IMPROVING CLASSROOM LEARNING:
THE EFFECTIVENESS OF TIME DELAY WITHIN THE TEACCH APPROACH

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The present study investigated the effects of a constant time delay (CTD) strategy within a TEACCH approach and the views of the classroom teacher surrounding the teaching process. Three male students with autism participated in the study. Both qualitative and quantitative methods were used to collect and analyze data. Although experimental control was not built into the study, the results indicated that the CTD delivered within TEACCH frame was effective in teaching four out of the five target skills in this study. The views of the classroom teacher regarding the teaching process were positive overall. The entire acquired target skills were maintained several weeks (i.e., four to six weeks) after the intervention was terminated. Moreover, participating students performed these four skills under different conditions other than the teaching conditions. Implications for practice and directions for future research with respect to effective teaching strategies for children with autism are discussed.

As with most typically developing children, those with intellectual difficulties need to perform a variety of functional skills such as daily living, self-care, and functional academic skills. It is known that while typically developing children are able to learn these skills through their daily life experiences children with severe and complex learning difficulties, require special arrangements in their learning environment and systematic instruction strategies in order to learn skills which contribute to their independence (Jordan, 2001).

The quest for appropriate teaching strategies which meet the complex learning needs of children with autistic spectrum disorder (ASD) remains a major challenge for teachers in all educational settings (Dunlap, Iovannone, & Kincaid, 2008; Jordan & Powell, 1995). In order to fulfill these requirements, educators and teachers working in special education have been looking for evidence-based practices (Perry & Condillac, 2003; Reichow, Volkmar, & Cicchetti, 2008; Simpson, 2005); and effective and efficient teaching strategies validated by experimental research and achieved through developing or modifying teaching strategies (Tekin-Iftar & Kircaali-Iftar, 2004).

One of the most effective teaching methods, widely used by practitioners working alongside students with special needs, is errorless teaching (or near errorless teaching). Errorless teaching procedures were developed from the assumption that the best learning takes its source from positive practices and responses instead of errors made during instruction (Wolery, Bailey, & Sugai, 1988). In this research study constant time delay (CTD), one of the errorless teaching methods was used to teach some skills to children with autism.

CTD is a response prompting procedure that has been successfully used in teaching students with special needs. It requires the fading of a controlling prompt, which the assistance is given by a teacher, but in a time lagged fashion that enables the learner to perform a correct response. During the first stage of the CTD, zero second time delay prompts are provided; in other words, immediately after presenting a task direction, the teacher provides the controlling prompt, which ensures the learner does the task correctly. After a specified number of zero s delay trials, the teacher introduces a certain amount of time (four or five seconds) between the task direction and the controlling prompt. That is to say, after giving a task direction the teacher waits for the correct response from the student for a predetermined period. If the student does not initiate the correct response, the teacher presents the controlling prompt (Schuster, Griffen, & Wolery, 1992; Tekin & Kircaali-Iftar, 2002).

Research has shown that CTD has been effectively used for teaching students with various disabilities such as learning disabilities, mental retardation, multiple disabilities, developmental disabilities, and autism (Ault, Wolery, Gast, Doyle, & Eizenstat, 1988; Daugherty, Grisham-Brown, & Hemmeter, 2001; Yilmaz, Birkan, Konukman, & Erkan, 2005). Furthermore, the literature shows that it is possible to use this procedure for teaching discrete behaviors such as sight word reading, naming the values of coin combinations, identifying animals as well as chained behaviors such as snack and drink preparation, purchasing skills, various leisure skills (Bozkurt & Gursel, 2005; DiPipi-Hoy & Jitendra, 2004; Kurt & Tekin-Iftar, 2008; Ledford, Gast, Luscre, & Ayres, 2008; Tekin & Kircaali-Iftar, 2002; Werts, Venn, Demblowski, Wolery, & Doren, 1996).

As with Applied Behavior Analysis (ABA) based errorless teaching methods, TEACCH (Treatment and Education of Autistic and related Communication Handicapped Children) is another approach with reported successful outcomes in the literature (Jordan, 2001; Schopler & Olley, 1982; Simpson, 2005). TEACCH is an intervention approach, which has been developed at the University of North Carolina in order to meet the needs of people with Autistic Spectrum Disorder (ASD) and their families. Co-founded by Eric Schopler in the 1970s Division TEACCH now offers support to organizations across the United States and worldwide (Schopler & Mesibov, 1995).

Central to the TEACCH philosophy is the concept of Structured Teaching (Mesibov, 1997). This includes the physical structure of the classroom which may be divided up to provide students with clear unambiguous areas in which they are taught to conduct specific activities, for example an independent working area or an area where they may make choices from preferred activities (Davies, 1997). A daily schedule, which is organized and meaningful, is used to provide predictability and clarity; and it informs the student about forthcoming events. The daily schedule may be full day, half-day or consist of a limited number of activities depending on the ability of individual students to comprehend its meaning. Likewise, a work system is used to organize individual activities and inform students what work they are required to do, how much work they are expected to do, when it will be finished and what they should do next. Each individual work task should also be structured and visually organized in its own right in order to achieve understanding, clarity and motivation and thereby reduce anxiety (Mesibov & Howley, 2003). It is possible to achieve this through: (a) visual clarity (for example highlighting the important facets of the task), (b) visual organization (arranging task components in separate containers) and (c) visual instruction (bold arrows or numbers may give an order in which to assemble components). In addition, it may be argued that, in order for structure to be effective as part of a successful teaching strategy it should be progressive, visually instructive and lead to greater independence.

Major components of TEACCH approach such as structured work systems and visual supports have been confirmed as evidence based practices (National Professional Development Center on Autism Spectrum Disorders, 2008). The physical environment plays a key role in the learning needs of individuals with ASD (Myles, Hubbart, Svanson, Schelvan, & Simonelli, 2007). In structured teaching, learning environment is modified to meet the needs of individuals with ASD and utilizing students' strengths in the area of visual processing is emphasized (Schopler, Mesibov, & Hearsey, 1995). TEACCH also includes many of the principles of ABA (shaping of appropriate behaviors, prompt fading and reinforcement). However, some practitioners assume that successful programs can only include TEACCH strategies or ABA methods such as discrete trial teaching, but not both (Webber & Scheuermann, 2008). On the other hand, it is recommended that teachers use structured teaching components and ABA based methods as a basis for effective programming (Myles, et al., 2007; Webber & Scheuermann, 2008).

Teachers provide structure and organization in the classroom or any other learning environment to help students' function successfully in TEACCH settings. However, it might be thought that delivering instructional prompts, employed by the teacher during training, in a systematic and effective way within a TEACCH setting which is physically structured and visually organized would empower the quality of instruction and produce positive outcomes for children with ASD when teaching the skills. Also, using CTD within a TEACCH setting would transfer the potential benefits of errorless teaching methods into the educational settings employing TEACCH approach. Errorless teaching methods in educational settings have been recommended for three reasons: (a) all of the errorless teaching methods are effective; (b) because the learner gives correct responses almost every time for each trial, errorless teaching methods facilitate the development of positive interactions between learner and teacher; and (c) because the learner receives more reinforcements and because of the low rate of error it is argued

that the opportunity to demonstrate problem behaviors during errorless teaching sessions is low (Tekin-İftar & Kırcaali-İftar, 2004; Wolery et al., 1988). Although, there have been research studies examining the effectiveness of the CTD for teaching students with various disabilities and some literature also reports successful outcomes for the TEACCH approach in this respect, no studies could be found where these two models were used in conjunction. A classroom based research study employing CTD within a TEACCH setting would show an alternative and effective way of teaching the skills to the practitioners who work in TEACCH settings. Therefore, the main objective in this study was to examine the effectiveness of both paradigms when used together. It may also be argued that, the effectiveness of any procedure should not be the only reason to use it and social validity or consumer satisfaction is another key factor when selecting a teaching procedure for students with special needs. Thus, in this study the views of the classroom teacher regarding the teaching process were also ascertained.

Consequently, the purpose of this study is three fold. It explores how: (a) to reveal the effects of a CTD when used in conjunction with the TEACCH approach on promoting the acquisition, maintenance and generalization of the skills taught in the study, (b) to elicit the views of the classroom teacher regarding the teaching process, and (c) to record and evaluate the views of classroom support staff and residential care staff (key workers) that have responsibility for participant students in their houses, regarding the applicability of the target skills.

Method
Participants and Target Skills
The study was conducted in a classroom at Sunfield Special School in UK. There were five male students in the classroom when the study began. While three of them were diagnosed as severely autistic, the rest of them were students with mental retardation. Therefore, all the students with ASD in the classroom participated in the study. The ages of the students ranged from 12 and 14. They were all nonverbal; however, were able to use PECS (Picture Exchange Communication System) (Bondy & Frost, 1994) to express their simple needs such as requests for food, toilet or a choice of activity. All the participating students were able to dress themselves and feed themselves, while two of them were able to use the toilet independently; the remaining student needs support with his toileting skills. The participating students understood the majority of concepts, such as colors or the meaning of numbers, at a simple matching level.

In order to choose appropriate target skills for each of the students a selection process was undertaken in which their IEP (Individual Education Plan) targets were examined as well as objectives from their SSENs (Statement of Special Education Needs). Before targets were finalized by care staff. The care staff had the responsibility for the participant students in their houses, while classroom support staff was asked for their opinions about their suitability as functional skills. Other considerations included discussions about previous learning, the performance levels of students in different developmental areas and the practical acquisition of resources or areas in which to conduct teaching. To validate the selection of target skills a questionnaire in English was developed and presented to both classroom support staff and residential care staff.

At the end of this enquiry process the following target skills were chosen for participating students (the names used are pseudonyms). Bill was taught to give the correct picture of a fruit when the teacher used a written word in addition to a verbal request; he was also taught to make a hot drink. Garry was taught to give the correct picture of a classmate when it was verbally requested and washing up was his second target skill. Ross' target skill was to discriminate between pictures of males and females when verbally requested. The success criterion level for each student was set at 100% except for Garry whose criterion was 90% for at least three consecutive sessions.

Data Collection and Analysis Procedure
Both qualitative and quantitative methods were used to collect and analyze data in the study. An AB design as a single-subject research was used to measure the effectiveness of a CTD as a quantitative method. The experimental conditions included baseline, instruction using a CTD within TEACCH frame. Also, generalization and skill maintenance monitoring were conducted. Generalization data were collected via pre-test and post-test measurements and occurred before training and at the end of teaching of each target skill. To collect generalization data a student's performance levels in terms of the target skills were assessed under different conditions (e.g. in different settings or with different materials). To obtain qualitative data in terms of the teaching process, the classroom teacher collected observational data as a participant observer (Robert-Holmes, 2005). Furthermore, a Target Skills

Evaluation Questionnaire (See Table 1) was used to determine the opinions of the classroom and care staff about the target skills employed in the study. Classroom support staff and care staff were asked to answer the questions in the questionnaire by choosing Yes or No columns for each question, but were also given the opportunity to add further comments which they thought might be relevant.

Table 1
Questions in the Target Skills Evaluation Questionnaire

1. In your opinion is this skill functional (i.e., useful) for the student to learn?

2. In your opinion will this skill contribute to the independence of the student?

3. In your opinion will the acquisition of this skill go towards improving his quality of life?

4. In your opinion is this skill appropriate for the age of this student?

5. In your opinion will this skill facilitate the later learning of some other more functional skills?

6. In your opinion will this skill be useful outside the classroom for this student?

7. In your opinion will this skill be useful in the classroom for this student?

Implementation of Constant Time Delay within the TEACCH Structure
For the length of the study the classroom and all participating students followed the TEACCH structure in terms of instructional activities and general environment. To employ the CTD within the TEACCH structure, before the teaching process began in the study, detailed plans were developed for each student and for each task which included: identity information about the student, teaching settings and times, behavioral objectives for each target skill, materials to be used both in all sessions, a description of teacher-student interactions during the teaching process, the collection of baseline, generalization and maintenance data, antecedents and consequences of student responses and a reinforcement schedule, definitions for possible student responses and a recording process for student responses.

In this study CTD was to be used together with a TEACCH approach and for the following reasons it was thought they might jointly be effective: The students in the study had been using the TEACCH approach for some time, were familiar with the process of TEACCH approach and so tasks offered within that process should be more readily learned. Tasks were designed and presented in a clear, unambiguous way, so that in some ways the task helped with the instruction and using such tasks during instruction engaged previously learned skills, for example matching. Target skills were also presented in a form which was easily recognizable to the students; for example, teaching materials were given in trays and work advanced from left to right in the instruction sessions. The one to one work station of TEACCH provided physical structure which reduced noise and visual distraction; it was also a familiar place where work was regularly conducted and therefore students knew they were expected to work in that area. In addition, a work schedule kept students informed about what to do, how much to do, when it was finished and what to do next. Also when the instruction took place out of the classroom, a transition schedule was used to direct the student to the working area.

Discrete tasks were constructed and given in a familiar way, using the TEACCH structure as a stable component and designed to reduce anxiety as described above. In the CTD sessions chained skills are normally broken down into individual steps through task analysis and this is consistent with the way in which complex activities are normally offered to these students within the TEACCH approach.

When teaching plans were completed the following elements were put into practice for teaching both discrete and chained target skills. During the experimental stage of the study students were instructed on a one to one basis. While the chained target skills were taught in a kitchen in the school, all discrete target skills were taught in one to one stations in the classroom. There were two teaching sessions each day for each skill; however, discrete skills were taught twice per session while chained skills were taught only once per session. Task analyses were developed for the chained skills. Chained skills were taught within a total task format; that is to say, instruction sessions began with the first step of the task analysis and were followed by each step in sequence irrespective of the student's success rate. Throughout the study all correct responses given by a student were rewarded with verbal and social rewards until the student met the criterion for success. When a student achieved a target to the prescribed level, rewards were given only after the last step of the task analysis for chained skills and after the last trial at the end of each session for discrete skills. However, the student's attention and

cooperation were rewarded on two occasions within each session. The controlling prompts used were chosen depending on the needs of the student and target skills. For example, one student required hand over hand physical prompting while another only needed a gestured prompt (i.e., pointing to the objective).

Baseline Sessions
After this preparation stage, the study commenced with a baseline assessment for each target skill. At least three consecutive baseline sessions were conducted in the study until stable data were obtained in terms of the performance level of each student for each target skill. In each session two trials were carried out for each picture for the discrete skills. At the beginning the teacher said, *Check your schedule*. When the student checked his schedule and sat on the chair in the one to one workstation the teacher said, *We will start to learn the names of fruits. Are you ready to work?* If the student gave a positive response, the teacher rewarded his cooperative behavior and gave the task direction, *Give me pineapple*. Then the teacher waited four seconds allowing the student to initiate a response. All correct responses, performed independently were rewarded verbally and socially while incorrect responses were ignored during the baseline sessions. In each baseline session for the chained target skills only one trial was carried out for each step of the task analysis. A single opportunity format was used to measure the performance level of each student during the baseline sessions. That is to say, the teacher presented the task direction and recorded the student's response to the steps of the task analysis. When the student initiated an incorrect response the teacher interrupted the student and the student's response was recorded as incorrect. At the beginning the teacher said, *We will learn to make a hot drink. Are you ready to work?* If student gave a positive response, the teacher rewarded his cooperative behavior and gave the task direction, *Prepare a hot drink*. Then the teacher waited four seconds for the student to initiate a response. The number of correct responses performed independently was recorded and rewarded. But, when the student initiated an incorrect response, performed an incorrect response, or did not show any response his response and the rest of the steps in the task analysis were recorded as incorrect responses during baseline sessions only.

Constant Time Delay Instructional Sessions
At the beginning of the instruction sessions the teacher said, *Check your schedule*. When the student checked his schedule and sat on the chair in the one to one workstation or when he went to the working area for his chained skill (e.g., kitchen for making a hot drink) the instruction session started. In the instruction sessions two types of delay intervals were used: (a) zero second delay interval, and (b) four second delay interval. At the beginning of teaching, zero second delay intervals were used in all trials in the first three instruction sessions. Zero second trials were conducted as follows: The teacher had pictures ready and secured the student's attention (*We will learn the names of classmates. Are you ready to work?*). After receiving an affirmative response to his question the teacher gave the task direction (*Give picture of Paul*) and presented the controlling prompt immediately as a physical (hand-over) prompt plus a verbal prompt, saying, *This is Paul*. The four-second delay interval trials were implemented in the same manner as zero second delay trials except that the teacher waited four seconds for the student to respond before providing the controlling prompt. That is to say, a task direction was given and the teacher waited the appropriate delay interval (four seconds), then he provided the controlling prompt as physical prompt plus a verbal prompt. Error correction was provided for incorrect student responses. If the student showed no response after the initial task direction, the task direction and controlling prompt were repeated until the student responded correctly, following which the teacher moved to the next picture. When the student showed an incorrect response before or after the controlling prompt, the teacher interrupted the student's actions and provided a controlling prompt in order to obtain the correct response and moved to the next picture.

Instruction sessions for chained skills were conducted in exactly the same way as for discrete skills except that there was only one trial during each session. At the beginning of teaching the skill, a zero second delay interval was used in all trials in the first three instruction sessions and were conducted as follows: The teacher had the materials ready and secured the student's attention (*We will learn to make a hot drink. Are you ready to work?*). After receiving an affirmative response, the teacher gave the task direction (*Make a hot drink*) and presented the controlling prompt immediately as a physical prompt. For the four-second delay interval trials the teacher provided the task direction and waited four seconds for the student to respond. If the student did not initiate a response, the teacher delivered the controlling prompt as physical assistance. When teaching chained skills, error correction was provided for incorrect student responses but if the student showed no response after the initial task direction and controlling prompt, the task direction and controlling prompt were repeated until the student responded

correctly. The teacher then moved on to next step of task analysis. When the student showed an incorrect response before or after the controlling prompt, the teacher interrupted the student's actions and provided a controlling prompt to obtain the correct response for that step of task analysis. The teacher then moved on to next step of the task analysis. During all teaching sessions the teacher waited behind the student to provide physical assistance.

Maintenance and Generalization Probe Sessions
The maintenance effect of the CTD within the TEACCH setting was assessed after one, two, and six weeks for Bill's chained target skill (making a hot drink), one, two, and four weeks for Bills discrete target skill (naming fruits), one and four weeks for Garry's chained target skill (washing-up) and one, two and five weeks for Garry's discrete target skill (identifying classmates) following the instruction process. Maintenance and generalization sessions were conducted in an identical manner to baseline sessions except rewards were withdrawn during these sessions. In the maintenance and generalization sessions rewards were presented only after the last correct responses of students. Generalization sessions for Bill's and Garry's chained target skills (making a hot drink and washing up) were conducted in the kitchen of their house. Furthermore, generalization for the discrete skills (naming fruits and identifying classmates) was tested by using a variety of photographs.

Reliability
In order to validate the data collected in this study, inter observer agreement data were also collected from random sessions in the form of video records, which were examined by the researchers and the observer independently. Inter observer agreement data were collected during at least 27% of all experimental sessions and was calculated with a formula of the number of agreements divided by the number of agreements plus disagreements multiplied by 100 (Tekin-Iftar & Kircaali-Iftar, 2004). Reliability data indicated a 98% (range = 92-100%), 96%, (range = 80-100%), 99% (range = 97-100%), and 98% average agreement (range = 92-100%) across sessions during baseline, generalization, maintenance and instruction sessions respectively.

Results
Effectiveness of Constant Time Delay
Baseline, training, maintenance, and generalization data for Bill, Garry and Ross are shown in Figure 1 through 5 respectively. The closed circles represent the percentage of correct responding during baseline, instruction, and maintenance sessions. Open triangles the represent percentage of correct responses during generalization sessions. As seen in Figures 1 through 5, two participating students performed their four target skills at criterion level. Although the third student showed some improvement in performing his task, he did not meet the criterion. In other words, although experimental control was not built in the study the descriptive findings show that the CTD delivered within TEACCH frame was effective in teaching four out of five target skills in this study. Based on these findings, it can be said that CTD delivered within TEACCH frame was seem to be effective in teaching both discrete and chained skills to children with autism.
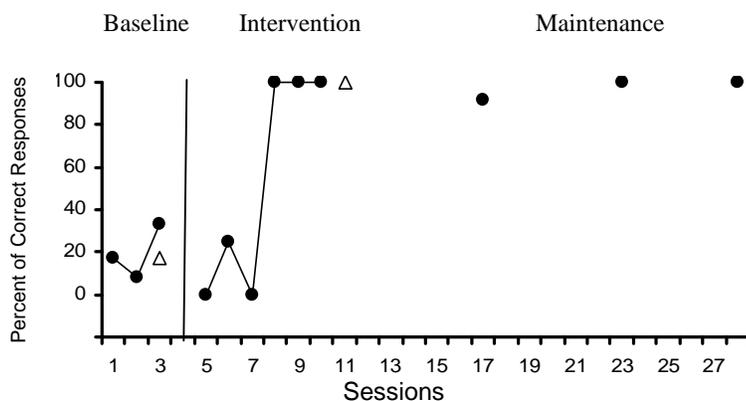
Figure 1
The percentage of correct responses for naming fruits by Bill during baseline, instruction, maintenance and   generalization sessions.

The instruction data for each student and for each target skill, the number of training sessions, percentages of student errors during training and amount of training time, are presented in Table 2. Bill needed six training sessions to reach the criterion for the skill of naming fruits, which took a total of nineteen minutes. Bill did not make any incorrect responses during this time. Bill required fourteen training sessions to reach the criterion level for making a hot drink while the total time spent to teach this skill was one hour and five minutes and the error rate during these sessions was 2%. Garry needed nineteen training sessions to reach the criterion for identifying his classmates. A total of 52 minutes training time was required to reach this level and Garry's error rate was 12%.
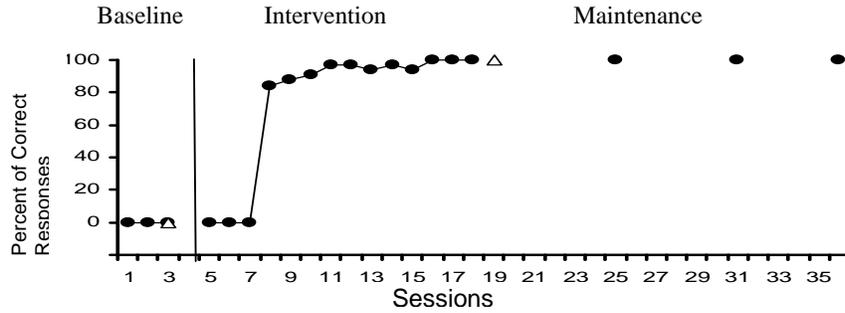

Figure 2
The percentage of correct responses for making a hot drink by Bill during baseline, instruction, maintenance and generalization sessions.
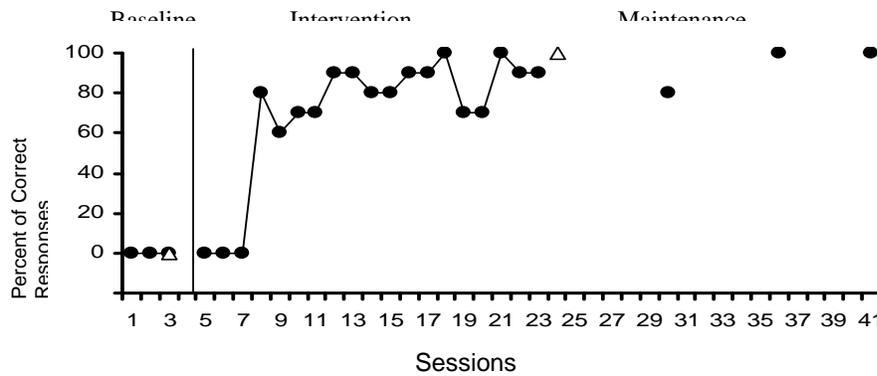

Figure 3
The percentage of correct responses for identifying classmates by Garry during baseline, instruction, maintenance and generalization sessions.
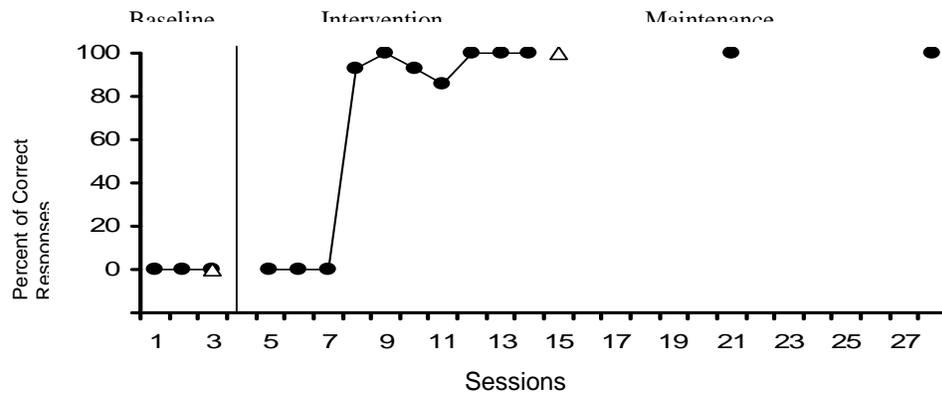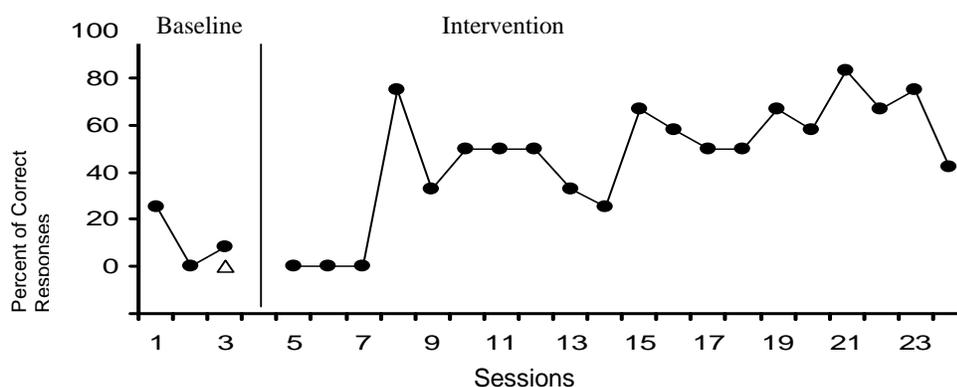

Figure 4
The percentage of correct responses for washing up by Garry during baseline, instruction, maintenance and generalization sessions.

Figure 5
The percentage of correct responses for discriminating between male and female by Ross during baseline, instruction and generalization sessions.

Ten training sessions were required to reach the criterion level for washing up by Garry and the total time was 28 minutes whilst the error rate was 3%. Although 20 teaching sessions were conducted to teach the difference between pictures of males and females to Ross, he was unable to meet the criterion in the study. During his training sessions a total of one hour and 38 minutes were spent with an error rate of 36%.

Table 2
Instruction Data for Each Student Up To Criterion Level During the Study

Students	Target Skills	# of Sessions	Error Rates	Training Time
Bill	Naming Fruits	6	0%	00:19:27
Bill	Making a Hot Drink	14	2%	01:05:16
Garry	Identifying Classmates	19	12%	00:52:40
Garry	Washing up	10	3%	00:28:20
Ross	Discriminating Male/Female	20	36%	01:38:01

Maintenance and Generalization Findings
Data collected in maintenance sessions showed that four target skills taught in the study were maintained at criterion level with a range of 80% and 100% accuracy and were generalized to different conditions successfully. As seen in Figure 1 through Figure 4, Bill and Garry were able to perform their chained target skills (making a hot drink and washing up) in the kitchen of the house where they live with 100% accuracy. Bill and Garry also generalized their discrete target skills (naming fruits and identifying classmates) to a variety of photos with different sizes, colors, and backgrounds with 100% success.

Views of the Classroom Teacher Surrounding the Teaching Process
As mentioned before, in this study it was thought that the effectiveness of any procedure should not be the only reason to use that procedure when providing instruction to students with special needs. The teacher's opinions regarding the teaching process are also important, therefore in this study; the views concerning the teaching process were defined, based on contemporaneous notes and described under the following headings listed below.

Advantages of the constant time delay.
Based on the data gathered from observation records of the classroom teacher, it can be said that he developed quite positive opinions about the teaching process and the implementation of CTD within

the TEACCH approach. The teacher expressed the opinion that the zero second prompting trials, that is, leaving no time lag between a task direction and the prompt, was very effective in the initial teaching phase and when the four second delay trials were introduced it gave the student time to process a request yet still receive support if required.

The classroom teacher reported that the CTD and the TEACCH approach are very harmonious when used together. For example, he stated, *In my opinion the CTD is totally appropriate to use in conjunction with TEACCH for the following reasons: they are both highly structured, that is to say instruction is presented in a uniform, systematic way; complicated skills are broken down into small steps making it easier for students to assimilate information; it is straightforward for a teacher to identify areas of difficulty; and skills are repetitively taught which closely matches the learning style of most autistic people*.

According to the teacher, one of the satisfying sides of using CTD was its flexibility which allowed the necessary modifications to be made; therefore, taking into account the individual differences of students. He said, *Although this is a very systematic way of teaching skills, it is by no means rigid and on many occasions tasks were modified and teaching prompts changed in order to meet individual learning needs*.

The teacher observed that CTD demanded rigorous planning and preparation and this in itself resulted in satisfaction. He also noted that teaching needed to be highly structured but once the process had been mastered the discipline, which was required, resulted in positive feelings concerning the acquisition of personal skills and abilities. The teacher thought the clear structure of the process meant that another teacher was able to take over the teaching at any point using the predetermined prompting method without jeopardizing the student's attainment in the learning process. He also felt that this was important in a highly staffed classroom where people may be required to work with different students on different occasions.

The teacher commented that the recording sheet used provided instant and graphical feedback which indicated the progress the student had made and over what time period. Moreover, he expressed an opinion that the recording sheet clearly pointed towards where weaknesses may lie and what strategies or tactics may be employed to help the student to learn.

The teacher observed that students benefited in as much as once they had learned the process of CTD they were encouraged to slowdown and therefore they were better able to concentrate and make progress. The teacher also said that there were notable improvements from all the students in their ability to wait; a positive by-product in addition to the planned teaching objectives.

The impact of autism and external factors on learning.
The teacher thought that when choosing or applying any teaching strategy it was important to consider the impact of autism. To reinforce this the teacher said *It is interesting to note that even an ostensibly pleasurable experience (e.g. a visit from a family member) might cause emotions such as excitement, which a person with autism may not understand or cope with in a positive manner. The student in question, afterwards, spontaneously began to cry for no apparent reason. It was later revealed that he had been refused chocolate cake in the lunch break immediately preceding this episode*. Another example was given by the teacher when he recalled, *On one occasion when teaching washing up to Garry, he waited for the soapsuds to disappear before putting down the bowl to finish the task. This reminded me that autistic people often display obsessive, ritualistic or sensory behaviors which at times supersede most other behaviors or outside influences, in this case a fascination with water. Alternatively it may have been that Garry did not think the job was finished until the soapsuds had disappeared. Whatever the cause of Garry's behavior, it resulted in him requiring extra (physical) support in order to complete the task*.

Individual learning styles.
The teacher thought that although CTD was very effective, in order to improve the quality of teaching it was also necessary to take into account the individual needs and learning styles of the students. For example, the teacher said, *I decided to give a small, informal test to Bill after a series of unsuccessful sessions in which only verbal requests were given. When an additional written request was given the student's performance immediately was improved*. The teacher emphasized the impact of individual differences on the teaching process with another comment, *It appears that Bill does not easily process*

verbal instructions but quickly learns to recognize the written names and corresponding pictures of objects when a controlling prompt is used with a visual request.

Disadvantages of the constant time delay.
When the teacher's observation notes were examined it was seen that he encountered some difficulties in making the data recording during the teaching process. The teacher said, *The only drawback that I discovered was that when I first began to use the CTD I found it difficult to record and concentrate on teaching at the same time. However, I gradually became more adept as time went by.*

The Opinions of the Classroom and Care Staff Regarding the Target Skills Used In the Study
Based on the data gathered from the Target Skills Evaluation Questionnaire it can be said that the classroom support staff and care staff (key workers for each student) had positive opinions regarding the target skills used in this study. While the average percentage of positive answers of classroom support staff was 87% (range = 72-100%); the average percentage of positive answers of care staff regarding the target skills was 88% (range = 71-100%). Therefore, in addition to the positive comments of the teacher concerning the teaching process, it might be thought that positive opinions of the classroom support staff and care staff in terms of the skills taught to the participant students strengthen the social validity of the study.

Discussion and Future Directions
The main purposes of this study were to examine the effects of a CTD strategy within a TEACCH approach and to elicit the views of the classroom teacher regarding the teaching process. Additionally, maintenance and generalization data were also collected. Although experimental control was not built in the study, the descriptive results showed that the CTD delivered within TEACCH frame seemed to be effective in teaching four of the five target skills in this study. The views of the classroom teacher regarding the teaching process were positive overall. Data collected in maintenance sessions showed that all of the acquired target skills were maintained within a range from 80% to 100% accuracy over a five to six week period. In addition, participating students learned to generalize these four skills under different conditions. The literature indicates that the CTD is an effective method when used to teach both discrete and chained skills to individuals with special needs (Schuster et al., 1998; Wolery, Anthony, Caldwell, Snyder, & Morgante, 2002). As is the case with findings in the literature, this study demonstrated that CTD was effective in teaching various skills to children with autism within a TEACCH framework. Based on these findings and the positive opinions of the classroom teacher regarding to the teaching process educators might be encouraged to employ the CTD to teach both discrete and chained skills to children with autism within the TEACCH approach.

Based on the data collected and analyzed, it may be argued that some findings are worthy of discussion. First, because an AB single-subject research design was used to measure the effects of a CTD within the TEACCH frame, experimental control was not built in the study. AB design is the simplest and weakest version of the single subject designs and it cannot be used to make a confident assumption of a functional relationship between dependent and independent variables. However, if there is a change on the intervention phase compared to baseline the teacher may use this information to make inferences about the effectiveness of the intervention and think that the intervention had an effect (Alberto & Troutman, 1995). Therefore, it may be argued that the findings of this study could provide guidance to the practitioners and give them an idea about using the CTD within TEACCH frame. On the other hand, in the light of the findings of this study, the effects of CTD within a TEACCH setting might be examined with stronger single subject research designs in further research.

Second, this study has a potential limitation on the issue of generalization. Generalization data were collected via pre-test and post-test measurements and occurred before training and at the end of teaching of each target skill. In other words, generalization was tested only once in all cases immediately following the intervention sessions. Therefore, in future studies, instructional arrangements for generalization would be made in a more controlled manner. For example, generalization of the skills may be planned and implemented during instructional sessions.

It may be said that error rates were minimal except for one student in the study. The literature indicates that during CTD training sessions a low rate of error occurs (Schuster et al., 1998; Tekin et al., 2001). The highest error rate in this study occurred during training with Ross (i.e., 36%) and although this student made some improvement he was unable to meet the criterion level. In the light of these results, it may be argued that his target skill was too difficult a concept and was, therefore, not

appropriate for his developmental level. However, this was a skill, which was derived and therefore justified because of a parental request. It may have been possible to reduce the error rate for this student by modifying the teaching materials or even adjusting the task itself. However, the end of the school term precluded this possibility.

Although the success criterion level for each student was set at 100% for at least three consecutive sessions, an adaptation was made on Garry's success criterion level for his discrete skill (identifying classmates). In other words, because stable data occurred between 90% and 100%, intervention was terminated at this level. However, as can be seen in Figure 3, Garry performed this skill at 100% accuracy level in generalization session soon after the intervention. Garry also showed 100% performance in the last two maintenance sessions.

At the beginning of the study, the students were not accustomed to the CTD and observations given by the classroom teacher indicated that after students learned the teaching process their success level increased. This notion leads to the belief that if students had been familiar with the CTD from the start of the study they might have reached the criterion level earlier.

Although the classroom teacher had experience in teaching a variety of discrete and chained skills to children with autism, he was using the CTD for the first time in this study. Despite this, the teacher implemented the procedure easily and when his positive opinions are taken into consideration it can be suggested that CTD is a teacher friendly procedure. The teacher mentioned only one negative side of the procedure. He encountered some difficulties in the data recording whilst at the same time concentrating on the teaching process. However, it may be argued that, especially in highly staffed classrooms, support staffs are able to make the necessary recording.

The findings of this study provide several opportunities and recommendations for future research. In this study a CTD was used within a TEACCH approach. As Mesibov, Shea, and Schopler (2005) pointed out, TEACCH has its roots in behavioral approach and the compatibility and strong interface, which emerged between the two approaches, should therefore come as no surprise. In further research, the effects of different types of errorless teaching methods, for example simultaneous prompting procedure or progressive time delay procedure might be examined when used in conjunction with a TEACCH approach. In this study only the classroom teacher's opinions regarding the CTD was obtained; henceforth, it may be beneficial to elicit the views of other practitioners such as classroom support or care staff in residential schools, defined in terms of the teaching process.

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