Philosophy Study, October 2022, Vol. 12, No. 10, 533-539
doi: 10.17265/2159-5313/2022.10.001

Philosophy of Teaching

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Education is a complex system that has evolved over thousands of years to reach its current level. It has many objects and subjects. The education systems of the countries are very diverse. Almost every country has its own ranking approach, because there is no universally accepted scientific theory of education. The search for effective reform in education continues today, but any reform that is not based on scientific theory cannot solve the problem. There are many problems in the content and management of education. Knowledge assessment is also flawed. No country can build an ideal school. It can be considered that in the last hundred years, education has not developed conceptually in the desired direction. Thus, education aims to train strong personalities, not perfect (wise) people. Although individualistic education may seem beneficial locally, globally it divides humanity and prevents its sustainable and harmonious living. However, in societies made up of perfect people, in principle there will be no division, harmony will exist, because perfect people solve problems not by force, but by reason, prefer cooperation rather than conflict. This means protecting the planet. To make the world a gun-free society, the view of education must change conceptually. This article presents a new philosophical view of teaching knowledge and proposes a new model, criteria, and theory.

Keywords: teaching model, criterion, assessment of knowledge, appropriation (a), quality factor (K), average knowledge, ideal school, relative learning criterion

Theoretical Part

The main objective of education is the transfer of knowledge and the assessment of acquired knowledge. Many ranking scales have been used in the last century to assess knowledge in the educational system.

In order to solve the problems facing education, a beaker with a height of L_0 (Figure 1) with a "liquid of knowledge" in it is proposed as a *model* (Askerov, 2004). The height of the full part of the beaker is marked by L_d, and the height of the empty part is marked by L_b. It is clear that the full height of the beaker is equal to the sum of the full and empty parts:

$$L_0 = L_d + L_b \quad (1)$$

This simple model and formula allows creating a scientific basis for knowledge transfer, learning, and assessment during teaching (Askerov, 2022).

Relative Learning Criterion

For centuries, the volume of knowledge was used as a criterion. The ratio of the learned part of the teaching material (L_d) to the part to be learned (L_0) has historically been used as a criterion. Let's call this criterion relative

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learning and denote by *a*:

$$a = L_d/L_0 \quad (2)$$

Today, this criterion is widely used in the world education system to evaluate knowledge.

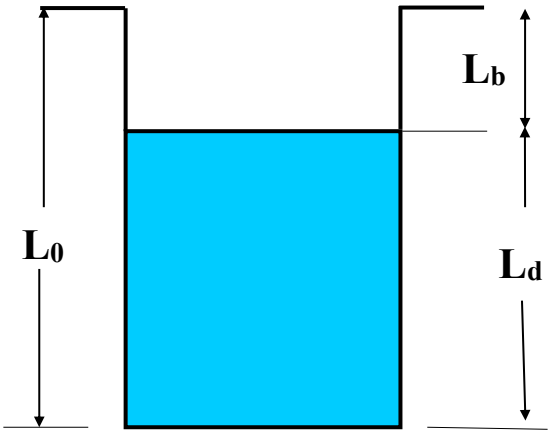

Figure 1. Knowledge teaching model.

Notes. L_0 indicates the volume of educational material to be studied; L_d shows the learned part of the educational material; L_b shows the unlearned part.

Let's call the unlearned part of knowledge as *relative knowledge scarcity* and denote it by *h*. According to the model, the relative knowledge scarcity can be determined by the following formula:

$$h = L_b/L_0 \quad (3)$$

As you can see, the proposed beaker model allows accurate measurement of acquired knowledge.

Linear Grading Scale

The success of the historical criterion *a* is vast, but it also has its flaws. It is subjective, authoritarian, and left to the teacher's discretion. If we divide the length Lo of the beaker by 5, 10 or 100, then it is possible to make a 5-point, 10-point, 100-point rating scale accordingly. For example, on a 5-point scale, the height L_o of a beaker is divided into five equal parts and represented by whole numbers from one to five. The knowledge of the one who mastered the program 100% is evaluated with the number "5", the knowledge of the one who mastered 80% is "4", the knowledge of the one who mastered 60% is evaluated with the number "3"[1]. Since the dependence between the mastering rate and the discrete values is linear, it can be called a *linear evaluation scale*. On this scale:

if $a = 1$, then $L_d = L_o$. This means, the school is *ideal.*

if $a = 0$, then $L_b = L_o$. In this case, there is no educational activity.

It is known that assessment is a factor that strongly influences the quality of education. This ranking scale can qualitatively distinguish the relative knowledge of the students in the class, but a more accurate scale is needed.

A New Criterion

The ratio of the acquired part of the teaching material to the unacquired part can be used as a criterion. Let us denote this ratio by *K* and call it the *quality factor* (Askerov, 2004):

[1] Some educators mistakenly consider this scale to be a 3-point scale.

$$K = L_d/L_b \quad (4)$$

The quality factor K shows the ratio of what we know to what we don't know.

Formula (4) shows that when $K = 1$, the learning level is 50%, that is, known part is equal unknown. When $K = 4$, learning is 80%. That is, four-fifths (4/5) of the teaching material has been learned, and one-fifth has not been mastered.

Thus,

if $K = \infty$, the education system is *ideal.*

if $K << 1$, the status of education system is horrible.

The K and a criteria are essentially very different from each other. Thus, the criterion a takes into account only the mastered part of the educational material, and the criterion K takes into account both the mastered and the unmastered part. The relative learning criterion a varies is very narrow (0-1) interval, while quality factor K varies in a very wide (0-∞) interval. Since the ranges of criteria change are different, the pedagogic results they yield are also different.

Since knowledge is valuable, the wisdom of its correct evaluation is great. By the way, let me mention that it is more appropriate to use the a-criterion in the first grades of secondary schools, and the K criterion in the upper grades.

The following conclusions about education are derived from the model:

(a) the sum of relative knowledge and relative scarcity of knowledge is *unity* (Askerov, 2004):

$$a + h = 1 \quad (5)$$

(b) there is a relationship between both criteria:

$$K = a/(1-a) = a/h \quad (6)$$

Table 1

Educational Parameters of School Students

No.	Name and surname	*a*	*K*	*h*	Rank
1	2	3	4	5	6
1	O.M.	90	9	10	1/17
2	Z.A.	86	6	14	3/17
3	S.H.	66	1.9	34	14/17
4	F.H.	62	1.7	38	15/17
5	V.H.	79	3.7	29	9/17
6	M.M.	75	3.1	25	11/17
7	I.M	77	3.3	23	10/17
8	T.K.	69	2.2	31	12/17
9	F.K	60	1.5	40	16/17
10	H.A.	83	4.9	17	5/17
11	S.B.	82	4.5	18	6/17
12	B.A.	85	5.5	15	4/17
13	F.R.	43	0.75	57	17/17
14	S.Z.	81	4.3	19	7/17
15	R.H.	81	4.3	19	8/17
16	A.A.	89	8.1	11	2/17
17	T.T.	68	2.13	32	13/17

In higher points of relative knowledge, differentiating students by knowledge is important, but very

difficult. Two students with relative knowledge of 99 and 99.1 percent are practically identical, because the difference in knowledge is imperceptible (0.1). However, when using the *K* criterion, this difference is equal to 11 and is substantial. That is, the imperceptible difference in students' knowledge with the criterion *a*, and the difference in knowledge is very clear when measured by the criterion *K*.

The *K* criterion is better for clearly distinguishing the students according to their knowledge (or the ability of the contestants).

Experimental Part

To check the correctness of the formulas (1)-(6), which are the scientific basis of education the database of one of the secondary schools was used.

The dependence of criterion *a* on the quality factor *K* was presented in Figure 2. Each point in the graph shows the educational success of a student.

It worth mentioning that the non-linearity of the empirical *a* (*K*) dependence confirms the correctness of the knowledge teaching model. One of the effective and modern methods for the assessment of knowledge is the *score-ranking system* (Yakimov et al., 2010). This method has been used in RF schools for more than 10 years. Since each educator can create his own subjective system, this method is also flawed.

In Figure 2, the learning parameters of the class leader are $K = 8.7$; $a = 90$. The second best student's indicators are $K = 8.1$, $a = 89$. In fact, the *a* (*K*) dependence is a natural *score-ranking* dependence. This dependence is essentially very different from the *score-ranking system*.

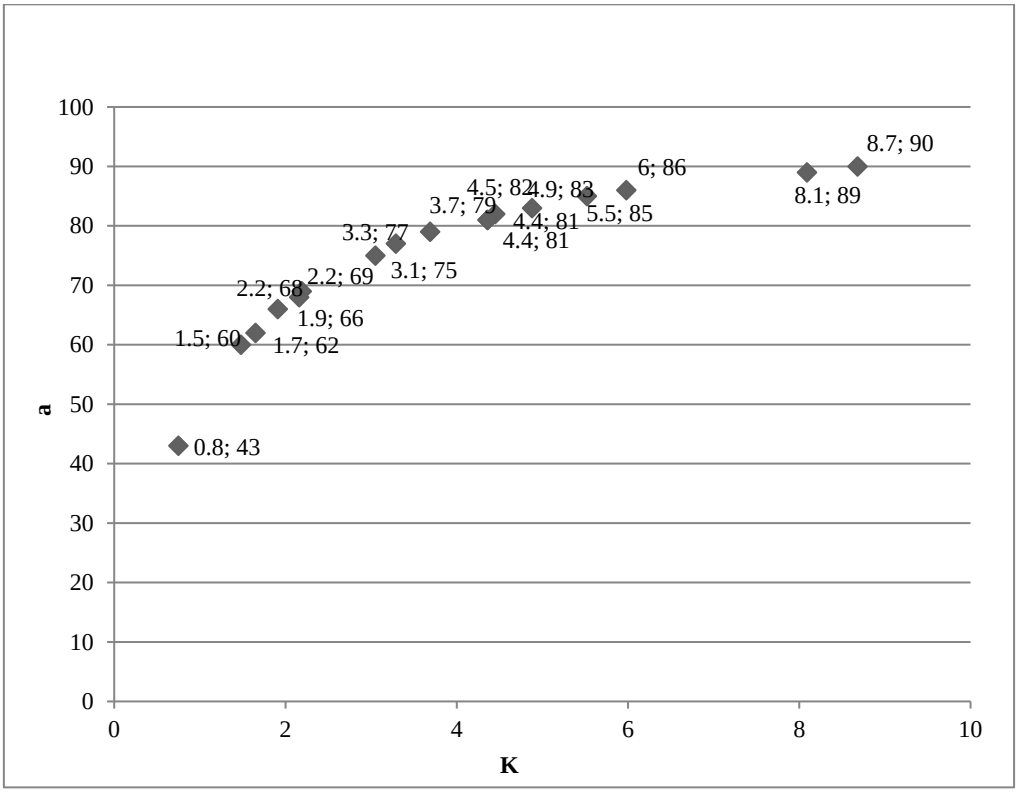

Figure 2. a(*K*) dependence.

The historical criterion *a* presented on the ordinate axis, and the quality factor *K* on the abscissa axis.

If we look carefully at the graph, we will see that there are 16, not 17 squares. This demonstrates that the two students have the same knowledge level. This irregularity can be addressed by increasing the number of test questions or by using other pedagogical skills (the student's social activity, thinking style, creativity, etc.).

The dependence of relative learning a on K is indeed a natural score-ranking dependence and creates a new pedagogical environment. It opens up new prospects for improving quality of education.

This pedagogical openness allows students to compare their knowledge with the knowledge of other students, and allows the teacher to change the structure of the class. In addition to the "teacher-student" channel of knowledge transfer, it leads to the creation of an additional "student-student" channel. So, he prefers to organize his class in groups of four-five students. The environment of competition among students is transformed into cooperation. As a result, students become each other's "teachers" and each student becomes a subject of the educational process. Undoubtedly, this will serve to improve the quality of education.

In addition to building an effective education system, $a(K)$ graph has a great impact on the subjects of education.

Students experience different emotional states by clearly seeing their place in the classroom. New conditions are created to motivate passive learners. Many educators believe that every student has a high learning ability. Depending on his lifestyle, he may or may not develop into a genius. Learning should be the student's own goal. You just need to divide the daily time evenly and devote a lot of time to study.

Parents experience different emotional states when they see the real place of their children in the $a(K)$ graph. This chart will fundamentally change their attitude towards their children's education. They will work more closely with the school and parents. This will ultimately help the "parent-school" interaction.

Teachers become pedagogical managers who can fully control the class, as they deeply know the knowledge and skill level of both the whole class and each student. They can develop a methodology that can activate weak students. By changing the structure of the class, they can create a tandem between strong and weak students, etc.

Average Knowledge

In traditional education, the study of the individual is dominant because the class is not viewed as a whole living organism. A class is viewed as a mechanical sum of individuals. The rich potential of the class is not used. Usually in education, the teacher works not with the whole class, but only with a part of the class. This is a very flawed situation, both pedagogically and economically, and it has been going on for years.

Looking at the class as a whole and living organism is of great economic and pedagogical importance. This review brings up a new pedagogical parameter—average knowledge—indicator for the whole class. The average knowledge indicators of the class shown in Figure 2 are equal to ($K = 4$ and $a = 0.81$). So, out of 17 students of the class, eight are above average and eight are worse than average.

This indicator also reveals the professional ability of educators. Teachers who achieve a high average mastery rate deserve respect. This approach will stimulate educators to constantly self-develop. If the class is viewed as a single living organism, this indicator can be increased year by year.

As it can be seen, the average value of acquired knowledge is of exceptional importance for improving the quality of education. I believe that the average price of in-class acquisition in education is what GDP per capita is worth in economics. It is of strategic importance to raise the average value of acquired knowledge parameter of the whole class. The way to create an ideal school is through this setting.

Education: For the individual and the Mass

It is clear that not only individuals, but all citizens should be educated for the state to be powerful. For this reason, it is more important that the education of the mass (or whole class) is higher than that of individuals. Although education in school classes is a priori intended for mass education, in practice education is carried out on individuals. Unfortunately, today's schools can educate individuals but cannot educate the whole class (mass). This world is the fault of education. There is a pedagogy of individual education, but I don't think there is a pedagogy of mass education (two-students, three-students, *n*-students).

Every student has strengths that can be exploited. This potential is not used due to the lack of team (collectivism) spirit in the process of knowledge transfer. But raising the educational level of the whole class is of greater importance.

During the lesson, the class can be divided into two parts: *active* and *passive*. Those who can learn the study material and those who can't. In other words, those with an education level above and below the average knowledge level. Unfortunately, the teacher mainly works with the active part of the class. He asks questions to the class, gets answers from excellent students, and then continues the lesson. The presence of passive students does not bother him. Students whose knowledge exceeds the average knowledge level are *subjects* of the educational process along with the teacher. This active youth constitutes the gold fund of the nation.

Students whose level of knowledge is below the average level are the objects of the educational process. They are potential carriers of positive and negative human qualities or habits. Serious pedagogic work (education and training) should be carried out on them so that they grow up as citizens who can protect the public interest in the future.

Thus, by looking at the class as a whole living organism, using the potential of the class, it becomes possible to activate (subjectize) the passive students.

Ideal School

Modern education system cannot create an ideal school. It cannot turn the passive part of the youth into the subject of the educational process. The reason is that there is no universally accepted theory of education. According to the Gestalt principle of psychology, *the sum of the parts of a whole is not equal to itself, but is less than that*. Individuals learning well is good, but not enough. However, it is of greater importance that the educational parameters of the class (as a whole) are high.

By taking into account both correct and incorrect answers when assessing knowledge, we can create the *ideal school*—that is, a school where every young person can learn at an excellent level. An ideal school is one for which $a = 100\%$, $K = \infty$. The traditional educational environment only teaches those who can learn, because the modern education system cannot create a pedagogical environment where everyone can learn. Such teaching has no pedagogical basis.

A few individuals excelling or being an Olympic champion is fine locally, but not very important globally. Their educational success is related to themselves, less dependent on the country and school. Valuable educationist Schleicher (2022) believes that "even in the most unfavorable school, an educated young man can grow" (p. 11). Because some of them are natural phenomena, they will shine wherever they are.

At the end of the article, I would like to note that the state of the world education system is not encouraging. The ways in which knowledge is transferred from teacher to student are not yet fully understood. This article attempted to clarify this problem and the following results were obtained.

Conclusion

In order to create a scientific basis of teaching, a new model, new concepts, and a mathematical apparatus were proposed, reflecting the characteristics of knowledge transfer.

To evaluate knowledge based on the new model, two criteria were proposed:

a) the ratio of the studied part of the educational material to the complete part; this criterion ranges from 0 to 1 and was called *relative appropriation* (*a*);

b) the second criterion called the *quality factor* (*K*), shows the ratio of the learned part of the educational material to the unlearned part. This criterion ranges from 0 to ∞. According to the ability to differentiate knowledge, criterion *K* is much superior to criterion *a*. Essentially, these criteria are very different. Criterion *a* assesses the learner only on correct answers, while criterion *K* assesses the learner on both correct and incorrect answers. The *K* criterion is also very valuable for the quality of education as a monitoring tool.

The correctness of the formulas, which are the theoretical basis of teaching, was tested in practice. The non-linearity of the experimental a(K) dependence confirms the correctness of the theory. *a*(*K*) dependence directly reveals the score-rating relationship of students within the class. This dependence creates a new pedagogical environment to improve the quality of education.

It is recommended to look at the class not as a mechanical sum of students, but as a single living organism. At this time, the unity of mass and individual education, an environment of cooperation (not competition) is created. It is necessary to know the average knowledge level of the class. By changing the architecture of the class, dividing it into small groups (three-five students), an additional “student-student” channel for learning is opened.

Score-rating dependence paves the way to build an ideal school. In an ideal school, every learner is a subject of the educational process. Average knowledge is the beginning of the path to an ideal school.

Students whose knowledge is higher than the average knowledge level are considered the subject of the educational process, and those whose knowledge is lower are considered the object. If the class is viewed as a single living organism, then it is possible to increase this indicator year after year.

The most serious defect that negatively affects the development of education is the error made during the assessment of knowledge. In traditional assessment, only the correct answer is taken into account. In order to improve the quality of education, it is necessary to consider both correct and incorrect answers during evaluation.

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