

# REFLECTION IN STUDYING ELECTRONIC TABLES AT SCHOOL

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***Abstract.** The present study is dedicated on forming skills for producing reflections from both students and teachers in studying the topic 'Electronic Tables' at school. This study provides a detailed explanation of the applications of the ALACT model where the process of reflection is realized via a cyclic model. An overlook is given on specific examples from the IT education which realize reflection.*

**Keywords:** reflection, education, information technology, electronic tables, cyclic model

**2010 Mathematics Subject Classification:** 97Q60

## Introduction

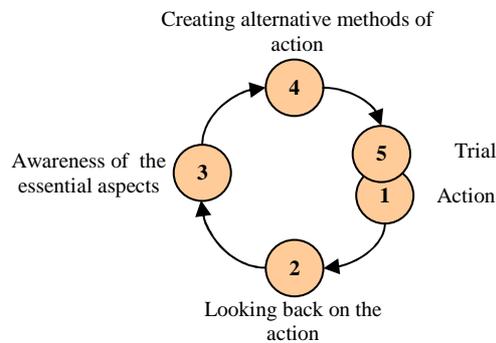
We witness revolutionary changes in modern lifestyle influenced by the rapid development of information technology (IT) and its applications in everyday life. These changes will apparently lead to extreme transformations in every aspect of life as we know it. Quick and high-quality adjustments are necessary in education. The schools must by all means supply its alumni with adequate education and prepare them for the challenges that IT presents not only in their future occupations but in everyday life. Modern IT permeates quickly in the methods for teaching different school subjects. The standard educational three Teacher – Students – Schoolbooks is now a four with the addition of IT. The new situation presents students with demands for knowledge of new studying strategies and techniques which guarantee the acquisition of additional knowledge and skills for adapting to new circumstances. In this situation the teachers have the difficult task of finding balance between traditional teaching and application of IT in pedagogic science. An important role in solving this problem can be attributed to applying elements of philosophy and psychology such as reflection and synergy.

In world pedagogic theory and practice there is a wider usage of the so called "reflexive teaching". Models of reflexive educational practices are being created. The basic goal is to deliberately educate teachers and students alike in applying reflection in education. In this current study we will attempt to present one opportunity for developing reflection skills in studying the section 'Electronic Tables' in the IT education in the 7th grade in the Bulgarian school system. This study is a natural sequel to [1].

### Alact model for organizing a reflective practice in IT education

There are different models for organizing reflective pedagogic practices. One of the most popular models is ALACT and it was suggested by the Dutch professor in pedagogy Franz Korthagen. Since there is not a universal definition for reflection, Korthagen gave his own unofficial definition: “The reflection is the process by which someone reflects when he or she tries to restructure his or her experiences and/or knowledge” [2].

In Franz Korthagen’s concept reflection has to follow certain phases (steps). In the ALACT model the reflection process as restructuring experiences and knowledge is described as a cyclic model. (figure 1)



**Figure 1:** *The ALACT model describing the ideal reflection process*

Five phases (steps) can be distinguished for this model: (1) action, (2) looking back on the action, (3) awareness of the essential aspects, (4) creating alternative methods of action and (5) trial which is a new action in itself and is therefore the starting point of a new cycle (see figure 1). The name of the model, ALACT, is an acronym from the first letters of the names of the five phases – 1) Action 2) Looking back on the action 3) Awareness of the essential aspects 4) Creating alternative methods of action 5) Trial.

After action, steps 2, 3 and 4 describe the process of reflection by asking three basic questions:

- In step 2: What has happened?
- In step 3: What was important for me?
- In step 4: What will I decide for next time?

This model seems very simple and at the same time intensifies the acquisition of knowledge based on experience. We will now explain steps 2, 3 and 4 in detail.

#### **Step 2: Looking Back on the Action**

This step is necessary for the next step 3. The teacher has to explain the situation before the student can distinguish what is important. The questions presented in figure 2 can be useful in encouraging concreteness in the reflection process:

0. What is the context?	
1. What did you want?	5. What did the students want?
2. What did you do?	6. What did the students do?
3. What were you thinking?	7. What were the students thinking?
4. How did you feel?	8. How did the students feel?

**Figure 2:** *Concretizing questions for phase 2 of the ALACT model*

Finding the answers to all those questions is often difficult for the teachers. Especially the questions in the column on the right are often problematic: sometimes teachers have no idea about what are their students thinking or how do they feel. Of course, this is a good starting point for discussing the question what can the student or the teacher do during the next class to find out the answers. The important final step in phase 2 connects the answers to questions 1 to 8 or in other words analyzes the cyclic process that goes on between the teacher and the students. For example: How did the teacher's own feelings influence their actions during the class, how did those actions influence what their students feel or want, how did that influence the students' behavior, what was the effect from that behavior on the teacher's feelings, etc. This is how the basic aspects of the process are clarified during the class which leads to reflection in phase 3. The following questions can be helpful in phase 3:

- How do the answers to the previous questions relate to each other?
- What is the influence of the context/school as a whole?
- What is the meaning to me right now?
- What is the problem (or positive discovery) now?

### **Step 3: Awareness of the Essential Aspects, Theory and theory**

According to Korthagen in phase 3 a need may arise for more theoretical elements and they can be introduced by the teacher and can be adapted to the specific needs and interests of the teacher and the situation undergoing reflection. He calls this 'theory' with a small 't'. The important thing is that it must help the teacher accept those characteristics of the situation which are important for the question how to react in this situation. This is the main difference between 'Theory' with a capital 'T', the basic academic theory which aims to understand the situation. It means that the 'theory' with a small 't' is not a reducing or simplifying of the official academic knowledge but is fundamentally different in character. The 'Theory' with a capital 'T' is a conceptual knowledge which is personally related and is tightly connected to concrete contexts.

### **Step 4: Creating Alternative Methods of Action**

In this phase the alternative methods of action are created. From the theory which the teacher constructed it is easy to take under consideration new methods for dealing with the situation. It is important that the teacher finds new solutions

which he/she will in fact use in the classroom (phase 5). The following questions can be useful in this phase:

- What alternatives do I see? (Solutions or approaches to use in my discovery)
- What advantages/disadvantages do they have?
- What will I decide for next time?

Despite the fact that the ALACT model seems very simple, reflection is not simple at all. Because teachers are not used to talking about their experience, phase 2 of the model can be a real struggle in the beginning. Most teachers want to jump straight into phases 3 or 4. They want solutions but as we pointed out, phase 2 is necessary for the next two steps even though it takes time and patience to ponder upon it.

Creating schemes and models similar to the ALACT is a relevant activity because abstract theories turn into technologies that are applicable in practice.

### Reflection in teaching ‘electronic tables’ at school

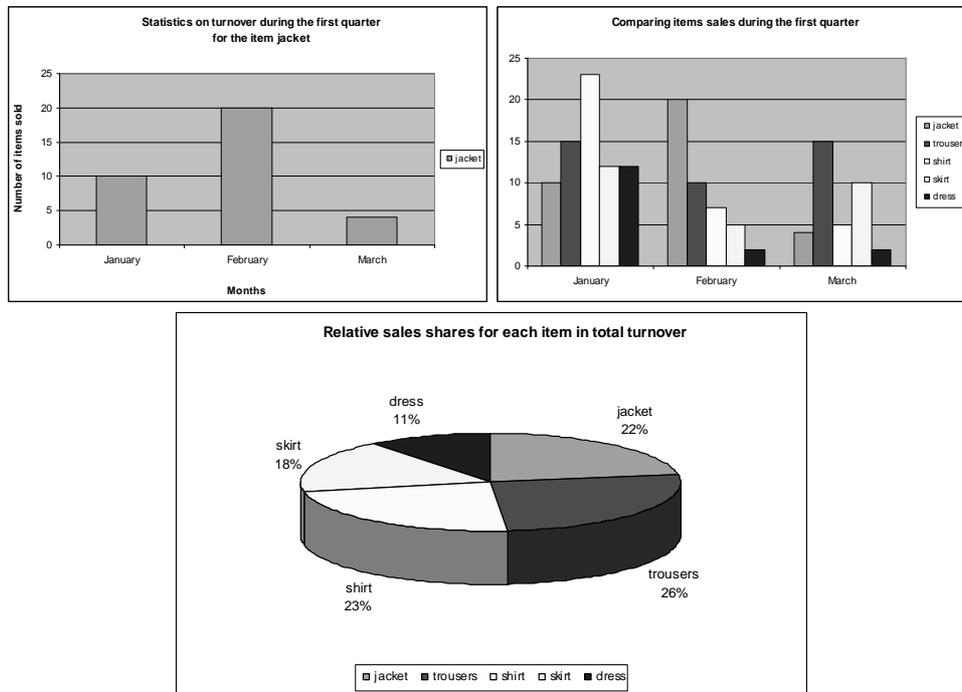
The section ‘Electronic Tables’ is basic in the IT teaching process. In the secondary school it is part of the schoolbooks for mandatory education in the 5<sup>th</sup>, 6<sup>th</sup> and 7<sup>th</sup> grades [3, 4, 5]. For grades 9-12 the section is described very straightforward without impacting the scientific weight of the contents in [6].

We will take a look at two specific examples from the ‘Electronic Tables’ section where we will attempt to apply the ALACT model.

**Example 1.** Using only studied IT, create an electronic table displaying the sales in a clothing store and diagrams using data from the table. This example is directed towards 7<sup>th</sup>-graders studying IT as a mandatory subject. They have the knowledge and skills for working with the programs MS Excel from their IT education in the 5<sup>th</sup> and 6<sup>th</sup> grades. The example is suited for the students’ age. The teacher presents a model of the table and diagrams that have to be created and builds them together with the students.

This is how the different ALACT phases (steps) may look for this example:

<b>Table reflecting the number of items sold during the first quarter in a clothes store</b>					
<b>Item</b>	<b>January</b>	<b>February</b>	<b>March</b>	<b>Total sales during first quarter</b>	<b>Average items sold per quarter</b>
jacket	10	20	4	34	11
trousers	15	10	15	40	13
shirt	23	7	5	35	12
skirt	12	5	10	27	9
dress	12	2	2	16	5
				<b>Fewest items sold during first quarter</b>	<u>16</u>
				<b>Most skirts sold</b>	<u>12</u>



**Figure 3:** *Model of the assignment*

**Phase 1: Action**

On the teacher's side, the actions are: presenting the assignment for the students to execute; directing towards a specific IT to use in the execution of the assignment; explaining the presented model and the steps for its execution.

On the students' side, the actions are: creation of the table and diagrams as in the presented model using the studied IT and their storage as a computer file.

**Phase 2: Looking back on the action**

During the creation of the document the teacher discusses with the students how to create the computer file. Thus, the teacher helps the students reach the answers to questions such as: What are we trying to do? Which IT should we use to do it? In how many ways can it be done using what has been studied thus far?

**Phase 3: Awareness of the essential aspects**

This is an extremely important phase during which the teacher and the students consider and realize different aspects of the performed activities. The teacher may remind the students of different theoretic components and present them new techniques from the IT that has been used.

**Phase 4: Creating alternative methods of action**

During this step the teacher discusses different ways of realization similar computer files with the students. The usage of alternative IT is also discussed. The

advantages and disadvantages of the discussed technology are also being considered.

#### Phase 5: Trial

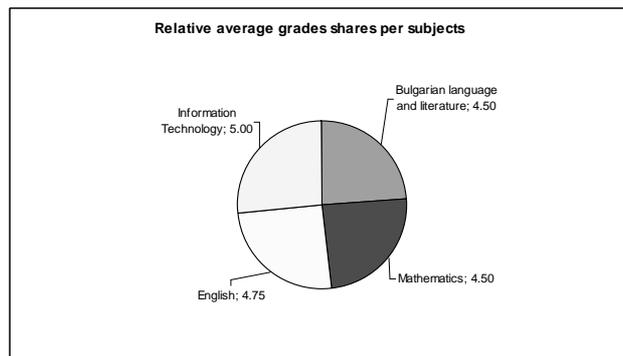
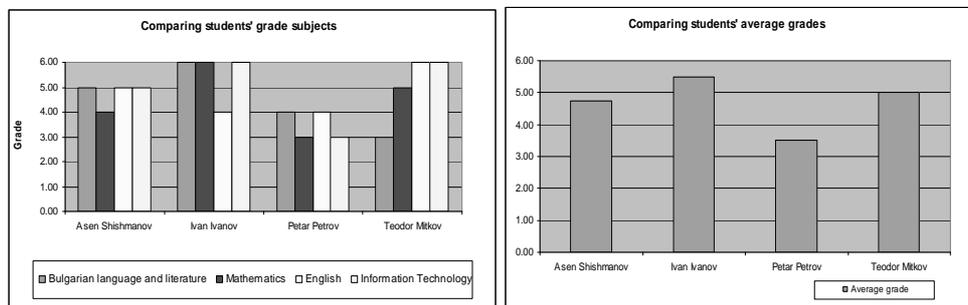
During this step the teacher presents a new assignment for execution by determining only the topic of the assignment.

**Example 2.** Create an electronic table displaying the grades of the students from the same class in specific subjects. Calculate the average grade for all subjects as well as each student's average grade. Show the maximum average grade for all subjects and the minimal average grade out of all students. Create diagrams using the model presented from the teacher.

Moving to phase 1 for creating a new computer file which leads to a new beginning for the ALACT cycle.

Student/Subject	Bulgarian language and literature	Mathematics	English	Information Technology	Average grade
Asen Shishmanov	5.00	4.00	5.00	5.00	4.75
Ivan Ivanov	6.00	6.00	4.00	6.00	5.50
Petar Petrov	4.00	3.00	4.00	3.00	3.50
Teodor Mitkov	3.00	5.00	6.00	6.00	5.00
<b>Average grade per subject</b>	<b>4.50</b>	<b>4.50</b>	<b>4.75</b>	<b>5.00</b>	

<b>Maximum average grade for all subjects</b>	<b>5.00</b>
<b>Minimum average grade out of all students</b>	<b>3.50</b>



**Figure 4: Model of the assignment**

Phase 1: Action

On the teacher's side, the actions are: presenting the assignment for the students to execute; directing towards a specific IT to use in the execution of the assignment; explaining the presented model and the steps for its execution.

On the students' side, the actions are: designing the electronic table; building it using the studied IT and filling in the data; creating diagrams following the assignment and storing them as a computer file.

Phase 2: Looking back on the action

The teacher discusses the assignment with the students and asks the following questions: What has to be done? Are there similarities and differences with the previous assignment?

Phase 3: Awareness of the essential aspects

The teacher asks the students about the theoretic part of the assignment execution. During this reflection phase the students have to find out by themselves where their skills and knowledge are not at the desired level.

Phase 4: Creating alternative methods of action

Applicable similar cases for designing and developing electronic tables are being discussed which present and analyze data from other thematic areas.

Phase 5: Trial

During this step the teacher presents a new assignment for execution by determining only the topic of the assignment. The students gather the materials they need on their own and move to phase 1 for creating the new computer file which leads to a new beginning for the ALACT cycle.

Let us point out as a conclusion that the section 'Electronic Tables' from the subject Information Technology presents many other opportunities for realization of reflection in education and practice.

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