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Preliminary results of evaluation of educational program "Peri Anemon & Ydaton"

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Introduction

The research team of METEO Gr at the National Observatory of Athens has implemented an educational program for secondary schools named "Peri Anemon & Ydaton" since 2016. The content of the educational program is in line with the curriculum of the Middle and High Schools and its structure is based on the constructive model of Driver and Oldham (Driver, 1986).
The curriculum aims to provide to students acquisition of knowledge on severe weather phenomena, with emphasis on their impact on individuals and the society. The curriculum has an interdisciplinary as well as a holistic character. The interdisciplinary approach ensures the synthesis of knowledge, concepts and approaches from different sciences, natural and human, with the aim to unify the knowledge (Flogaiti, 2006). The evaluation of an educational program is a prerequisite as it helps to improve the program and determine if the program meets their stated goals. The purpose of this paper is to present the preliminary results of the evaluation of the educational program "Peri Anemon & Ydaton".

Methodology

Evaluation is a systematic process of collecting, analyzing and interpreting information to determine the extent to which students achieve instructional objectives (Gronlund, 1990). In the evaluation process, the first step is to determine the objective of evaluation and to quantify the achievement of the educational goals. The program "Peri Anemon & Ydaton" aims to present and discuss the weather phenomena, which affect students in the Mediterranean area, emphasizing in the severe weather phenomena and the related protection measures.
The main objectives of the program are the explanation of the following weather phenomena:

A. the creation of cyclonic and anticyclonic systems
B. the formation of the cold and warm fronts
C. the water cycle and the creation of clouds
D. the stability and the instability in the atmosphere
E. the cloud classification
F. the creation of thunderstorms
G. the creation of cloud-to-ground lightning strikes
H. the formation of tornadoes.

The dominant tool for teaching strategies is the didactic tool of the model, since the student can confirm or reject his perceptions about the development of the weather phenomena. Furthermore, the students can discover the factors that influence the meteorological phenomena, such as the creation of high intensity rainfall and thunderstorm, the formation of a tornado and the creation of lightning, while developing psychomotor skills. During the educational program, the cooperative approach is applied to ensure students' cooperation. In parallel, modern teaching tools (educational videos, interactive tablet applications, experimental devices) are implemented, aiming at the experiential approach of knowledge. For the above objectives, Bloom's taxonomy was used, while the program targets 8 overall goals.
A multiple-choice questionnaire with 20 questions pertaining to the whole cognitive approach is used as an evaluation tool. To ensure student's participation in the evaluation, the questionnaire is given as a software application and students are informed of their success score at the completion of the questions. In this paper, we used the results of the 257 questionnaires completed by Middle and High Schools students, from all over the area of Greece.

Conclusions

Among the 257 questionnaires completed by the students and analysed, the correct responses **average is 67%.** The number of the sample can be characterized as satisfactory in order to obtain reliable results. The total percentage of correct answers was calculated in relation to the ***relative frequency percentage*** **(pi**) and the ***cumulative frequency percentage*** **(Pi),** as indicators of evaluation (Figs. 1, 2). A total of 78% of the sample provided answers with an accuracy exceeding 50% (Fig. 1).
To assess the achievement of the above eight (8) learning objectives, twenty (20) questions formed the questionnaire and were categorized by objective (A to H) as follows: **A:** Q1, 2, **B**: Q3, 4, 5, **C:** Q7, 8, 18. **D:** Q6, **E:** Q9, 10, **F:** Q13, 14, 15, 16, 20, **G:** Q12, 19, **H:** Q11, 17. Every question is an evaluation criterion relevant to the cognitive goal. The main preliminary results of the educational evaluation of the program are presented in Figures 1 and 2.

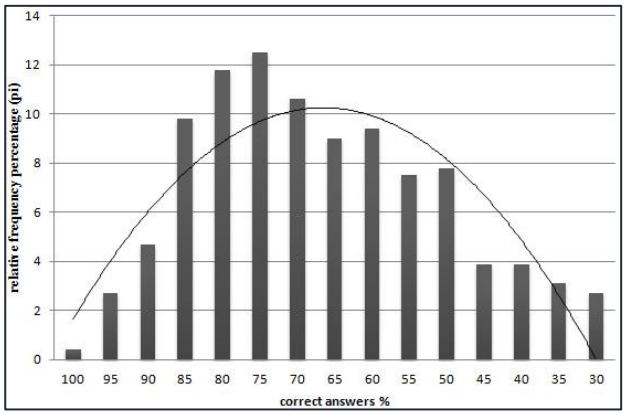

Figure 1: Relative frequency of correct answers (pi)

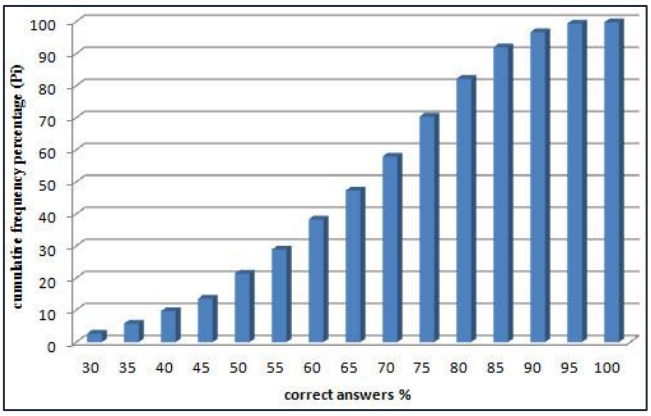

Figure 2: Cumulative frequency of correct answers (Pi)

Fig. 1 presents the relative frequency of correct answers, while Figure 2 presents the cumulative frequency of correct answers. For the analysis of the above results, the assumption that the 5/10 grade (or 50%) is considered successful was adopted. As it is obvious from Figure 1, the majority of students gave correct answers from 50% - 85%, proving that the educational program achieves its educational goals, at a satisfactory level. The percentage of correct answers in the range of 50 - 70 % ranged from 8-10 %. The corresponding percentage of correct answers from 70% - 85% was 10-12%, showing that this is the dominant range of students with correct answers. On the contrary, the percentage of correct answers which ranges of 30- 45% and 90% - 100% was less than 5%. The percentage of students with correct answers follows a Gauss distribution (Fig.1), revealing that the sample is representative, and that the questionnaire was built according to the educational programme and the average cognitive level.

Figure 2 shows that the cumulative percentage of correct answers with a success rate lower than 35 % is less than 6%. The percentage of correct answers with a success rate lower than 45% is 13,6%, while the corresponding percentage for success rates lower than 50%, 60%, 70% and 80% are 21,4%, 38,3%, 58% and 82%, respectively. Consequently, it is once again shown that the predominant range of students with correct answers is 50-85%.

The obtained results prove that the overwhelming majority of students had successfully answered to the questions, consistently to a normal (Gauss) distribution (Spiegel, 2000). Based on the above preliminary results of evaluation of the educational program "Peri Anemon & Ydaton", it is evident that the program is achieving at a great extent its cognitive goals. It should be noted that the evaluation is underway and it will be completed by May 2019.

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