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Comparison of different forms of informal education... in terms of teacher's work input and achieved results

Teaching and learning does not apply to a man and modern times. Animals also learn through exposure, stimulus recognition, reproduction, and imitation (Tomasello, 2002). Initially, also in hominid groups, children gained knowledge by analogous methods directly from adult members of the tribe. This type of informal education still applies to our human young children. When specialized professions (e.g., blacksmithing, quackery) began to appear with the development of civilization, their rules were secretly passed from master to student. In this case, we can talk about the beginnings of formal education. The invention of writing created schools. Scribes were educated in ancient Egypt and Mesopotamia, and in ancient China, there were schools that educate children who were at least 12 years old. Private teachers taught in ancient Greek city-states. In Rome, the educational system changed as the state changed. Ultimately, however, four-level paid education developed. Religious orders and monasteries played a major role in medieval education. Towards the end of the 17th century, a new cultural and mental current (Enlightenment) began to emerge in Europe, which changed the approach to science, knowledge, and education. The current education system was created at the beginning of the 19th century in a militarized Prussian state, on the wave of industrialization. The aim of such education was to create a citizen for the needs of the administration and an obedient factory worker working an assembly line, whose rhythm of work was regulated by the sound of the bell. In schools discipline was in force – there was no room for individualism, developing a sense of autonomy or creativity. Over 200 years have passed, the world has changed and industrialization has a completely different face today and the nineteenth-century model of education centrally controlled by officials who decide about school-age of students and curricula, with annual classes, in which children run the same program at the same time, with bells every 45 minutes, is still functioning. This happens even though developmental psychology and neuroscience talk about the ineffectiveness and even harmfulness of the current model. As an alternative to formal education that does not meet today's expectations, informal education is promoted in many countries.

Informal education is defined as institutionally organized learning, but outside the education and training programs leading to qualifications entered in the Integrated Qualifications Register (Eurostat, 2016).

Informal education has many advantages. A very important element of informal education are teachers/educators who are highly valued specialists (in their field) and at the same time passionate about education. They willingly share their knowledge with children and young people and, by their very nature, use the research method in education. Another advantage of informal education is the technical background in the form of well-equipped studios and laboratories that are not available in a typical school. Outdoor education conducted as part of informal education allows the use of valuable natural resources – both in museum halls and in the field. In informal education, it is also possible to use time other than at school. Therefore, the student can not only conduct an experiment or observation but also plan, analyze the results, formulate and discuss conclusions, which is often impossible in a Polish school due to the system of 45-minute lessons preferred by the school administration. In informal education, laboratory and project methods are used more often than at school.

It could therefore be concluded that informal education is an ideal solution. Is this really the case?

First of all, observation of students 'behavior in informal classes show their great interest - it can be stated that students' motivation increases. However, is it motivation to learn? It seems to me that in informal education, misconceptions of students about education arise – students think that any learning is fun. There is a misconception that learning is nice, easy and fun (it can be but it is not always the case). In Polish, we speak of "conquering knowledge" – just like conquering the mountain! Is climbing pleasant for everyone?

The second problem that appears in informal education is the ratio of the costs involved in the results achieved. Therefore, it was decided to examine the costs of individual types of informal education and compare them to the results obtained.

Research

In the years 2016–2018, an experiment was conducted on the effectiveness of various techniques (types) of teaching science subjects in informal education and attempts to estimate the input of the teachers' work in individual types of education.

The aim of the study was to compare the effectiveness of various types of laboratory classes in informal education with the work time invested by those conducting the classes.

For 4 semesters, students participated in 1.5 hour long weekly classes at the Pedagogical University of Krakow. Each stage had a slightly different form – from forms requiring the greatest involvement of the teachers to the total minimization of their work.

1st stage

In the first stage, classes began with a short lecture using multimedia, which was the theoretical introduction to the classes. Then the students worked with a work card that contained:

- a detailed description of the activities to be performed,

- space for observations and conclusions,
- and again, the theoretical explanation of the issues raised on class lecture.

Classes were conducted by 2–3 teachers (for about 12 students). Classes were conducted on an "equal front" (all students performed the same experiment at the same time) and the student workstations were fully prepared (they contained everything that was necessary for the student to complete the task). Before and immediately after class pre- and post-test were carried out.

2nd stage

In the second stage, the only change (compared to the first stage) was the change in the form of conducting classes – instead of classes conducted on an "equal front", where each student performs the same task at the moment, these classes were

Fig. 1. Students at a multimedia lecture (photo by M. Nodzyńska)

Fig. 2. Fully prepared workplaces for students – before classes (photo by M. Nodzyńska)

Fig. 3. ‚Equal front' work under the supervision of teachers conducting the classes (photo by M. Nodzyńska)

conducted using the "circus" method. About 8 workplaces were prepared for students (arranged in a circle, hence the name "circus"). At each position, students had the opportunity to perform a different experiment – students worked in pairs. They were moving from one workplace to another workplace. The students were worked at their own pace and they freely chose the order of experiments. Teachers had a supervisory role (they did not show how to perform the experiment) and answered students' questions.

Fig. 4. Workstations where students work in pairs. There were instructions for students at workstations (photo by M. Nodzyńska)

3rd stage

Three changes have been made:

- The initial theoretical lecture was abandoned (only theoretical information on the worksheet remained). Students were encouraged to ask questions about theories when something was not clear to them.
- Workstation preparation was limited (some of the equipment needed, laboratory glassware and reagents students had to find themselves in the laboratory room).
- Classes were run by 1 or 2 teachers.

Similarly to the second stage – in the third stage the classes were conducted using the same technique as in the second stage ("circus").

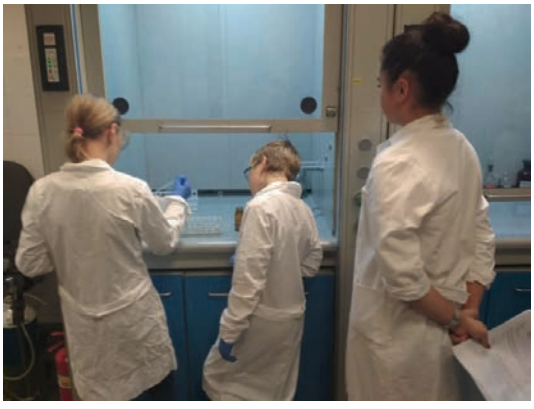


Fig. 5. Reagents and glass needed for classroom activities and instruction with theoretical material for students (photo by M. Nodzyńska)

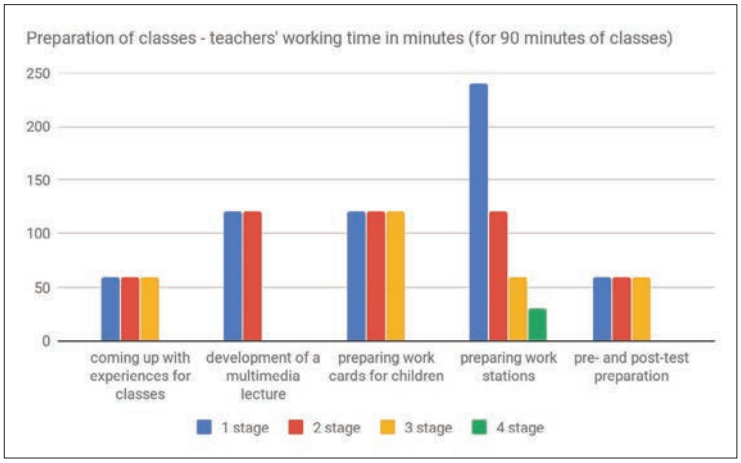
4th stage

In the fourth stage, instead of the work cards dedicated to them, students were given a chemistry script for 1-year non-chemical students (Nodzyńska, 2016), with theoretical information and descriptions of experiments. The students had no prepared workstations (they had to find all the equipment, laboratory glass and reagents they needed in the laboratory room). The students worked independently, each of them performed any experiments (from a given department) in any order. Only one person supervised the students' work and answered their questions. Pre- and post-tests were also abandoned in favor of self-evaluation carried out by the students.

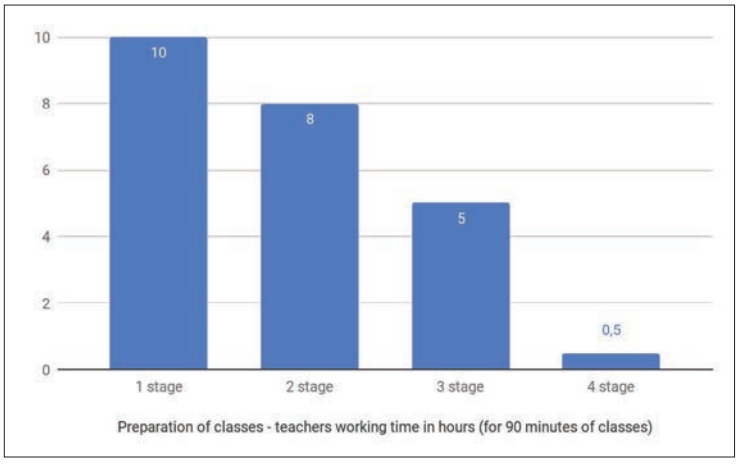
Fig. 6. Laboratory glassware and reagents on laboratory trolleys, students work independently with the script (photo by M. Nodzyńska)

The subjects of the classes in stages 1–3 were partially elicited with the students, while in stage 4 imposed by the script (Nodzyńska, 2016).

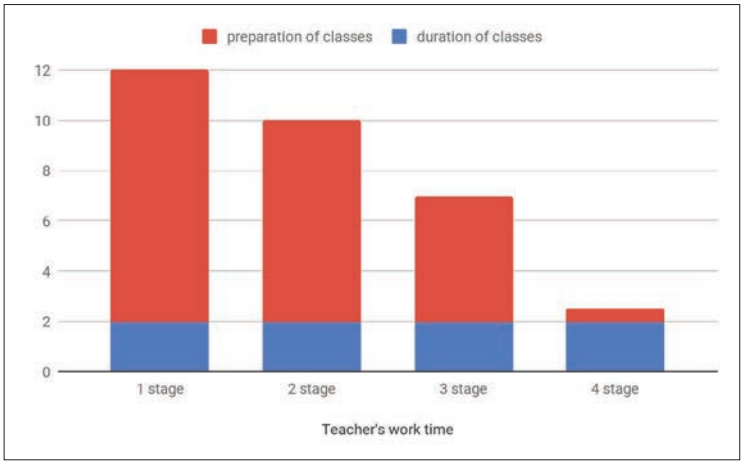
The graphs below show the average working time of a teacher who prepares classes of a given type (Graph 1 broken down into individual activities).



Graph 1. Preparation of classes – teacher's working time (in minutes) needed to prepare 90 minutes of classes with students (broken down into various activities; "Job preparation" also includes the time needed to buy the right ingredients and clean up after classes)



Graph 2. Total teacher's working time in minutes needed to prepare 90 minutes of classes with students



Graph 3. Total teacher's working time – preparation and conducting of classes

If we compare the time of class preparation in this way, it turns out that the costs of the teacher's work, in particular types of classes, change radically. Preparing and conducting 2 hours of classes for students, the topic of which was discussed with students, containing a mini-lecture, together with work cards, pre- and post-tests, purchases and preparation of the room (and then cleaning it) is about 12 hours, i.e. 1.5 days of teacher's work.

Preparing classes in informal education in this way seems ineffective. It is true that students get "tailor-made" classes and the teacher has the opportunity to go beyond beaten paths, but if you count the actual working time of the teacher, the cost of preparing and conducting the classes alone is about PLN 1,500 for one class. If we add the costs of chemical reagents, laboratory glassware, teaching aids or laboratory rental – we can see that the cost of such prepared activities is unacceptable.

If we compare these costs with the costs of stage 4, we can see a radical reduction in the costs associated with conducting classes. This type of activity, i.e. conducting previously prepared topics several times for subsequent groups of students, can often be observed on the private education market. These are both activities of private language schools, education schools, and museums. However, the question arises whether this type of education is still informal education? Often, the child/student is forced to participate in this type of activity, whether by parents or school (mandatory attendance during the so-called museum lessons). The educator's passion is also lost in such classes.

However, the issue of interest to us was not only to examine the contribution of the educator's work but also contribution to the increase in students' knowledge in particular types of classes.

The results of the study on the increase in knowledge

Although:

- topics implemented in stages 1 and 2 were selected by students,
- teachers conducting the classes were very involved in the clarification and explanation of the phenomena studied,
- students themselves did their own experiments and completed work cards,

the results regarding the increase in students' knowledge in stages 1 and 2 were not satisfactory (depending on the topic, they fluctuated between 20–30%). It can be stated that the increase in students' knowledge was inadequate to the funds invested.

In stage 3, an increase in knowledge was definitely greater (30–50%) but still lower than expected. However, in stage 4, an increase in knowledge exceeding the expected (45–60%) was observed. So definitely 'profits' were higher than the time spent and resources.

Summary

The obtained results show that the best results (taking into account the teachers' working time in relation to the obtained results) were obtained in activities that most closely resembled formal education. The students did not choose the topics of the laboratory themselves, they worked with the textbook, the classes did not have the form of games, there were no motivating elements, students themselves had to look for chemical reagents and laboratory glass in the laboratory. The question then arises: What is the purpose of informal education? This question should be asked by all participants in such activities: parents, teachers, children but also authorities. Popularizing science can be based on spectacular shows, but without pretending that this type of activity is science. It seems that effective educational activities in informal education require long-term learning and should not be based on spectacular actions. In informal education, emphasis should be placed on educating students' independence and subsequent tasks for students arranged in accordance with Bloom's taxonomy.

Therefore, it seems that in informal education it is a mistake to pay attention to a measurable increase in students' knowledge. Its main goal should be the motivation of students, their activation and the increase of so-called soft skills. With these objectives, the teacher's work input and the costs of this type of task are acceptable.

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Comparison of different forms of informal education in terms of teacher's work input and achieved results

Abstract

Nowadays, informal education is an integral part of children's education. Its undoubted advantage is arousing emotions and motivation to Science. However, is such education effective? Is the contribution of teachers/educators adequate to the increase of students' knowledge? The article describes research on four forms of science classes – from classes that require a very large amount of teacher work, to classes that do not require so much. Teachers' work time and the effects of their work were compared.

Keywords: informal education, time, commitment, effects

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