

*Example of authentic primary education on composting,
supervised by an association and scientists*

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Abstract ;

This work is a cooperation example of scientific research institutes with society foundations, and in particular the Institute of Arid Regions of Medenine (IRA) cooperating with associations working in the educational and environmental framework by supervising an extra -school activity for school children. The Errawassi Association for Development in Medenine has been collaborating since 2015 with five primary schools in the region, facilitating composting training sessions within the framework of clubs dedicated to the environment in these institutions, which constitutes an authentic learning situation, outside of school time. The running of this training was checked by taking samples, for physicochemical analyses, as well as, by surveys of teachers and parents of students. Following this study, the students showed a strong commitment to this activity, since they were able to see in practice the interest of this composting process, by promoting this product in the school garden. It was an introduction to recycling, sustainable development and involvement in environmental actions within the framework of an authentic teaching.

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1. Introduction

An authentic learning environment is an instructional approach that allows the construction of meaning based on real-life situations and the learner's personal experience, which are contexts that involve real-world issues and relevant projects for the learner [1–3]. Movements towards creating authentic learning environments are essential, as research has shown that when the learning process is separated from its real-world applications, knowledge remains inert and unused beyond the classroom [4]. Students develop many skills while participating in an authentic learning environment. Lombardi in his authentic pedagogy model reported in the Educational Communications and Technology Research Handbook [5], recognizes that in addition to becoming familiar with the language and symbols used by professionals, students will be able to: judge the validity and reliability of new information, develop the ability to recognize relative patterns in unfamiliar contexts, work flexibly across disciplines and cultural boundaries to develop creative solutions to the problem under consideration. So, through practice, students will develop the patience to follow through and solve more complex problems.

In this context of authentic pedagogy, learning outside of school time in the context of social and environmental actions is a way to immerse students in the real world as part of their learning [6].

Indeed, many studies in the sciences of education have focused on the impact of teaching or training outside school hours on the social responsibility and academic success of students [7]. As well as on the behaviour and civic organization of these students, among themselves, and towards the teaching staff, schools and in society [8]. From there came the idea of carrying out surveys of pupils' parents and teachers as part of this preliminary study on the impact of scientific awareness clubs on pupils, and in particular a composting club.

Concretely, composting is an important method for the recycling of organic waste collected in agricultural or kitchen waste. Adding compost to sandy soils improves the water holding capacity, makes these soils easier to till and plant. By adding organic matter to the soil, compost can help improve plant growth and health, and therefore yield in a farm setting [9].

This study focused on the preparation of compost, within the framework of scientific awakening clubs in schools, from organic household residues and garden pruning

waste, then this compost was used as a soil amendment. Different physicochemical analyses of the compost were determined during and after this preparation, in collaboration with the Laboratory of Eremology and the Fight Against Desertification of the Institute of Arid Regions of Medenine. These analyzes showed the smooth running of the process and the quality of the compost obtained.

Then, surveys of teachers and student's parents were carried out to assess the impact of this experience on schoolchildren.

2. Methodology

The Errawassi Association for Development in collaboration with Anged Medenine has installed composting boxes in schools and started the initiation to the composting process in five scientific awareness clubs belonging to five primary schools in Médenine, namely: Elamel school, Taieb Mheri school, Route of Gabes school, Ibnou kouldoun school and Hay Ennour school. As part of these clubs, schoolchildren, 50 in total, attended theoretical and practical training workshops on the recovery of domestic waste, the composting process and its phases, as well as gardening.

Indeed, these schoolchildren coming from various levels of study within each school and affiliated with the scientific awakening club, collected the various waste to be

composted, namely green waste and organic waste, measured them (2/3 green waste (nitrogenous matter); 1/3 dry organic waste (carbonaceous matter)) mixed in perforated plastic boxes having a volume of one cubic meter, moistened and stored for a period of two and a half months "Fig. 1". The temperature was continuously monitored to detect the different phases of the composting process, as well as turning and wetting were carried out to guarantee the homogenization and decomposition of the materials initially introduced. In addition, this work was checked by taking samples from the compost being prepared, as well as physicochemical analyses on these same samples were carried out at the IRA of Medenine. The interest and importance of this scientific work is to ensure the agronomic quality of composting for its subsequent use as a soil amendment, whether in agriculture or gardening to improve soil texture.

Fig. 1 : Dosing, mixing and storing compost for use in gardening



The physicochemical analyses were carried out according to the Dugain method described in the literature [10] on mature compost. Mineral analyses were carried out by acid attack of the ashes. The samples are then analysed by atomic absorption. The device used is of the HITACHI model Z-6100 type.

Then, a survey was carried out targeting teachers and parents of students to assess the impact of this experience on pupils. The teachers are ten in number, two for each school. For the parents of pupils, there are 53 of them, where 50 have active children in the club and 3 parents whose children are not affiliated with the club and have accepted to answer the survey, knowing that each club has approximately one ten students. Subsequently, there are two examples of

questionnaires distributed to teachers practicing in the activities considered in this pilot study as well as the parents of students.

Teacher's Quiz

1/ You have been teaching for:

☐ Less than one year

☐ 1 to 5 years

☐ 5 to 10 years

☐ More than 10 years

2/ You had prior knowledge of composting before the realization of this workshop

yes ☐ no ☐

3/ If not, please indicate your level of satisfaction with the initiation granted by the Errawassi association.

Tick the level of satisfaction in the attached grid:

very	quite	satisfied:	moderately	unsatisfied:	not satisfied:
satisfied:	satisfied:	level	of satisfied: level	level	of level
satisfaction	satisfaction	satisfaction	of satisfaction:	satisfaction:	satisfaction:
level 5/5	level 4/5	3/5	2/5	1/5	0/5

4/ The composting workshop is part of a scientific awakening club:

yes ☐ no ☐ if not.....

5/ Has participation in this workshop influenced your students on the following points? :

Check the aspect that seems to you where the students are influenced:

☐ Scientific awakening

☐ Organization, cleanliness, waste sorting

☐ Gardening

☐ Socialization

☐ School results

6/ You plan to continue this experience in the future

yes ☐ no ☐

If no why ?.....

This questionnaire was carried out by Dr K. Ardhaoui (ISBAM/IRA) as part of a pilot study on the influence of the activities offered by associations on the school environment. January 2019

Parents' quiz

1 / Your child participated in the composting workshop

yes ☐ no ☐

2/ If your child took part in the composting workshop, please indicate your degree of satisfaction.
tick the level of satisfaction in the attached grid:

very	quite	satisfied:	moderately	unsatisfied:	not satisfied:
satisfied:	satisfied:	level	of	satisfied: level	level
satisfaction	satisfaction	satisfaction	of satisfaction:	satisfaction:	satisfaction:
level 5/5	level 4/5	3/5	2/5	1/5	0/5

3/ Has participation in this workshop influenced your child on the following points:

Check the aspect that seems to you where your child is influenced:

- ☐ Scientific awakening
- ☐ Organization, cleanliness, waste sorting
- ☐ Gardening
- ☐ Socialization
- ☐ School results

4/ Your child did not participate: why? (Many possible responses)

- ☐ The activity did not interest him.
- ☐ The proposed day was not suitable.
- ☐ He needs rest and needs to play quietly at home.
- ☐ There are other activities.

This questionnaire was carried out by Dr K. Ardhaoui (ISBAM/IRA) as part of a pilot study on the influence of the activities offered by associations on the school environment. January 2019.

3. Experimental Results and Discussion

By following the evolution of the temperature as a function of time, we were able to ensure the normal evolution of the composting process, in fact the latter goes

through the known successive stages of mesophilic phase, thermophilic phase, cooling phase and the maturation phase "Fig. 2".

Fig. 2: An example of temperature monitoring during composting

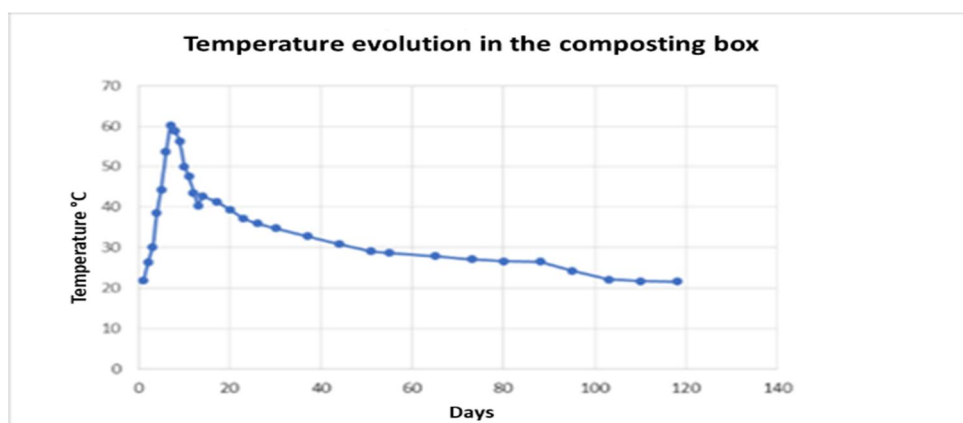


Table 1: An example of analysis results on compost

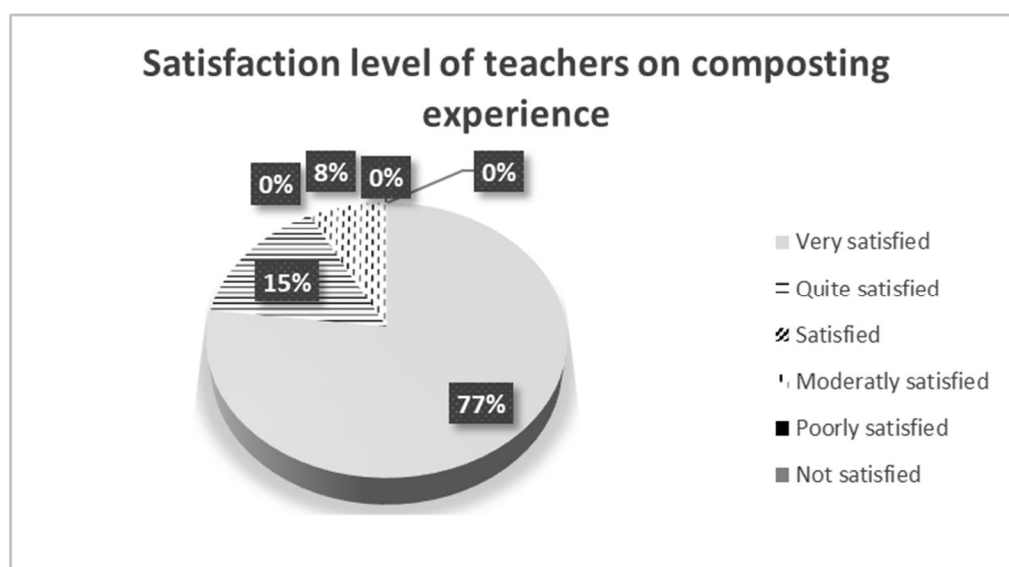
Parameters	Value
pH	7.3
E.C. (mS/cm)	5.7
Moist (%)	16%
S. M. (%)	84%
O.M. (% MS)	39
M.M (%MS)	63
C/N	12
K (mg/100g)	457
Ca (mg/100g)	1834
Mg (mg/100g)	289
Na (mg/100g)	1556
Fe (mg/100g)	175
Zn (mg/100g)	12
Mn (mg/100g)	6
C.O.T (%ms)	19.5
N.T.K (%ms)	1.6

EC: Electrical conductivity; SM: Solid Matter; OM: Organic Matter; MM: Mineral Matter; T. O. C. : Total organic carbone ; N.T.K : Total Kjeldahl Nitrogen

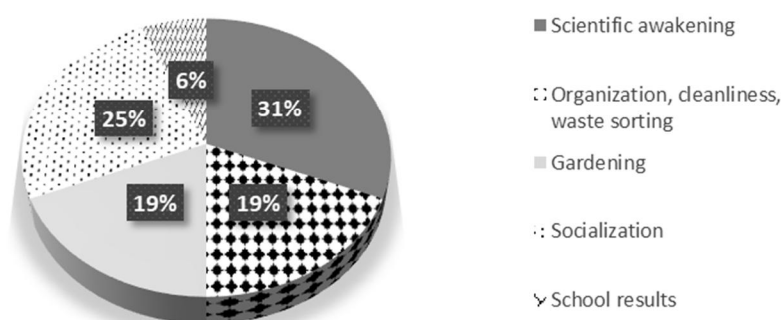
The compost studied has a pH close to neutrality and slightly alkaline, indicating the maturity of the product by the presence of humic substances which are characterized by their buffer effect. The recorded content of organic nitrogen is high in the compost studied and it is proof of the fertilizing value of the finished product. The C/N ratio shows a value below 20, which shows that the compost is mature. The product obtained has a considerable richness in trace elements (Table 1), which are indicators of the fertilizing value of the compost as well as its environmental quality being free of toxic metals, especially since these values recorded do not exceed Tunisian

standards [11]. Finally, the product produced within the framework of these clubs can be well incorporated into the soil. The survey undertaken with volunteer teachers supervising schoolchildren in scientific awareness clubs showed that the latter are teachers with more than 10 years of teaching experience. They were introduced to composting by members of the Errawassi association in Medenine. This is in close agreement with previous research findings [12,13], which revealed that experienced teachers are more likely to engage in volunteering and extra-curricular activities than their newly recruited counterparts.

Fig. 3 : Results of the survey carried out among teachers leading science awareness clubs



Aspects the most affected according to teachers



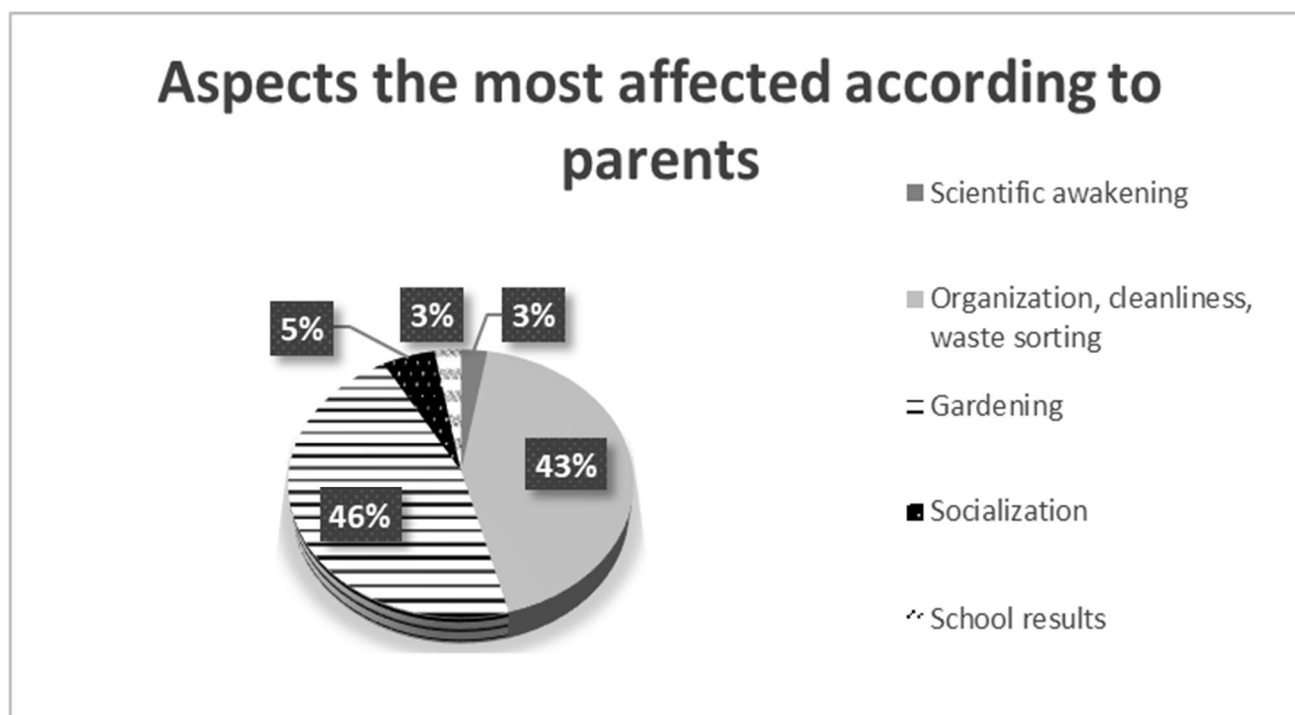
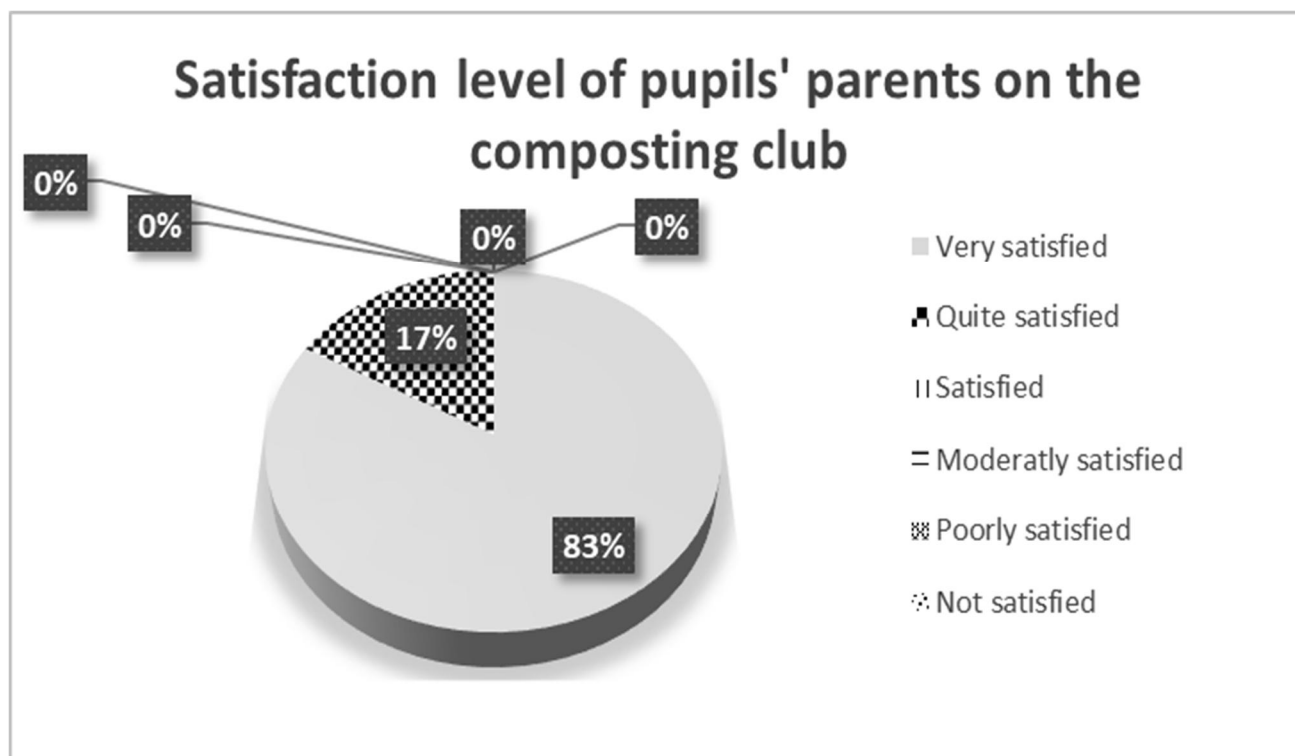
It can be seen that the majority of teachers are satisfied with this experience, those who are moderately satisfied deplore the lack of worker assistance for tasks requiring effort. Knowing that no teacher leading these clubs was little or not satisfied. These results are in agreement with those reported by Hursen [14], where teachers appreciate authentic pedagogical situations and even prefer it to classical pedagogy. On the other hand, the teachers have found that the schoolchildren who are members of these clubs have developed in terms of scientific awakening, organization, cleanliness, waste sorting, gardening and socialization, but little direct impact on their school results. Indeed, students in primary education are more involved in this type of activity while showing openness and better communicative skills as shown in the literature [15], moreover these scientific activities outside

of the classroom induce a renewed interest in natural science classes as explained by Braund and Reiss [16].

Finally, these teachers participating in our survey all judge the need to continue composting activities within the framework

of the club in order to see the long-term effect of this activity on the learning of schoolchildren, since it is a beneficial for the latter, which contributes to their openness to the natural, scientific and social environment.

Fig. 4 : Results of the survey carried out with the parents of school children



For the 50 parents, taking part in the survey, and whose children are active, it was found that they are mostly satisfied with the

activity of their children within the framework of scientific awareness clubs, since they have found that the latter are more

interested and participate in gardening, are more organized, attentive to cleanliness and the sorting of household waste. These survey results are in agreement with the results of Buckley and Lee [17], which revealed that extra-curricular activities or extra-curricular activities greatly influence students, improving their discipline, skills and involvement in various social activities.

Finally, only three parents whose children did not participate in the clubs agreed to answer our survey. They feel that this club is not interesting, and that their children need to rest and play quietly at home. Based on the research of Ashbourne and Andres [18] on the extra-curricular activities of their children, it appears that the parents have one of three attitudes towards the extra-curricular activities of their children, either they force them (for or against), or they facilitate their access to these activities, whether they encourage them. Thus, it is not impossible to find parents who use their authority to choose the activities of their children.

4. Conclusion

The scientific awareness clubs with the composting activity are approved by all the teachers involved and encouraged by the parents of the students participating in this club.

The students following this activity find themselves more organized, active in groups and aware of the need for sorting waste and are more interested in gardening, this shows the success of this authentic teaching attempt in extra-curricular time. Further, long-term studies will show if there is a relationship between early science clubs and improved academic achievement.

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