Project Evaluations/Testimonials

TF2: Children & Schools

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Ancient Greece

To evaluate the students' field knowledge evolution as well as to check for attitude changes two short tests were constructed. They were put together in a single looking test and were administered to the participating students at the beginning of the project (pre-test), at the end of the spring term as a mid-test and at the end of the fall term (post-test). This test is presented in the end of this report.

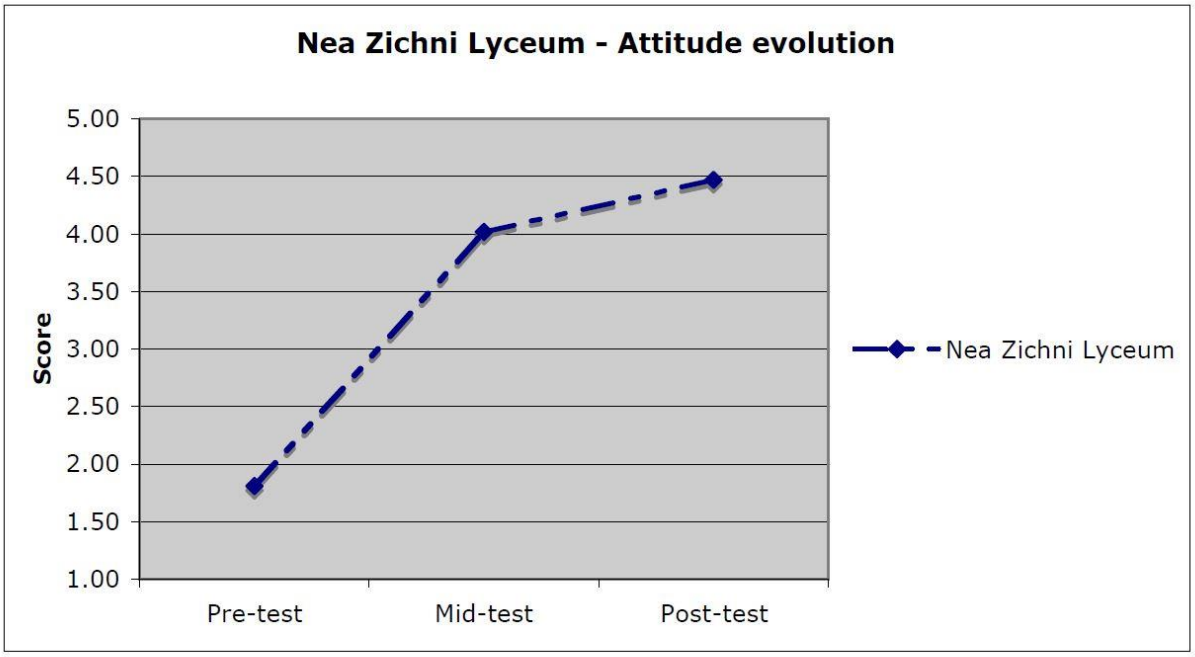
The first five questions were testing the students' attitude towards astronomy. A five level rubric was used to score the answers to these questions. Each answer received score points equal to the level of the rubric indicated by the student, namely 1, 2, 3, 4 or 5. Since in the last three questions of this test the highest score was showing a high dislike for astronomy, these three question scores were reversed for the final calculation of the score of the students in the attitude test.

The remaining eight questions were testing the field knowledge of the students in the specific areas which were discussed within the context of this project. Each answer was evaluated independently by two teachers and rated from 0 to 1 according to the correctness and completeness of the answer. This scale was composed of eleven levels, namely 0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9 and 1.

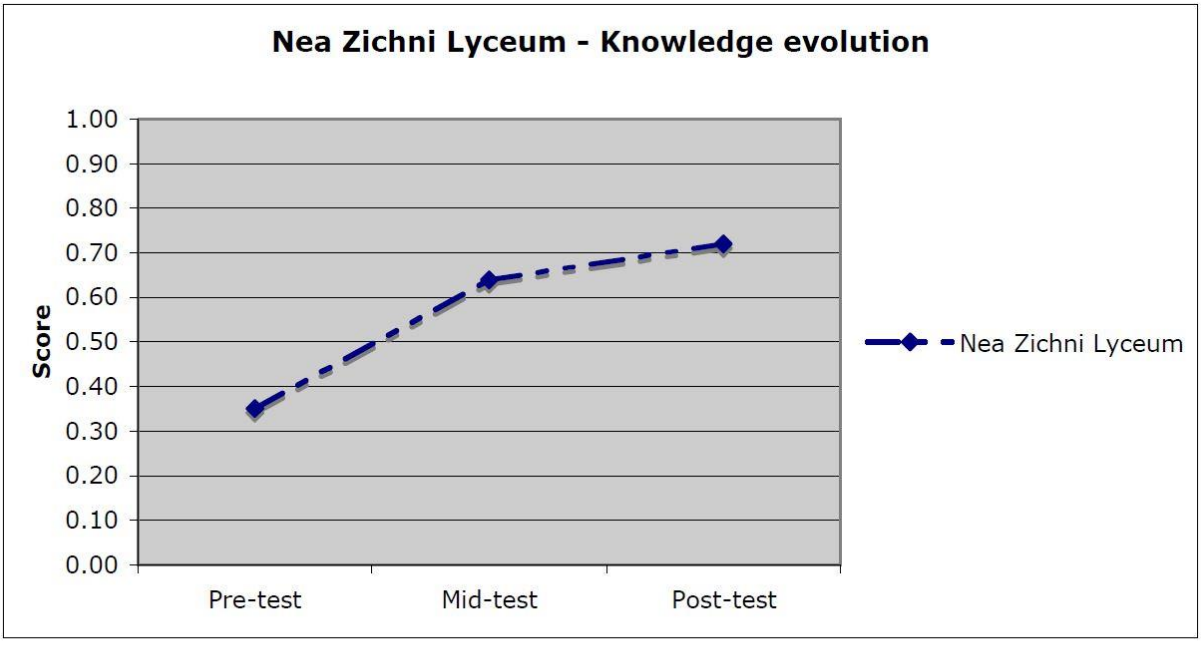
The students' scores were averaged for every test instance and were compared among the three instances to determine the successfulness of the project for the students of our school who participated in the project. The average students' scores are shown in the following table and are graphically represented in Pictures 1 and 2.

Nea Zichni Lyceum	Pre test	Mid test	Post test
Attitude	1.81	4.02	4.47
Field knowledge	0.35	0.64	0.72

Table 1. Average student scores for the participating students of Nea Zichni Lyceum



Picture 1. The participating students' attitude evolution throughout the project



Picture 2. The participating students' field knowledge evolution throughout the project

A significant improvement is observed in both the students' attitude towards astronomy and their relevant field knowledge throughout the whole project duration. This improvement is also verified by a statistical analysis through paired samples t-tests comparing pre- and mid- test scores, mid- and post-test scores and pre- and post-test scores. All tests show that the case for no improvement in any comparison can be rejected with greater than 99% confidence.

The improvement seems to be great in the first part of the project (from pre -test to mid-test) and quite small in the second part (from mid-test to post-test), as can be shown from the above graphs. This can be attributed to the fact that the initial scores in the pre-test were low, allowing for a great improvement afterwards, whereas the mid-test scores were above the middle point of the corresponding scales allowing for only modest improvements. To correct for this effect and better assess the improvement on both parts of the project we calculated the so -called Hake gain for both the attitude and field knowledge improvement in mid and post-tests. The Hake gain is defined as the normal gain divided by the maximum gain which can be achieved in each case:

Hake gain = (final score – initial score) / (maximum score – initial score) X 100% and the average Hake gains for both the attitude and field knowledge tests are shown in table 2.

Nea Zichni Lyceum	Pre test to Mid test Hake gain (%)	Mid test to Post test Hake gain (%)	Pre test to Post test Hake gain (%)
Attitude	69.28	45.92	83.39
Field knowledge	44.62	22.22	56.92

Table 2. Hake gains for the participating students of Nea Zichni Lyceum

In essence, Hake gain shows the percentage of students who changed attitude towards astronomy or corrected their initial knowledge about astronomy during the project. Hake gains below 30% are considered to be small, between 30% and 60% are considered to be of medium level to significant and above 60% are considered to be very significant.

As can be seen from the above table, there is a very significant total attitude improvement towards astronomy throughout the whole project. This improvement was mostly accomplished in the first part, but also appeared during the second part. This is expected since the excitement produced by the initial contact with a subject such as astronomy is likely to drive an initial wave of positive attitude towards astronomy. This attitude improvement will then decline but will remain present as

students gain a better understanding of the subject and get engaged in challenging activities, like astrophotography.

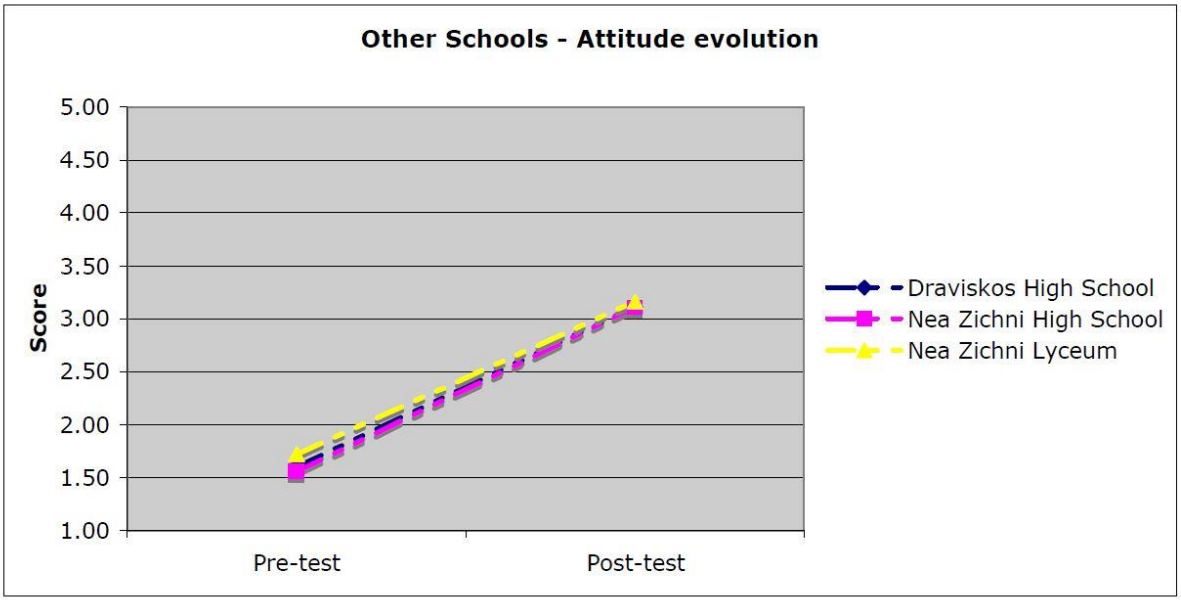
A similar trend is also observed in the field knowledge evolution: there is a greater improvement in the first part of the project and a smaller one in the second part. This is expected since there was no new knowledge offered to the students in the second part and the improvement can only be attributed to the fact that the students used some of their knowledge again and thus acquired a better understanding.

The second aim was accomplished by supporting the participating students along with invited university experts to present their techniques and findings at a series of public lectures to the students of the other schools of the district and the local community during the local cultural festivities in the summer of 2013. The participating students presented their work to the rest of the students in their class, students of the Draviskos High School and students if the Nea Zichni high School. All these students completed the same attitude and field knowledge test before and after the presentation and their answers were scored as described above.

These students' scores were averaged for every test instance and were compared among the two instances to determine the successfulness of the project for the students of our school who did not participate in the project and the students of the other two schools. The average students' scores are summarized in the following table and are graphically represented in Pictures 3 and 4.

	Pre test	Post test
Nea Zichni Lyceum		
Attitude	1.72	3.16
Field knowledge	0.31	0.40
Draviskos High School		
Attitude	1.60	3.11
Field knowledge	0.26	0.34
Nea Zichni High School		
Attitude	1.56	3.10
Field knowledge	0.23	0.31

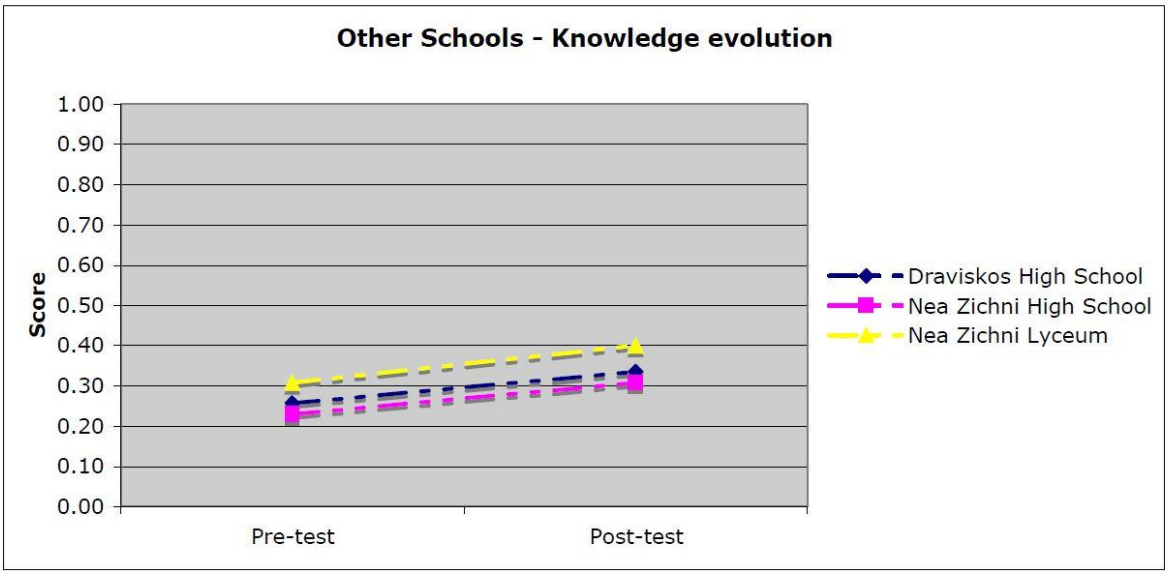
Table 2. Average student scores for the non-participating students of Nea Zichni Lyceum and the students of the Draviskos and Nea Zichni High Schools



Picture 3. Attitude evolution of students not participating in the project

It is evident from these results that there exists a significant improvement in the attitude towards astronomy of all students exposed even briefly through one lecture to astronomy. This improvement is also verified through a statistical analysis of the students' scores with a paired samples t-test from pre to post-test for all three schools at the 99% confidence level. The corresponding Hake gains are shown in Table 3.

The field knowledge evolution does now show such an improvement. This is expected since there was only one lecture given to them by our students. A statistical analysis with paired samples t-tests, however, reveals that this very small improvement is real at a significance level of 99%. This is attributes to the fact that most of the students showed a small but steady improvement of their test scores with very few decreases, which statistically yields an effect with high confidence. The corresponding Hake gains for the field knowledge evolution are also shown in Table 3.



Picture 4. Field knowledge evolution of students not participating in the project

	Pre- to post- test Hake gains
Nea Zichni Lyceum	
Attitude	0.44
Field knowledge	0.13
Draviskos High School	
Attitude	0.44
Field knowledge	0.11
Nea Zichni High School	
Attitude	0.45
Field knowledge	0.10

Table 3. Hake gains of students not participating in the project

Overall the above results show a remarkable success of the project in raising the students' interest and knowledge in astronomy. In particular, the students were stimulated in getting engaged in scientific activities related to astronomy and observing and taking pictures of sky objects through a telescope. This resulted in a increase in their interest about astronomy and subsequently in an increase in their related field knowledge. This is also evident from the students' small essays about their experience with the project, which are published in the project's web site. Furthermore, this excitement was also passed to the local community through the students' families (a couple of citizens owing telescopes contacted the school in an effort to organize more observing nights) and through the presentation of the students' work in the local summer festivities.

Astronomy for the Visually Impaired

Build up the kit with our own educational resources. Some of the materials included in the kit are no longer available - or will not be in the next future - like the "The Little Book about the Moon Phases" or the FETTU prints. And the fact that different people/organizations hold the copyright makes it impossible to sell the kit as it is now (see section 6 below).

We need to find also a way to mechanize the building of the constellation models, wich have been hand-crafted by four volunteers for these 30 kits.

Raise enough funding earlier in the project development. Establish contact with more institutions with development programs.

Rethink the mailing procedure. Consider sending the parcels through ONGs working in those areas, which would probaly reduce costs, improve reliability and avoid custom taxes. We would need to put them in contact with the targeted recipients, or to ask them to signal out suitable candidates.

Mathare-Kenya Ambassadors of Astronomy

The trainings received very positive feedback form the participants who requested more opportunities to develop their knowledge on astronomy and its practical and interesting delivery in the classroom. The summary of trainings' evaluation, attendance sheets and photographs are attached to this report.

NASE Africa

As part of NASE courses a very detailed questionnaire was replied by participants during the last day. In it, the questions are about the didactics, contents, utility of the topics, interests, and with the aim to receive the critics from the participants and the proposals to improve the Program. The results of the full questionnaires are in the annex of this report and in the website. But as summary we include here the result of the 2 key questions about the course:

* *The level of activities has been:*
too low □ *too high* □ *satisfactory* □

Kenya course: 95% satisfactory, 5% too high
Ghana course: 100% satisfactory

* *The subjects, have met your expectations?*
very well □ *well* □ *poor* □ *very poor* □

Kenya course: 90% very well, 10% well
Ghana course: 45% very well, 50% well and 5% poor

* What is your opinion about the usefulness of the course to their teaching?
very useful □ *useful* □ *not very useful* □ *useless* □

Kenya course: 100% very useful
Ghana course: 86% very useful, 14% useful

After the questionnaire we organize a working group in order to talk about the situation of astronomy education in the country. Participants have the opportunity to include some comments about the course in this working group. The conclusions session and its contents are included in the annex and in the website

2014

Astronomy in the SEA-ROAD Region

All children were selected from within the ASEAN member country region. Some children were accompanied by adults, particularly from counties outside Thailand. While these accompanying adults functioned as personal representatives in the form of school teachers or members of astronomy clubs, they were not regarded as attendees within the program.

Most items within the implementation tables were not relevant to this project as all attendees were children. However, some measure of the implementation process can be gotten through questionnaire survey and testimony from attendees.

How satisfied are you with:	Very Satisfied	Satisfied	Somewhat Satisfied	Somewhat Dissatisfied	Dissatisfied
1. Overall, how would you rate the seminar?	**11**	**14**	**2**		
2. The right amount of time for the seminar?	**8**	**15**	**4**		
3. The delivery of the program was organized?	**7**	**14**	**5**	**1**	
4. Information was clearly presented?	**6**	**6**	**10**	**4**	**1**

In general, feedback reflected mid to high scoring in all four (4) categories. Some notable departures was in Category three (3); "The delivery of the program .." scored a single "Somewhat Dissatisfied" remark relating to the cramming of material, especially on the final day – Sunday 26 October involving quite a lot of travel from Doi Inthanon back to the hotel in Chiang Mai. Category four (4); "Information was clearly presented", scored four (4) Somewhat Dissatisfied and a single "Dissatisfied". These comments are related to the standard of English by the 5 NARIT presenters. While some with superior English abilities than others, all NARIT staff are involved in an on-going English abilities up-lift program.

The highest scoring categories were, "The right amount of time for the seminar", and, "The delivery of the program was organised", with each scoring, "Satisfied" by over half of the attendees.

UNAWE-UNESCO-Mobil I for Central America

With a resounding success, UNAWEMO project took astronomy to children from humble schools of Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica and Panama, populations without access to this science.

2015

Astronomy Outreach for Inner City Youth

This very successful program motivated us to develop tools and activities to engage teachers who work with under-served youth – an audience we had not previously addressed. Support from the OAD was obtained so that this audience could be provided in-depth training for science education based on astronomy.

We utilized our standard program evaluation form (see Appendix for the actual document), distributed to all participants. All of the data are useful, but we are most interested in the responses to questions 5 and 6, which measure attitudinal shifts and personal motivations. In the programs conducted for the YOP teachers and the NCES teachers, more than 85% responded that they were motivated to 'learn more' and to 'attend more astronomy programs' to a Great Extent; all responses were either Great Extent or Some Extent. Thus, the attitudinal data indicate that the programs were successful in engaging the participants and moving them forward in connecting their students with astronomy content. All responses to question 7 showed that the program was 'Very Useful and Interesting', indicating that the content was of the right character and presented at the right level.

These data are archived and incorporated into the overall assessment and evaluation effort of our outreach program. It is important to have had the opportunity, with OAD funding, to directly target these teachers who reach underserved populations.

Discover the Universe

The workshop proved to be a real success despite the challenges of reaching teachers in countries with poor internet connections.

We ran a post-workshop survey to get feedback and comments from the participants. The survey was online (created in Google Forms) and we invited participants to fill it. 40 responded positively, which represents 22% of all participants.

The results are extremely positive, whether it's about the content of the workshop, the facilitator or the way the workshop was presented. Here are some highlights from the survey, while more details are given in Appendix 2.

- **100% of survey respondents said they would recommend our workshop to other teachers.**
- **100% of survey respondents said the workshop was interesting and well organized.**
- **100% of survey respondents said the facilitator was easy to understand, knowledgeable and fostered an environment where participants felt comfortable about asking questions.**
- **93% of survey respondents said they will use their new knowledge and resources when teaching astronomy.**

Number of participants: 176 (55% female, 45% male)

Countries represented: Canada, France, Switzerland, Spain, Romania, Tunisia, Gabon, Algeria, Morocco, Mali and Reunion Island.

While most participants were teachers, as we hoped, we also had people with different backgrounds such as informal educators (museum, science centres...) and astronomy and science education professionals. Therefore, some participants already had a good knowledge of astronomy.

The workshop is aimed at teachers without any prior knowledge of astronomy and who teach the very basics of astronomy. In Canada, this curriculum is aimed at kids aged 11-12. We were therefore surprised to learn that almost half of our participants taught to kids aged 15 and more (see Image 2). This explains why a common comment in the evaluation form was about wanting more advanced content and activity ideas.

Galileo Mobile Constellation

The participating schools have shared their joy at the visits in a dedicated Facebook group, which is more active every day!

How Big is Earth

We had hoped that students in each school would collaborate with students around the world. Unfortunately this did not occur.

The Pre-Activity Survey provides some insight on how well prepared in basic geographic, mathematical and scientific content the students were. It is interesting that most students knew who Eratosthenes was and where he lived but only 20% of the students knew after watching the Cosmos video that Eratosthenes had calculated the Earth's circumference within 5% accuracy.

The data shows how many misconceptions of basic ideas these middle school students have. 29 out of 40 students correctly described a ratio; 25 out of 40 students correctly defined a kilometer; and 27 out of 40 students knew that 360 degrees is the number of degrees in a circle. However, what these researchers found disturbing was that 49% did not know what a circumference is. This was equally distributed across all the four schools. Although 74% knew what a ratio was only 45% knew how to solve the ratio problem.

By the end of fifth grade students should know the difference between latitude and longitude. However, in our survey, only 37.5% knew what longitude was and 30% knew what latitude was. 25% of the students mixed up latitude with longitude.

Three students completed the survey of attitudes toward science post activity. Overall there is a positive science attitude but without having the data prior to the activity we

cannot say for certain these attitudes toward science are a result of these students doing the How Big Is the Earth Activity.

Traveling Telescope

At all times the teachers attended the school visits and gave back encouraging, positive reviews. There were times when the school had up to 1,500 eager students crammed into a large school hall.