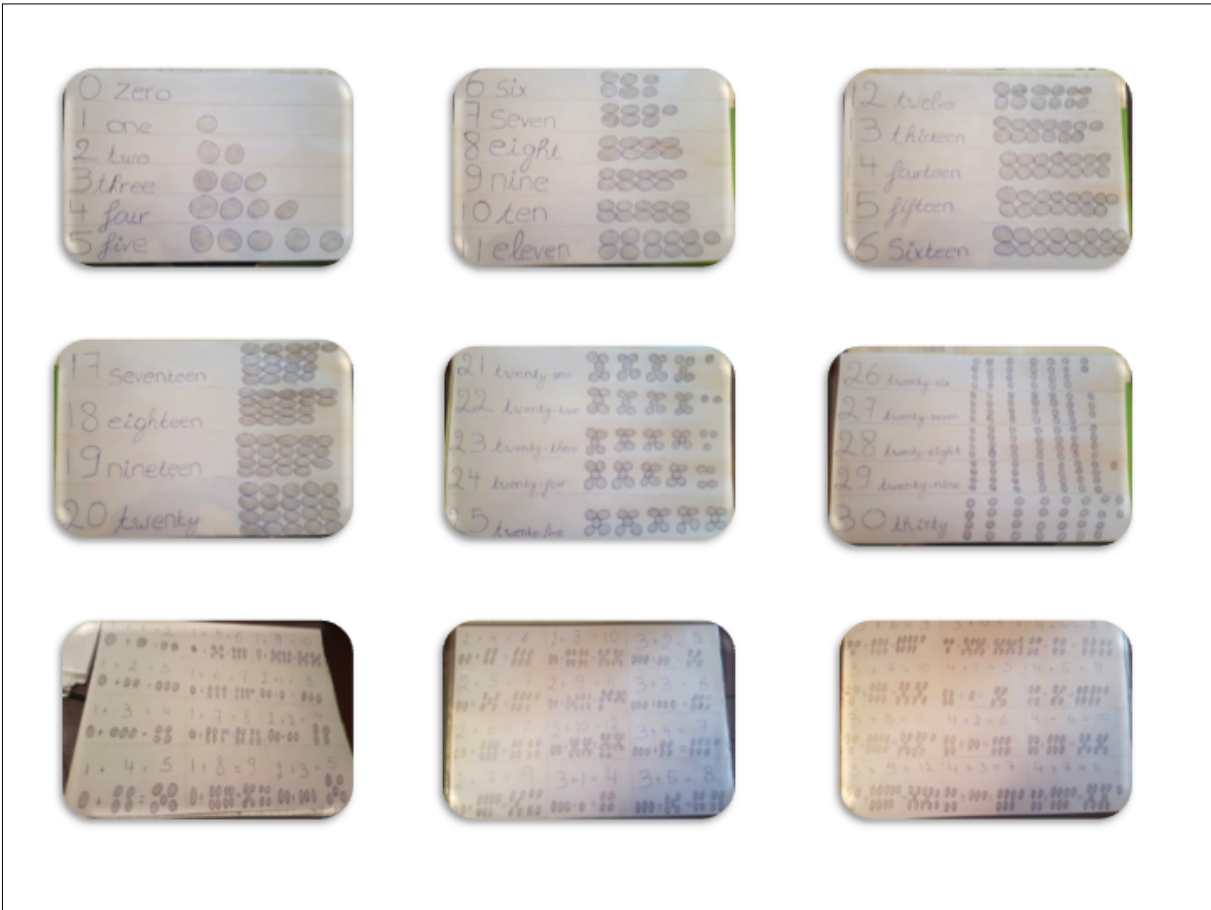
7 Appendix

7.1 Annex A

	Initial situation: knowledge and capability of the child.
	What do I want to achieve with the children?
	Which materials do I need?
	Attention points/ tips
	Error analysis
	Remedy
	Exercise description
	Differentiation

General paper

	No knowledge of the correct value of the numbers and counting of numbers.		Overflow in the beginning the numbers with the children and explain that every number has a certain value. Put the finger of the child on the visual support when counting
	Knowledge of the correct value of the numbers and counting of numbers.		
	Paper with numbers in ascending order, spelling of the number, value of the numbers		
	Good structure of the numbers. Enough space between the numbers. Big and attractive visualisation.		
	Group level is too various. The children don't understand the use of the general paper.		
	Make level groups. (general exercise with small/bigger numbers, mathematical operations) Do it together. Put the finger on the visual support.		



Exercise 1



Knowledge of the numbers up to ten/twenty/thirty.
Knowledge that every number has a value.



Knowledge of the correct value of the numbers,
counting of numbers and recognizing of the numbers.
Capable of catching a ball with two hands (eye-hand
coordination).
Learn to cooperate with each other.



Two balloons/ balls



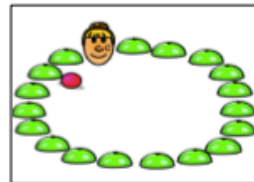
Equal group level.
Count together out loud.



To much wind.
The children are not capable of
catching a balloon



Use a ball (heavier).
Use a big soft ball (easier to
catch).



= teacher
 = children
 = ball/balloon



The children stand in a circle on the field.
The teacher says a number.
The children pass the balloon to each other on signal
of the teacher accordingly with the number.



The children are spread on the field. Pass the ball to
each other depending of the number (First exercise,
later competition with two teams).

Exercise 2



Knowledge of the numbers up to ten/twenty/thirty.
Knowledge that every number has a value.



Knowledge of the correct value of the numbers,
counting of numbers and recognizing of the numbers.
Capable of catching a ball with two hands (eye-hand
coordination).
Develop the condition.



One balloon/ ball



Children with the same level compare to each other.
The same numbers occur in both groups.



The children forget their number.
The group level is too various.



Write the number on the hands.
Younger children get a small number. Older
ones get a big number/ Younger ones get an
older buddy



= teacher

= children

= ball/balloon



Every child gets a number.
The teacher holds a balloon in the middle of the field.
The teacher says a number.
The children who were assigned with that number, run
to the balloon and try to catch it.
The group of the person, who caught it as first has
one point.



The teacher says two/ three numbers.
The teacher says a mathematical exercise. The
children who have the number that match with the
result of the operation need to run and catch the
balloon.

Exercise 3



Knowledge of the numbers up to ten/twenty/thirty.
Knowledge that every number has a value.



Recognizing the numbers.
Knowledge of the shape of the numbers.
Learn how to use the body (body perception)
Develop the condition.
Develop the responsiveness.



General paper with numbers/ card game with
numbers.



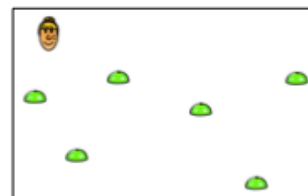
Be aware for mirror image.
Make clear that the ground represent the lines on
the paper.



The child forget the shape of the number.
Wrong expression of the number.



Point the number on the general paper (visual
support).
The child compares his expression with the
other children.



= teacher

= children



The children run around in the field.
The teacher says/ shows a number.
The children stop running and try to express the
number.
The children start running again on signal of the
teacher.



The teacher whispers a number in the ear of a child.
That child tries to express that number. The other
children try to guess which number it is (exercise/
competition).

Exercise 4



Knowledge of the numbers up to ten/twenty/thirty.
Knowledge that every number has a value.



Knowledge that every number has a value and recognizing the numbers.
Develop the condition.
Develop eye-hand coordination.



One/ two balls



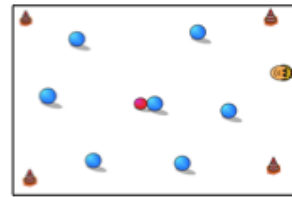
Use a soft ball.
Make sure that they can solve the exercises quickly, to prevent a queue.
Frequently change the child with the ball.



It is too difficult/ easy to hit the other children with the ball.
The level of the group is too various.
There is no ball.



Make the field smaller/bigger or give a second child a ball.
Make two groups depending on the level.
The child hits the other children with his hand on their shoulders.



= teacher
 = children
 = ball
 = field marking lines



One child with a ball. Tries to hit the other children with the ball.
If a child is hit, they go to the teacher and solves an exercise. If it is correct they can go back in the field.



The teacher says a number. The child with the balls tries to hit the other children with the ball accordingly to the number that was said

Exercise 5



Knowledge of the numbers up to ten/twenty/thirty.
Knowledge that every number has a value.



Knowledge that every number has a value and recognizing the numbers.
Develop the condition.
Learn how to use the body to jump.
Learn to estimate distances.
Learn the difference between less and more.



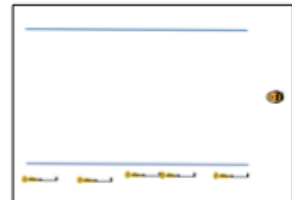
Count together out loud.
Let the younger ones jump one by one or with an older buddy.



The children can't count by them selves.
No knowledge of the differences between less and more.
The children don't jump properly.



Teacher counts together with the children.
Explain the difference with the general paper.
The teacher jumps together with the children and gives oral support.



= teacher
 = children



The children stand behind one line.
They jump to the other line and count their jumps out loud.
The teacher asks who has more than 5/10/15 jumps.
The second time the children try to jump less .
The third time the teacher gives them a number depending on their previous jumps. Now they try to jump to the other line accordingly to that number.



The children jump in a bag to the other line.
The children jump on one foot.
The children jump backwards.
The children are standing per two with the feet tied.

Exercise 6



Knowledge of the numbers up to ten/twenty/thirty.
Knowledge that every number has a value.



Knowledge that every number has a value and recognizing the numbers.
Develop the condition.
Learn to estimate distances.
Develop eye-hand coordination



2 stones/ 2 bottles caps
General paper



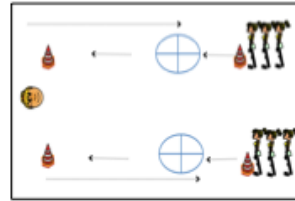
Make the numbers in the raster big enough, so they can read it from the start point.



The children can't throw the stone in the raster.
The children don't know the numbers of the raster.
The level of the group is too various.



Make the distance / make the boxes in the raster bigger.
Use the visual support on the general paper.
Make two groups. Choose the numbers in the raster depending on the level of the groups



= teacher
 = children
 = raster with numbers

Every team has a raster on the ground.
Every box stands for a certain number.
The child throws a stone in the raster. They say the number of the box and jumps until the box.
They jump around the number in the box and then they jump further.
After the raster they run until the teacher where they get an exercise.
They run back to their team and give the first one a high five.
The first one can start the exercise after the high five.



The two teams compare against each other. If the exercise is correct then they have one point.
You can choose the numbers in the raster depending on the level of the children.
They throw two stones in the raster. They take the sum of the two numbers

Exercise 7



Knowledge of the numbers up to ten/twenty/thirty.
Knowledge that every number has a value.



Learn to follow a certain indicated way.
Learn to count in ascending order.
Develop eye-hand coordination
Develop the condition



1 ball



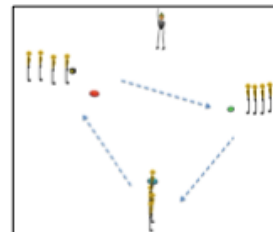
The child with the ball first says his/her number and throws the ball after the number. (The next child has then more time to think about the next number)



The children are not attentive. They don't know which number it was before them.
The group is too various.
The distance between the groups is too big/ small.



The whole group needs to say the number so everyone needs to be attentive.
Make two groups based on the level.
Make the distance smaller/ bigger.



= teacher
 = children
 = ball



The group is divided in 3-4 groups (depending on the size of the group).
They are standing in a square (4groups) or in a triangle (3groups).
The first of group one has the ball. The first child says 'one', passes the ball to the first of the second group and runs to the back of the second group. The first child of the second group says 'two', passes the ball to the first of the third group and runs to the back of the third group.

Add a second ball.

Exercise 8



Knowledge of the numbers up to ten/twenty/thirty.
Knowledge that every number has a value.



Learn to count in ascending order.
Develop the condition.
Knowledge that every number has a value and recognizing the numbers.



2 stacks of card numbers.



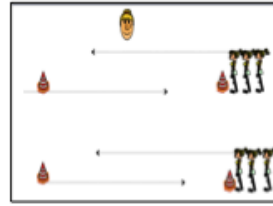
Put the cards in a plastic bag to prevent them from blowing away.



The child can't recognize the number, which they need to search.
The child forgot the previous number.



Show the number on the general paper that they need to search.
Show the previous number again.



= teacher

= children



Memory estafette

The group is standing in a line behind the start point. The first child runs to the teacher and pulls a card. If it is number one, they can hold it. If it is not number one, the child puts the card back and runs back to the line. The next one can start after a high five. The second child needs to search number two (if the first found number one, otherwise the second child also needs to search number one).



Two groups compare against each other.



Exercise 9



Knowledge of the numbers up to ten/twenty/thirty.
Knowledge that every number has a value.



Learn to count in ascending order.
Develop the condition.
Knowledge that every number has a value and recognizing the numbers.
Learn how to jump in a skipping rope.



2 skipping ropes.



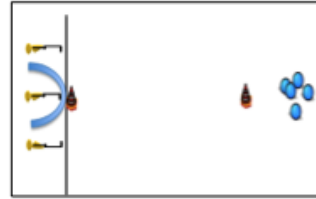
Change frequently the children who are turning the skipping rope.
Help the children with adjusting the length of the skipping rope.



The child doesn't know when they need to jump in the skipping rope.
The two children turn the rope too fast/ slow.
Not all of the children know the bigger numbers.



The teacher gives oral instructions when they can jump in.
The teacher gives oral support about the rhythm of turning.
Putt the children who know the bigger numbers in the end of the line.



= Two children are turning the rope and one child is jumping.
 = Children who are waiting in the line.



Two children are turning the skipping rope. The other children are standing in a line in front of the skipping rope.

The children run one by one through the turning skipping rope.

After the run practice every child says a number when they run through the turning rope. First child says one, second child says two.



First child runs in the turning skipping rope and says 'one' and jumps one time and gets out. The second child says 'two' and jumps two times and gets out.

The teacher says a number and the child tries to jump that amount in the skipping rope.

Two groups that compare against each other.



Exercise 10



Knowledge of the numbers up to ten/twenty/thirty.
Knowledge that every number has a value.



Learn to count in ascending order.
Develop the condition.
Knowledge that every number has a value and recognizing the numbers.
Learn to concentrate on the ball and the tennis racket.
Learn how to use a tennis racket .



1 Tennis ball
1 Tennis racket



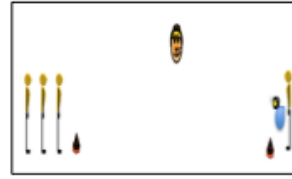
Always indicate someone of the group that needs to count for the child who is doing the exercises.



They hit the ball too hard.
It's too difficult to hit a ball.



Explain and show how they need to hit the ball.
Do it together with the child.
Use a balloon instead of a ball.



= teacher
 = child with tennis ball and racket
 = children at start point



The children are waiting at the start point.
On signal of the teacher the first child runs to the tennis racket and the tennis ball. The child hits the tennis ball with the tennis racket and tries to keep the tennis ball as long as possible in the air. The first child at the start point counts the hits. When the tennis ball falls in the ground the child lay the racket down and runs back to the group. The next one can start after a high five.



Two groups compare against each other.
Child hits the ball with racket while walking to the other point. Child solves at the other point an exercise.

Ball under the chin of the child and walks to the other point. Child solves at the other point an exercise.

Exercise 11



Knowledge of the numbers up to ten/twenty/thirty.
Knowledge that every number has a value.
Knowledge of the use of a tennis racket.



Develop the condition.
Knowledge that every number has a value and recognizing the numbers.
Learn how to use a tennis racket.
Learn to estimate distances.
Learn to work within a certain time.
Learn to work together.



1 Tennis ball
1 Tennis racket



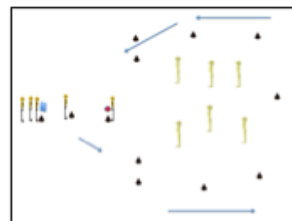
Divide the different levels in two groups.
Putt the children in the line according to the difficulty level (younger ones have easy exercises, older ones have more difficult exercises).



The child at the start point can't hit the ball.
The children are not able to run a whole round within two children hit the ball



Make the distance between the child at the start point and the child at the middle point smaller.
Make the field smaller.



= children in the field
 = child at the middle point
 = child at start point with a racket
 = child that solve the exercise



Two groups. One group is standing spread in the field. The other group makes a line behind the start point. A child who is standing at the middle point throws the ball. The first child at the start point has the tennis racket and tries to hit the ball and runs from honk to honk. Stop at a honk before the ball is back at the middle point. The second child at the start point tries to solve the mathematical exercises.
One point if a child runs a whole round and if the mathematical operations were solve correctly. As everyone of the groups hit two times, the two groups change position.



Exercise 12



Knowledge of the numbers up to ten/twenty/thirty.
Knowledge that every number has a value.
Some children have problems to roll a ball goal-oriented.



Knowledge that every number has a value and recognizing the numbers.
Learn to estimate distances.
Learn to roll a ball goal-oriented.
Develop eye-hand coordination.



10 bottles with numbers on
1 tennis ball / ball



Make the numbers on the bottles big enough.
Put a little bit of sand in the bottles to prevent them from blowing away.





The child doesn't recognize the number.
The children can't hit the bottles.



Use visual support of the general paper.
Make the distance from the start point until the bottles shorter.



 = ten bottles with numbers

 = Child with ball at starting point



The children are standing in a line behind the start point.
The first child has one ball. The 10 bottles are standing on the ground in a triangle. The first child rolls the ball towards the bottles. The child needs to say the numbers of the bottles that felt on the ground. (You choose the numbers on the bottles depending on the level of the children.)



Make the sum of the numbers that felt on the ground.
Two groups compare against each other.



Exercise 13



Knowledge of the numbers up to ten/twenty/thirty.
Knowledge that every number has a value.
Some children have problems to throw/ catch a ball goal-oriented.



Knowledge that every number has a value and recognizing the numbers.
Learn to estimate distances.
Learn to throw/ catch a ball goal-oriented.
Develop eye-hand coordination.



4-5 Tops of big bottles with numbers on



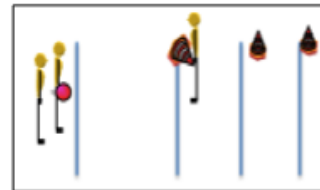
Write the numbers on the bottles big enough.
Frequently change the child who catches the ball.
Depending on the level you can use a push-through system.





The group is too various.



Make sure that the bottles are spread over the field so that every child has a chance. Put bottle number one-two very close to the start point. Bottle three-five further from the start point. Bottle six-ten very far from the start point.



 = child that catches the ball.

 = child that throws the ball.

The first child has two balls. The bottles are spread over the field. The bottles with the lower numbers are closer to the start point and the bottles with the big numbers are further from the start point. The first child says a number of the bottles. The child with the ball tries to throw the ball until that bottle. Another child tries to catch the ball with the bottle. After the child throws the ball, he/ she takes the sum of the bottles of which they have caught the ball. For example: if there are two balls in bottle 8, the child takes the sum of 8+8.



Make the sum of the numbers.



Two groups compare against each other.

Use only even or odd numbers. The children will learn the relation between the numbers.



Exercise 14



Knowledge of the numbers up to ten/twenty/thirty.
Knowledge that every number has a value.
Some children have problems to throw a ball goal-oriented.



Knowledge that every number has a value and recognizing the numbers.
Learn to estimate distances.
Learn to throw a ball goal-oriented.
Develop eye-hand coordination.



4-5 Bottoms of big bottles with numbers on



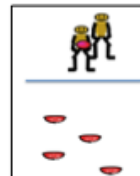
Write the numbers on the bottles big enough.





The child can't throw a ball in a bottom.
The group is too various.



Make the distance from the start point until the bottoms smaller.
Make sure that the bottles are spread over the field so that every child has a chance. Put bottle number one-two very close to the start point. Bottle three-five further from the start point. Bottle six-ten very far from the start point.



 = bottoms with numbers

 = child with two balls at the start point



The children are standing behind the start point.
The bottoms of the bottles are spread over the field.
The first child has two balls. The child tries to throw the ball in a bottom. The child takes the sum of the numbers of the bottoms wherein the balls are.

Make the sum of the numbers.



Smaller/ bigger numbers on bottles.

Use only even or odd numbers. The children will learn the relation between the numbers.



Exercise 15



Knowledge of the numbers up to ten/twenty/thirty.
Knowledge that every number has a value.
Some children have problems to throw a ball goal-oriented.



Develop their condition.
Learn how to jump properly with two feet.
Recognize different numbers.



2 Big bags.



Make sure that the bags are big enough for the older children.



The child falls every time when they jump.
The child has difficulties to get in the bag



Explain that they need to hold the bag with their hands and they need to jump with the two feet together.
The second child in the line always helps the first child to get in the bag.



= teacher

= child standing in the bag



The children are standing behind the start point. The first child is standing in a big bag. On signal of the teacher, the child jumps to the other marking point. There the child gets a mathematical operation. If it is correct, the child goes out of the bag and runs with the bag to the start point. The child gives the bag to the second child.



Two groups compare against each other.



Exercise 16



Knowledge of the numbers up to ten/twenty/thirty.
Knowledge that every number has a value.
Some children have problems to throw a ball goal-oriented.



Knowledge that every number has a value and recognizing the numbers.
Learn to estimate distances.
Learn to throw a ball goal-oriented.
Develop eye-hand coordination.
Learn to work together.



10 bottles with different numbers on.
1 bottle in a different colour than the other bottles.
4 tennis balls/ balls



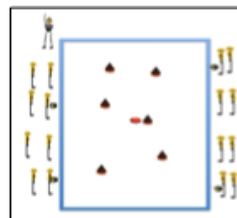
Write the numbers on the bottles big enough.
Put a little bit of sand in the bottles to prevent them from blowing away.







The children can't hit the bottles.
The children cross the marking line



Make the distance between the marking line and the bottles smaller.
The point doesn't count if they crossed the line.



-  = teacher
-  = children
-  = the king
-  = bottles with numbers

The group is divided in two teams who are standing four per four against each other.
In the field stand bottles with number on and one king in the middle (bottle with the different colour). The children are standing behind a marking line. Every team has two balls. The children try one by one to roll a ball and to hit a bottle. If they hit a bottle and falls on the ground, they can take the bottle. A ball can only hit the king (5points) after all the bottles with a number are hit. Every team take the sum of the numbers. The team with the biggest number wins.



After a child rolled a ball, they need to run to a marking point and back.

Choose the numbers on the bottles depending on the level of the children.