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WILL THE CONSTRUCTIVIST APPROACH EMPLOYED IN SCIENCE TEACHING CHANGE THE “GRAMMAR” OF SCHOOLING?

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Introduction

In Turkey, both the preparation of the science and technology subject programme and the application of prepared programme have been realized quite recently. The development of the programme got started in mid-2003 spontaneously with the Science programme development efforts. Experts from Ministry of National Education and various universities participated in these efforts. These experts discussed about which philosophical basis the programme would be built on and which learning theory and approach would be adopted. As a result of these discussions, some decisions such as adopting constructivist approach without neglecting former theories and putting long lasting efforts (starting a comprehensive project in our country like the American project called 2061 project), and the new programme's being “student centred”(Science Programme Development Work [FBPGÇ], 2003) were made. Primary school fourth and fifth grades Science and Technology course programme was developed by “Special Commission of Science Courses”, Education and Training Board, Ministry of National Education in 2004. In the development of the programme, as learning and teaching approach, constructivist approach requiring students' active participation in learning process lays the basis (Ministry of National Education [MEB], 2004). When some of the fundamental conceptions emphasized in the booklet of the programme are examined, it can be seen that through this new programme the thing that is aimed at is equipping the students with skills and understandings rather than encouraging them to memorize and remember the information, and

Abstract. *This study aimed to describe the extent to which constructive approach in Primary School Science and Technology subject programme is reflected in the classroom atmosphere. For this purpose, the study investigates how students perceive cooperativeness in the classroom, order and student involvement, teacher involvement and support and which factor(s) in the new programme are thought to be better than the ones in the old programme. The present study where descriptive method was applied was carried out with 371 fifth grade students. In the study, Classroom Environment Scale was used. The students positively perceive the new classroom environment where the new Science and Technology subject programme is applied. The findings obtained from the study indicate the reflections of constructivist approach in the classroom environment and considerable presence of behaviourism as well.*

Key words: *constructivism, science and technology education, classroom environment, teaching and learning.*

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developing understandings directed towards life and concepts rather than getting them to study subjects in detail. Moreover, more emphasis is put on constructivism rather than simple lecturing, on student-centeredness rather than teacher-centeredness, on cooperative learning rather than competitive and individualistic learning.

When we look at the criticisms directed against the new primary school programme, we see that most of the academicians studying in the field of programme development agree on one view that is "building educational programmes on one single approach and basing all the implementation principles of the programme on this one approach restrict variety needed to meet individual differences in educational activities and this forces the teacher to behave within certain patterns (Gömleksiz et. al. 2006). When the opinions of the specialists evaluating the new programme (Science and Technology Programme) are examined, it is seen that there are some weak and strong points of the programme. Based on the behaviours of students and teachers in classroom environment, the main purpose of the present study is to investigate the approach underlying the new programme. How constructivism is realized in modern schools today has been examined in this study. According to the constructivist approach adopted by the Science and Technology programme, learning is not the flow of information from the knower to the learner who is a passive receiver. There has been emphasis on the construction of knowledge by the learner.

In this regard, the roots of the constructivism can be traced back to Piaget in social constructivism. Constructivism was shaped by the principles of cognitive psychology and has recently been used more often in the fields of mathematics and science. Dewey and Vygotsky are constructivists but they were interested in the social dimension of the term (Ronald, 1997). When the studies conducted on constructivism are looked at, it is observed that many scientists think that the seeds of the constructivism were sown by Dewey, Piaget and Vygotsky. Some studies trace the roots of it back to the older times. For instance, in a study by Grennon (1999), it is seen that the first important document of constructivism dates from the time of Socrates. In addition, Kant argues that logical analysis of actions and objects leads to the growth of knowledge and this view allows one's individual experiences to generate new knowledge. According to Kant, perceived experiences occur before or during the event. In some studies, constructivism is presented as opposed to objectivist/behaviourist approach learning in constructivism means constructing our own meanings in the world we live in, and this is done by reflecting on our experiences. According to Dewey, our experience is reconstructed by means of thinking [called also reflection]. In the similar token, Piaget states that in our own experiences, there are schema (Chicoine, 2004).

According to Mvududu (2005), there are some misconceptions concerning to constructivism: in cooperative learning, as Vygotsky explains in his theory, the learners learn what they have learned through interactions with other knowledgeable people. Cooperative groups do not render the learning wholly constructivist, because in groups, students work with different means, and one of them can be constructivist. Another misconception is related to active learning. Not every activity can be interpreted as constructivism. The key concept in constructivism is building on pupil's own thinking [what is done in creative, active etc. cooperation between teacher and learner. Development of pupil's own thinking – this is mentioned above common goal of pedagogical interaction/cooperation between partners – teacher and learner.] Student's constructing his own thinking can nor be achieved with isolation from the external world. If what really constructivism is becomes clear, the misconceptions will be reduced. Learning within the framework of constructivist learning perspective is connected with personal processes. In these processes, novel notions and experiences are connected with what the learner has already learned (Liang ve Gabel, 2005). According to Liang and Gabel (2005), in the classroom environment where constructivist approach is adopted, the teacher is expected to serve the functions of supporting, guiding, and facilitating rather than the functions of teaching, information providing, and information transferring. Moreover, in the classroom environments where constructivist approach is adopted, it is more likely to meet students who are synthesizing the new information according to their former knowledge, experiences, belief and attitudes and then shaping the information and finding their own meanings within the information rather than the students who are ready to receive the information. By comparing some behaviours



observed in constructivist classroom environment with those observed in the traditional classroom environment, we can clarify our ideas about how constructivism is realized in classroom. In the study conducted by Lord (1999), it was found that the knowledge was more profoundly absorbed, the students learning in the traditional classroom atmosphere are more disadvantageous in relation to transfer, analysis, and criticize over the students learning in the constructivist classroom environment. Moreover, the group where constructivist approach was applied to was found to be more informal and the students enjoy the works they do in the classroom.

In a study Boghossian (2006) investigated constructivist, behaviourist and Socratic pedagogies. As a conclusion of the study, he summarized that in the constructivism, there is an active participation, having access to a meaning through personal experiences, students' discovering their own truths and intellectual processes, development of pupil's own creative, of active, critical etc. scientific as well as artistic thinking. In the study the author states that in behaviourist approach, information is received from external sources, and what is true and what is false is determined by the teacher. On the other hand, in Socratic pedagogy in the quest of the reality, students are helped by their teachers, what is true and what is false is not imposed by the teacher, students' assent is sought when decisions are made, like a dog trainer, the teacher leads the student on their own way where they want to go, and there are no truths for me and truths for you. In a study Boghossian (2006) and Cronje (2006), the main characteristics of constructivist and behaviourist approaches as follows): constructivist approach, instead of a strict and authoritarian teacher role, facilitator and trainer roles for the teacher is adopted. In constructivist approach, it can be argued that the course objectives are not rigid, molding is low and the objectives are not strictly imposed but they are disputable. Moreover, in constructivist classroom environment, when the student's behaviours are examined, it can be seen that the students have intrinsic motivation, they learn through experiences, they consider the matter from many different perspectives, they construct the information with their and mankind's former knowledge, they view the mistakes as opportunities for learning, and they learn in an environment of cooperation and assistance of teachers as guides in mankind's already gained experience. In addition, in constructivist classroom environment students construct their own meanings for the novel information according to their as well as and mankind's former life experiences (knowledge, skills, attitudes). The main output is personal meaning within general context of mankind's experience. The basic assumption in constructivism is the notion that the best way is the way through which the students develop their skills to find and process specific as well as general information they need on their own life.

Many learning activities and many lessons include elements from both behaviourist approach and constructivist approach. While behaviourism represents teaching, constructivism is a means of understanding how human beings learn. Therefore, these two approaches do not contradict with each other, just they have different orientations (Cronje, 2006). According to Mayer (2001), learning includes three stages. These are:

(a) choosing, (b) organizing, (c) integrating. Mayer argues that choosing is connected with behaviourism, integrating is somewhere in between and organizing belongs to constructivism (cited in: Cronje, 2006). Based on this perspective of learning, constructivism in relation to learning entails not rejecting other approaches to learning. However, in a classroom environment, some dominant principles are expected to be observed.

Richardson (2003) states that constructivist pedagogy process includes basic characteristics: focusing on the individual, being "*student-centred*" arranging group dialogues, sharing meanings on a subject and managing the construction of a new form, planning and mostly performing unplanned entries to the knowledge emerging during the conversations (giving references, finding explanations from web sites, or explaining different meanings), improving what individual student understands on his own and raising awareness during the learning process. These elements are summarized by Richardson with this phrase "assistance to student's learning". However, Charlotte (2007) states that while in the constructivist approach, students construct their own meanings, they are aware that the importance of teacher's role does not diminish and teachers do not have less critical roles when compared to their roles in traditional classes. The difference, on the other hand,



is that teachers should fulfil the functions of designing the activities in the learning environment, drawing students' attention to the salient structures in the information, all of which require to get students to focus on teaching rather than only making presentations, and determining questions and activities. According to Grennon (1999), when some teacher roles are examined in constructivist approach, constructivist teacher:

encourages and accepts student initiative and autonomy, while arranging the subjects, uses the terms of cognitive terminology such as performing analyses, making predictions, and creating, *allows* students to react, obtains information about student's existing knowledge base to help him understand the structure, *encourages* students to have dialogues with other teachers and students, *encourages* students to ask each other provocative questions and open-ended questions, so that they can be encouraged to make research, looks for the details in students' previous reactions, *gives* enough time to students to establish connections among the structures and to form metaphors.

What should the modern learning environment be in constructivist approach today? What are the principals of teaching and learning? When we examine the answers to these questions given in the study of Plourde and Alawiye (2003), following activities are expected to take place in a constructivist environment: student questions are desired and used, students are encouraged to express their opinions, students are encouraged to look for the opportunities of cooperation and be active, students' ways of thinking, interests and experiences are used in the lesson, students are encouraged for the use of alternative sources of interest, students are encouraged to test their opinions even through their predictions and speculations, the respect for cooperation (collectivism), individualism and differences in opinions is promoted, enough time is given to students for the analysis of and reflecting on the information, support and encouragement are provided to help students to consolidate their opinions, to reshape the knowledge with new evidence and experiences.

According to Teber (2006), the most important influence on science teaching was induced by the works of Piaget on genetic epistemology. Piaget argues that when compared to the adults, the experiences of the children about the world are irrational, nonsense and even controversial. And in this situation, the children structure their own opinions on the phenomena not related to formal education. Knowledge is constructed by the individual himself and not received in ready made format, learners in a science programme have already had opinions about many natural phenomena, when the science teaching pays attention to the existing knowledge of the individuals, it becomes more effective, models for the concept construction of the learners are possible, concept construction of every individual learner is unique. Application of constructivist teaching/learning approach in science programmes of some countries dates back to earlier times than in Turkey. The emergence of the constructivism as a teaching/learning theory dates from several decades (Kim, Fisher & Fraser, 1999; Taber, 2006). Yet, only in the last decade, the constructivist learning theory and its application have drawn the attention it deserves (Richardson, 2003). In the classrooms, where the constructivist teaching/learning approach is used, the effect of the constructivism has been studied and positive effects of this approach have been found on the classroom learning environment (Kim, Fisher & Fraser, 1999).

Students' positive perceptions of the classroom environment have many advantages. In a study of Brok, Fisher, Rickards and Bull (2006), it is seen that when the students perceive the classroom environment positively, they show better performance and exhibit more positive attitudes towards the subjects learned. In a study conducted by Dorman ve Adams (2004) it was found that when the students positively perceive the classroom environment, they learn better. Fisher and Kim, (1999) found statistically significant relations between students' perceptions of their own classroom environment and their attitudes towards science (Cited in: Mvududu, 2005). In the study of Beghetto (2007), it is reported that there is a relationship between the perceptions of their science competency and the teacher support. This study focuses on how the constructivist approach used in Science and Technology programme implemented in Turkey affects the classroom environment. The problem of the present study is attempted to be solved based on how students perceive the classroom environment. The focus of the study is investigating the students' perceptions of the



transition from traditionalism to constructivism and/or tracing the footprints of the constructivism along with the traditionalism on the classroom environment. However, it is not always possible to put some learning activities into certain frameworks of a specific learning and teaching approach. For example, in a traditional classroom it does not mean that the concepts "*teacher and student-centeredness*" can view student and teacher as separately acting parties. In order for a meaningful learning to happen there should be close interaction between teacher and learner.

Problem of the Study

1. How are the students perceiving classroom cooperation, order and student involvement, teacher involvement and teacher support in the science course where the new Science and Technology programme is applied?
2. From which aspects, do the students think that the classroom environment where the new programme is applied is better than the old one? Which of these aspects are connected with behaviourist and constructivist learning approaches?

Methodology of Research

Descriptive method is used in order to understand how the primary school students perceive the classroom environment where the new Science and Technology programme is applied. The universe of the study consists of the primary school fifth graders who studied the old science programme when they were in the fourth grade and now studying the new Science and Technology programme in the fifth grade. The study was conducted among totally 14 primary schools. 375 fifth graders studying at these schools make up the sampling of the study. In the selection of the sampling, purpose sampling method was used. Fifth graders both familiar with the old science course programme and the new science (Science and Technology) programme make up the sampling of the study.

In the study, Classroom Environment Scale measuring the students' perception of the classroom environment was used. The scale developed by John, Frances ve Hin-wah (2003) is four-dimensional and includes 28 items in total. The scale is a four-factor-scale including the cooperation among the students, classroom order and student involvement, teacher involvement and teacher support. This scale was administered to the pupils exposed to both old science programme in the fourth grade and the new Science and Technology programme in the fifth grade. The classroom environment scale was designed in five-point Likert scale type. The scale scores of the sampling was found to be 0.79. To assure language reliability of the scale, the scale was translated into Turkish separately by three translators. Translated scale and the original scale were compared by the group of the translators. During this process, attention was paid to whether there are different translations and there are no deviations in the meaning. The translation was found to be appropriate.

Results of Research

How do the pupils perceive the classroom environment where the new Science and Technology programme is applied? When the means of the scores obtained for the student communication, teacher support and teacher involvement sub-scales are examined, it is seen that the pupils perceive the classroom environment positively above the mean. As for student involvement, it is seen that the pupils' positive perception of the classroom environment is close to the mean. When we look at the mode values presented in the table, we see that there is an aggregation favouring the positive perception of collaborativeness, teacher involvement and teacher support; on the other hand, for student involvement, the aggregation is below the mean.

Pupils' perceptions of student collaborativeness were solicited through four questions and the findings are presented in Table 1.



Table 1. Collaborativeness in the Classroom Environment.

	Never	Rarely	Sometimes	Often	Always
Classmates help each other in learning	6	21	144	97	103
After class, classmates find other to discuss homework.	68	88	166	31	18
If a student has difficulty in learning, he/she can find a classmate to help	25	40	102	82	122
If a student does not understand the teacher's instruction, he/she can ask classmates.	27	52	114	88	90

Data presented in Table 1 indicate that the pupils state that classmates usually help each other in learning if they have difficulty in learning, they can ask their classmates to help and if they do not understand the teacher's instruction, they can ask their classmates. Pupils also state that though the pupils have a good cooperation in the classroom, they do not come together very much to discuss homework. Order and student involvements are solicited through eight questions, and the findings are presented in Table 2.

Table 2. Order and student involvement.

	Never	Rarely	Sometimes	Often	Always
In class students can usually keep quiet.	81	86	120	48	36
During the class, students are working hard to do their assignments	19	56	112	96	88
The classroom is usually very noisy	73	95	100	69	34
In class, students are working very hard to study	17	53	158	103	40
When the teacher teaches, students will normally behave themselves	111	68	109	52	31
Students are often disturbed by other classmates in class	34	27	115	98	97
Students do not pay attention to classroom discipline	39	45	136	84	67
In class, some students speak loudly, some read other books and some talk with each other	85	71	94	65	56

Findings presented in Table 2 show that the pupils think that they usually keep quiet in class, they work hard for their assignments, they are disturbed by other classmates in class, and not much attention is paid to classroom discipline. Nearly 28% of the pupils find the classroom a noisy place. Almost 33% of the students think that their classmates usually talk loudly, the pupils talk to each other and they read other books. Almost 48% of the pupils think that they behave in line with teacher warnings. Findings for teacher involvement are presented in Table 3. The pupils' perceptions of teacher involvement are solicited through nine questions.

Table 3. Teacher involvement.

	Never	Rarely	Sometimes	Often	Always
The teacher is always willing to answer students' questions	19	13	51	55	233
The teacher is patient in teaching students	13	4	52	47	255
The teacher often draws attention to examinations	21	13	63	87	187



	Never	Rarely	Sometimes	Often	Always
If a student requests, the teacher will explain the answer patiently	9	10	63	98	191
The teacher is earnest in teaching students	6	8	38	78	241
The teacher arranges adequate time for teaching every lesson	11	12	49	99	200
Before class, the teacher has enough preparation	18	12	58	84	199
The teacher explains textbook contents in detail	6	9	41	96	219
The teacher helps students to revise before tests and examinations	10	6	46	84	225

As can be seen in Table 3, the pupils' perceptions of teacher involvement are largely positive. The pupils think that the teacher is often willing, patient, tries to respond to student requests, is earnest in teaching, arranges adequate time for teaching every lesson, explains textbook contents in detail and draws the pupils' attention to tests and examinations.

As it can be seen from Table 4, pupils think that the teachers reward pupils for progress in academic achievements, help pupils to set learning goals, encourage pupils to see whether their own study method is helpful. Moreover, it is seen that the teachers often give advice on pupils' learning process, praise their performance in learning, design some class assignments as to allow pupils to apply knowledge in daily lives, and provide some strategies for improving learning to every student.

Table 4. Teacher Support.

	Never	Rarely	Sometimes	Often	Always
The teacher often rewards students for progress in academic achievements	34	51	132	74	80
The teacher often helps students to set learning targets	4	10	62	90	205
The teacher often encourages students to see whether their own study method is helpful for learning.	11	25	76	106	153
The teacher gives advice on students' learning process	11	17	63	107	173
The teacher praises students' performance in learning	7	18	73	119	154
The teacher often designs some class assignments so as to allow students to apply knowledge in daily lives	16	18	109	103	125
The teacher provides some strategies for improving learning to every student	35	34	98	106	98

From which aspects do pupils perceive the classroom environment better? The pupils in the sample were asked to respond to maximum five questions to solicit which aspects of the classroom environment are perceived to be better when compared to last year. With the help of the pupils' responses, the reflections of behaviourist and constructivist approaches in the classroom environment are investigated.

On the ground that the total number of the pupils' reactions is 1343, it can be argued that the pupils perceive the classroom environment in the new programme in terms of more active participations in learning process when compared to perception of the classroom in the old programme. Pupils show the tendency of perceiving the classroom environment more positively in the classrooms where the new programme is applied compared to the perception of the classroom environment in the old programme. Some of the questions in the classroom environment scale are thought to be structurally more constructivist and some are more behaviourist. For instance, pupils working in cooperation with each other in the class, the teacher's encouraging and supporting pupils are viewed to be more connected with constructivism. On the other hand, helping pupils when they have difficulty, pupils' being quite, the teacher's teaching, explaining, revising are thought to be more related to behaviourist ap-



proach. In this context the direct involvement of the teacher can contradict with constructivist approach. Pupils' working hard, the teacher's praising pupils' performance in learning can be presented under the heading of other categories. When the pupils' reactions are considered, it is seen that in the classroom environment where the new programme is implemented, the constructivist approach is given 41.02% more place than in the old one. Moreover, 37.52% of the new programme that is based on constructivism seems to be made up by the elements of the behaviourist approach.

Discussion

In Turkey, constructivist approach is being applied in Science and Technology programmes as a new understanding constructivist learning. To what extent transition from "teacher-centred" classroom to constructivist approach has been achieved can only be observed and understood by investigation of real classroom environment. Certainly, in the classrooms where constructivist approach is applied, it can not be claimed that there is no place for other approaches. However, the basic approach on which the newly applied Science and Technology programme is built on is constructivism. When the old programme and its applications are investigated, they can be criticized as they are teacher-centred and mostly dominated by behaviourist approach, and these criticisms brought about the main reason for the transition to the new programme. Those who have prepared new Science and Technology programme certainly do not expect to see the immediate reflections of the constructivist approach in the classroom environment. In Tabak's study (2007) holds that the teachers are trying to adapt themselves to constructivist approach. Moreover Köseoğlu (2006) mentioned that curricular change has become necessary as in the entire world and he argued that the new programme would be regarded as successful if 50% of the teachers within the first five years, and all teacher population within the first ten years understood the philosophy underlying the new programme. It may take some time for teachers to learn, and accept this philosophy. Yet, in the study findings it is evident that the pupils positively perceive the classroom environment where new Science and Technology programme is being implemented. The study findings display the indications that the constructivist approach used in new Science and Technology programme can be adopted in a shorter time than expected. We see that the pupils in the sample of the present study think that there is more cooperation and assistance among themselves which is one of the elements of the underlying philosophy of constructivist approach. It is also observed that the pupils more frequently help each other and cooperate with each other in the class. The channels of communication do not only flow in the direction from the teacher to pupils but also from student to student. And this indicates that in the new programme teaching is directed to the processes "a bit different" from those of the old programme. Though the cooperation or interaction among the students are not an indication and proof of constructivism on their own, it can be argued that that kind of behaviours are more likely to be observed in constructivist classroom environments. In a study of Travis and Lord (2004), a significant difference was found between the classrooms where constructivist approach was applied and the classrooms where traditional teaching was conducted in relation to student-student interaction and the questions directed by pupils to teachers and pupils. In this concept Chin (2007) states that the questions play a key role in classroom discussions and teacher questions serve the function of a psychological tool in pupils' constructing the knowledge.

When how pupils perceive the classroom environment is examined depending on order and student involvement, it is found that the pupils think they are usually quite in the classroom, they work hard to the assignments, they are disturbed by other classmates, and they do not pay much attention to class discipline. The pupils think that the classroom is noisy. A question aiming to solicit the sources of the noise indicate that the pupils think that the classroom is noisy because some students talk loudly, some read other materials and some talk to each other. In their study Travis and Lord (2004) found that the classroom where the traditional teaching is conducted are less noisy than the classrooms where constructivist approach is in use. These findings at least make us feel the existence of constructivism in the applications.

The pupils mostly perceive their teachers as "involved". Moreover, the pupils think that their teachers are patient and devote adequate time for every lesson. Further, the pupils think that their teachers are



willing to answer pupils' questions, draw students' attention to examinations, explain textbook contents in detail, and are willing to help students to revise. These findings prove that in relation to teacher behaviours in the classroom environment, besides constructivist approach, behaviourist approach seems to have influence. Unal and Akpınar (2006), investigated whether the science teachers are using constructivist approach in their classrooms through interview and observation techniques. In this study, most of the students were observed to be using traditional means of learning. All of the teachers who had been in the profession for 1-5 years were observed to be using the traditional ways of teaching. Although the science teachers in the study believe that constructivist approach is better, none of them perform teaching in their classes complying with the constructivist approach. Moreover, another finding of this study is that almost half of the teachers are not aware of the fact that pupils' existing knowledge and experiences are the basic elements of the constructivist learning and teaching.

The pupils in the present study think that the teachers help students to set learning targets, encourage them to see whether their own study method is helpful for learning. Moreover, the teachers give advice on pupils' learning progress, praise pupils' performance in learning, and design some class assignments so as to allow pupils to apply knowledge in their daily lives. Provide some strategies to improve learning to every student. These findings indicate that in the classrooms where constructivist approach is applied, teachers support pupils. In their study, Travis and Lord (2004) found in their video recordings that teacher support is slightly less in constructivist classrooms than it is in traditional classrooms. In the same study, it was found that in the constructivist classrooms, the teachers statistically speak less than they do in traditional classrooms. In the present study, the pupils seem to perceive the classroom environment more positively in the new Science and Technology programme than that of the old Science programme. The dimensions most positively perceived in the present study are student involvement, teacher involvement, cooperation, and teacher support.

The pupils' stating that they work very hard in the class, they behave themselves, when the teachers teach, they ask their classmates if they do not understand the teacher's instructions may be considered to be an inclination from traditionalism towards constructivism. They think that works done in the class result in noise, being disturbed by others in the class and emergence of discipline problems. The teacher's encouraging pupils to see whether their own study method is helpful in learning, giving advice on pupils' learning process, being willing to answer pupils' questions, designing some class assignments so as to allow pupils to apply the knowledge in their daily lives and providing some strategies for improving learning to every student can be regarded as the example behaviors of a constructivist teacher. On the other hand, pupils' perceiving the teacher as someone drawing pupils' attention to examinations, making explanations upon the requests of the pupils, often helping pupils to achieve their targets can be regarded as the indication of the presence of the behaviorists approach in the classroom.

According to Tyack and Tobin (1994) there is a "grammar" of the Schooling. By the "grammar" of schooling they mean the regular structures and rules that organize the work of instruction: for example, standardized organizational practices in dividing time and space, classifying students and allocating them to classrooms, and splintering knowledge into "subjects." In addition Tyack and Tobin continue to state that "...Reformers believe that their innovations will change schools, but it is important to recognize that schools change reforms. Perhaps the grammar of schooling will be able to be changed into the constructivist approach.

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