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Science camps in Europe – Collaboration with companies and school, Implications and Results on Scientific Literacy

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ABSTRACT: The paper informs on the characteristics of a Comenius Network of seven organizations, who are collaborating in exchanging best practice on science camps. This exchange includes evaluation results on more science camps of European organizations, which will deliver information on organization, collaboration with companies, pedagogical aspects, as well as sustainability on career decisions. The results will be distributed online, and in a series of workshops. First results of a pan-European survey on Science Camps and on participants of a German science camp are reported.

KEY WORDS: best practice, science camps, collaboration, pedagogy, career

INTRODUCTION

Employment within science, technology and health sectors is expected to grow in the next decade. Promoting awareness of the many career options available in these fields is important for today's youth.

The lack of technicians is seen to be not only a national, but also an EU-wide problem and a competition among the economical well performing regions of the world (Europe needs more scientists 2004). As one result of this problem many summer camps were established through various organizations. The objective of these camps is not only to recruit more young people for a career as scientist or technician, but also to raise the scientific literacy (OECD 2003). In many EU countries various organizations (companies, universities, science centre, and public organizations) are conducting (science) summer camps. In Denmark the number of especially scientific summer camps has been growing over the last decade.

Most science camps are designed to provide positive learning experiences for the participants, strengthen the intrinsic value that youth place on science, and increase the awareness of the diverse opportunities

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available in science, technology and health. The principles used to reach these goals is to allow youth to interact with positive role models, student entered teaching, and connecting science, technology and heath to the live of youth (Crombie et al, 2003)

In summary most summer camps are driven by the wish to activate and engage students and to convince them through fascinating experiments, laboratory work and the contact with experts to an education within science, technology and health.

On this topic a consortium of seven members from 6 states of the EU and one partner-country got the Comenius network SCICAMP funded from 2013-2015 (Grant No. 527525-LLP-2012-DE-COMENIUS CNW). First results of our research are presented here.

CHARACTERISTICS OF SCIENCE CAMPS

Several characteristics of science camps make them a special opportunity to teach and learn science in a more effective way than classroom science lessons. These characteristics are:

Special Location

Usually science camps are located in an interesting surrounding, like research institutions, hostels in a nice landscape, companies´ training centers or hotels for young people. The location is one of the attractions of a science holiday camp. Only very few camps take place in schools.

Staff

The teaching staff usually is recruited by the institutions offering the science holiday camp. Most of the staff was not trained as teachers. Some are retired persons who join the camp as volunteers trying to convince young people. Often young members of the organizations, who function as role models, complete the staff.

Time

One of the most convincing aspects is the length of time used for the activities. Science camps last usually one or two weeks with full day activity. These amount of time is very often seen as a relaxing fact which helps to deal much more intense on science questions. The relaxed atmosphere of holidays plays an additional role on the well performance of science camps.

Programme

The programme consists of all activities connected to science education, like excursions, lab activities, discussions with experts, interviews, internet research, lectures etc. The enlarged time schedule (compared to regular classroom teaching) allows the research work with inquiry-based methods. This includes the rising of questions with relevance for the students, an open approach toward research orientated problem solving and the finding of results which are able to answer scientific problems and which help developing their opinion based on scientific facts.

Entertainment

As science camps are often placed in holidays, the students expect an aspect of entertainment. Parts of the scientific programme or excursions are holiday-like entertainment for themselves (like canoe-trips for bird watching) but some courses are bound to buildings to that explicit entertainment activities are embedded.

Target group

Science camps are designed for all ages. Already children are targeted with respect to the which to offer an early contact to science and technology. The main focus group is young people closer to their career decision. - Some science camps are directly focussed on girls or as special courses for gifted students.

Research

Research on STEM education up to now focussed mainly on out-of-school teaching parallel to regular school periods. It showed an effect of any activity on learning and learning outcome, but not yet on career decisions. Retrospective research of those students who chose technical studies or jobs in technology and science showed a similar effect: those students who had already been engaged in science camps or extracurricular science activities report, that they had been interested before (Schaef, 2011).

Collaboration with local science and technical organizations

Usually science camps are organized in collaboration with local science or technical organizations. Science centres, universities, SMEs or Industry are usually involved and offer excursions, guided tours or discussion with experts. Sometimes the partners offer their labs or workshops to let students work there and make their own experience or investigation.

Funding

The funding is either organized by the centre holding the science holiday camp, by sponsors, by public funding or – partially – by the parents of the participants. Funds of sponsors are usually not predictable and are offered from year to year, but also public funding is not necessarily continues. After all funding remains as a problem to be solved by the organizations of science camps.

RESEARCH ON SCIENCE CAMPS

Background

Research on teaching / learning Science, Technology, Engineering, and Mathematics (STEM) focused mainly on out-of-school teaching parallel to regular school periods. It showed an effect of any activity on learning and learning outcome, but not yet on career decisions. Retrospective research of those students who chose technical studies or jobs in technology and science showed a similar effect: those students who had already been engaged in science camps or extracurricular science activities report, that they had been interested before (Schaef 2011). Research on learning in labs shows an effect on the students' interest, knowledge and motivation to deal with questions of Science and Mathematics (Glowinski 2007, Pawek 2009). These labs are usually visited for one day. The impact of summer camps on career decisions is not yet researched, but questionnaires show a great acceptance of this event. Facilitating positive experience for youth people in science and technology is one (of the best) ways to increase interest in these careers. Positive experiences are thought to promote confidence with and positive attitude towards science and technology (Crombie et al, 2003) .

In their examination of the influence on career decisions Vickers, Ching and Dean (1998) concluded that summer science programs featuring hands-on science activities are a highly effective way to increase both interest in science and technology.

The evaluations of science summer camps conducted to date have tended to be either anecdotal or limited to the analysis of a single camp program (Crombie et al, 2003). No approach has been taken to compare the various activities and to evaluate these activities in the long run to evaluate how and in which way science summer camps effects attendee.

Results from a pan-European survey

The first research was made by a pan-European survey by the partners from Denmark. Questionnaires were sent out to more than 300 organisers of science camps. The return rate was 10%.

Most of the camps are resident camps (90 %) with duration from 1 to 24 days, while the average is 5-7 days. The age varies from 6 to 20 years, the largest portion is represented by upper secondary school with 33 %. Most stakeholders are universities (90 %), but also companies, parents, public authorities, media and sponsors are mentioned (each by about 40 %). The financial resources are made by sponsorships and foundation grants (each 64 %), less by governmental money (36 %). Nearly all camps (82 %) ask for participation fee.

The comments on the participants underline the high motivation of the young people joining the camps. The raise of interest and the opportunity to reflect career decisions is obvious to all organizers, as well training in practical skills for lab work. Parallel to this they also see a positive outcome for their own organization by being part of the educational system and to have an opportunity for communication.

Results from Science Camp-participants

The results from questionnaires of and interviews with science camp participants of summer camps in Germany and Denmark both show the same picture: the interest in science and science careers is risen by a 5-day camp. Most participants (80%) would like to stay longer, and the majority (70 %) report an rise in interest in science and technology.

A more impressing fact is the rise of the scientific self-concept, which was already high when the participants started joining the camp (Figure 1). The self-concept was reported by a series of 8 questions dealing with problems and challenges of science subjects, scientific experiments and opinions on one's own skills in science. The questionnaires were distributed at the beginning of the camp (pre), the end (post) and three months later (follow-up).

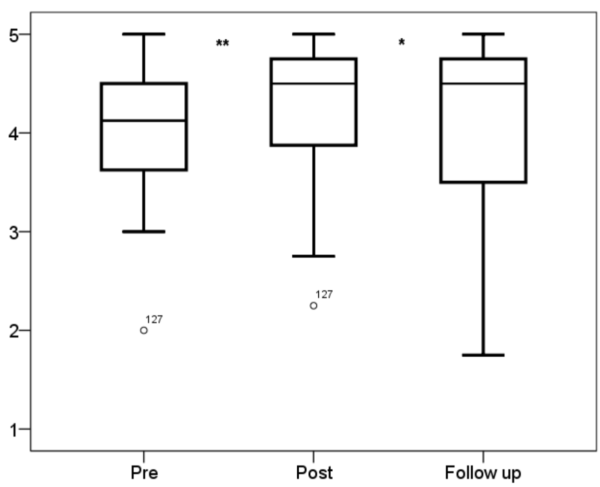

Figure 1. Development of Scientific Self-Concept. Shown are mean values from a Likert scale from 1 (Totally disagree) to 5 (Totally agree). Level of significance: *<0.05 and ** < 0.005, (N=52)

Beside the questionnaires the consortium collects observations by visits in science camps in the participating countries. Our first visits in Portugal and meetings with young people in Serbia show the same picture: participants grew very much in their confidence, their ability to present results of their activities but also of their reflections on science an technology. The presentations are full of unique ideas, which could be elaborated further and may grow to a status of a new patent.

These observations underline the broad impact of science camps on the participants. This might be illustrated by a quote of one of the organizers: “Science camps are an extremely positive experience mainly because they create networks and social relations in children and kids interested in sciences, who often feel different because of their interest. During a camp, they can freely express all their potential.”

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