SCIENCE EDUCATION PROGRAM IN THE SUMMER CAMP "BÁTOR TÁBOR"

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ABSTRACT

In a summer camp for chronically ill children, I have devised a science education program. All programs in the camp are organised to provide a feeling of success, which positively influences the children's self-esteem and recovery process. Thus the presented programs are planned to focus on playfulness, experiential activity, creativity and personal revelation. Considering the time and financial constraints, I compiled experiments and activities mainly in the field of hydrodynamics and electricity. I designed specific programs for smaller children and teenagers and trained the volunteers to mentor the programs. I present the structure of the programs, and with the help of some examples show how I built playfulness and creativity into them.

INTRODUCTION

Bátor Tábor, a summer camp, is a member of the Serious Fun Children's Network that was founded more than 25 years ago by the actor, Paul Newman [1],[2]. The international camp association has 16 members all over the world, all of which treats children with different chronic illnesses (cancer, diabetes I., Chron's diseases, juvenile idiopathic arthritis, haemophilia, muscular dystrophy, etc.) by a method called therapeutic recreation. Bátor Tábor is the regional therapeutic recreation centre for Central European children, and thus its invigorating adventures are available for Hungarian, Slovakian, Czech and Polish children.

Fig.1. Mosaic of life in Bátor Tábor

The camp is situated 60km northeast of Budapest, next to a town called Hatvan, in Hungary. Every building and facility had been constructed to meet the needs of children with serious illness. Up to 70 children can sleep in the cottages, and the dining hall can seat 160 guests. The volunteer's cottages can host up to 66 people, with medical attendance backed up by a friendly and well-equipped medical building. The camp facility includes a high-ropes course, a rowing lake, an archery field, a horse-riding hall, a sports hall, etc., which together provide an excellent basis for the recreation therapy (Fig.1). The camp hosts about 1000 campers per year: one-week sessions for children aged 7 to 18 in summer, long-weekends for smaller children with their families in autumn and sessions for the ill children together with their siblings in spring. Camp-life is intense, colourful and well organised, and at the same time supporting by presenting new challenges and successes. The therapeutic recreation method used in the camp has some key elements that we use through the sessions: Children experience a positive, receptive social environment which helps them in fitting into their groups, making friends and developing connections with the volunteers. The camp programs are designed to adapt challenges to the children's personal abilities, thus all of them attain personal success. Volunteers continuously give verbal and non-verbal, positive and trustworthy feedbacks for the real successes. Furthermore, they reinforce and enhance the cooperative attitude of campers with specific games and activities. Since these children usually have a negative self-image because of their illness, it is important to mark them with positive labels to counterbalance this and to strengthen their self-confidence. Scientific investigations confirmed the significant positive effect of these camps [3], although long-term follow-up studies are still missing [4].

THE RENEWED "MAGIC WOOD" PROGRAM

Among the other programs there is a so-called „Magic Wood" thematic program in Bátor Tábor. The program is situated in a woody part of the camp, and this is where its name comes from. Earlier, this program focused on cooperative games and experiences connected to nature. Since this program seemed to be less attractive for the children, the management of the camp asked me last year to work out a new program, where science is in the centre of the activities. For the program development I had to take into account the following circumstances: (i) There are sessions for children aged 8 to 13 (children cohort) and aged 14 to 18 (teenagers) in the camp. (All campers attend school but most of them had to skip it for shorter or longer periods.) (ii) Three different programs were needed for both children and teenage cohorts, two of them had to be 80 minutes and one of them had to be 160 minutes long. (iii) The programs are visited by children with limited moving abilities, and they have to be completely safe (iv). Only about 5 hours are available to train the volunteers (with different backgrounds) to be expert instructors in these programs in the summer camps. (v) The foundation pledged about 350 EUR (100.000 HUF) for the innovation, and this amount of money had to cover all the materials and accessories we needed for the new programs. Knowing these constraints, I decided to develop programs based mainly on physical experiments, supplemented with brainteasers and new cooperative games. Biological experiments I had to exclude because of their longer timescale and because of financial reasons. Similarly, chemical experiments are generally more expensive than physical ones, and sometimes are not sufficiently safe for a camp like this. As I will show later, some applied activities and experiments have biological or chemical basis as well, but these are the exceptions.

The selected physical experiments can be classified into two groups, they are either experiments studying complex systems, or they are experimental systems based on simple physical laws, which behave spectacularly or counterintuitively (Table 1.)

Table 1. The applied physical experiments. References denote videos which present the experiments in detail.

Complex systems	**Spectacular experiments**
magnetic chaotic pendulum [5]	Colouring milk using detergent [6]
Convection of warm and cold water (in simple and rotating tank) [7]	"Take the coin on dry" [8]
Instability of warmer salty water (fingering) [9]	Carthesian diver [10]
Tornado bottles [11]	Lava lamp [12]

Further, I intended to offer the campers the opportunity to meet physical laws in action, hence I looked for activities where they can build or hack toys or instruments based on physics or chemical physics (Table 2.).

Table 2. Activities based on physical laws. References denote videos which present these activities in detail.

Electricity	**Mechanics**
Making homo-polar motor [13]	Making paper rocket [14]
Making Faraday train [15]	Making rubber band helicopter [16]
Making lemon and soil batteries [17]	Moving boat by Marangoni effect [18]

PROGRAM STRUCTURE, EXAMPLES

Every program is managed by two trained volunteers (a program leader and an assistant), and there are 2-4 additional volunteers present to motivate and support the children and help them if it is necessary. All programs have a background story that everybody is part of: the dressed program leader, the assistant, and the children as well. Thus the program is placed into a funny and motivating context. Every program starts with a warm-up game which can be a cooperative game or a brain-teaser for the group. Then the program leader and the assistant give instructions about how to prepare the experiment or build the instrument, while they present the safety instructions too. (Naturally, all information is transferred by the characters they play in the background story.) After a series of experiments or activities the group arrives at the end of the story, which generally starts with a challenging situation and is solved with the assistance of the children. The program finishes with a closing process where volunteers and children focus on the individual and group successes, and volunteers give positive feedback to the children's personal successes. After presenting the general structure of the programs, I will show now a specific program for children in detail, and present another one which was designed for teens in a less detailed manner.

So let us see how an 80-minute program for children looked like: *Introduction, background story:* An "alien" arrived at the camp (program leader) and a "scientist" (program assistant), specialist of exotic languages, can communicate with her/him. The scientist introduces the situation to the children and interprets the alien's problem. *Warm-up cooperative game:* The alien made a lot of pictures about the birds living in the camp and recorded their songs but she/he does not know the name of these birds and could not pair the birds' pictures with the recorded songs. The children now have to work in pairs and collect the pictures of the birds and the cards with their names in a cooperative game: One camper is blindfolded and the other directs her/his vocally (Fig.2.).

After collecting the pictures they pair the bird names with the pictures together. The next game is to pair the bird songs with the bird pictures. We start with the simplest songs (e.g.

Fig.2. Collecting the bird cards cooperatively

owl, cuckoo) to make the decision easier for the more challenging songs (e.g. great tit, nightingale). A solution is accepted only if all of the children are convinced that this is the good solution. (Sometimes it was not so easy to attain this state, thus in these cases the volunteers helped to reach the correct solution together.) The main activity: The alien is very happy because she/he learnt a lot from the children, and as a return she/he teaches them how to build a rocket. (The alien is an expert in it, since she/he arrived by a rocket to the Earth.) Then the alien presents a ready-made paper rocket to show how and why it flies if one blows it out with a help of a straw. After that the volunteers show the children, step by step, how to build the rocket (Fig.3. left, detailed description in [14]). When all of the children have finished building the rockets and decorated them as well, they put the rockets in action together (Fig.3. right).

Fig.3. Building and blowing out the paper rockets. Left panel: The alien (the author of the paper) shows the children how to build the paper rocket. Right panel: Rockets on fly. The Magic Wood cottage is situated in the background

Closing: The children and the volunteers form a circle. The assistant announces that the alien has to leave now, and since the rocket is ready, she/he can. The program assistant asks the children to think a bit about what they have learned from the alien and what they can teach her/him. Then everybody has a chance to answer these questions. Volunteers control this process and give positive reinforcements both to the individuals and to the group as a whole.

In the program designed for teens, after telling the background story and finishing the warm-up game, the group (10-12 campers) is separated into two parts. One part of the group goes back to the Magic Wood cottage and all of them install their experiment of magnetic chaotic pendulum with the help of a trained volunteer. The moving of the pendulum is visualised by LEDs fixed on a 3V button battery at the end of the pendulum. The motion is

recorded by long exposure photographs in the dark room. Children have the opportunity to try different number of magnets and initial conditions, several different colours of LEDs and different exposure times on cameras (Fig.4).

Fig.4. Experiment with magnetic chaotic pendulum. Left panel: The experimental set up. Right panel: Motion of chaotic pendulum visualized by yellow LED in 8 sec. exposure time

At the same time, the other half-group prepare experiments based on hydrodynamics. First they study the convection of warm and cold water in an aquarium, which is a simple but impressive experiment that children can actively take part in (Fig.5).

Fig.5. Some experiments in the program for teenagers. Top left panel: Mixing of coloured hot and cold waters. Top right panel: Tornado bottles in action. Bottom: Colouring milk by food colour and studying the effect of detergent

Then they prepare their own water tornado experiments and consult the volunteers about their observations on the motion of water and air in the bottles. At the end they make the well-known milk-detergent-food colour experiment (Fig.5). All experiments are preceded by a

short explanation of the physical background and a discussion about its role in our every-day life. The two subgroups change their positions in the half-time. Again, to make the experiments successful means that the children manage to overcome some obstacle or help the program leader and assistant to attain some sort of a funny goal.

CONCLUSIONS

Programs based on scientific experiments and activities are naturally fit into the general aims of Bátor Tábor. According to my experience and feedbacks from children and volunteers, youths generally are interested in science, we just have to find the right platforms and methods to make it enjoyable. Focusing mainly on physics-based experiments and activities helped me to work out relatively cheap and safe programs within the time frame of 80 or 160 minutes. The most important conclusions from this first series of renewed Magic Wood program is that the playful and supportive social environment opens children's creativity and cooperative attitude, and science thus becomes fun for them. The good indicator of the success of the programs is that a lot of children chose Magic Wood as a facultative program in every session, despite the fact that canoeing, archery or horse-riding were among the alternative possibilities. Further, the management regularly collects feedbacks from the children and the volunteers at the end of the sessions about the camp-life and the programs, and these reports unambiguously confirmed the success of this program.

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