

## **Teaching Social Skills Interventions with Digital Cognitive and Language Machines to a Student with Autism**



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**ABSTRACT:** The present paper, through a case study of a student with autism, refers to the diversity in language and social skills and the communication difficulties across the lifespan. It aims to support the social skills based on the pedagogical principles of teamwork and student-centeredness according to the Framework for Analytical Special Education Program (FASEP) in secondary inclusive education. The main hypothesis examines the meaning of teaching in autism for philologists (Greek language teachers) who use -a] differentiations with targeted individual-structured "social stories" and -b] interventions in the emotional organization by verbalizing feelings with digital cognitive and language machines in a student with autism. The methodology of the inclusion intervention programs use the pedagogical tool TISIPfSEN (Targeted, Individually Structured, and Inclusive Intervention Programs for Students with Special Educational Needs). Accompanied by a questionnaire which given to (N = 104) philologists. The individually targeted social skills instructional interventions with digital cognitive and communication machines were implemented with a rubber band folder and a digital folder for a student with autism. With structured, graded-difficulty learning readiness exercises, the understanding of the meaning of language rules of cooperation with others was supported. Philologists have understood that autism difficulties following through the semantic aspect of language affect the individual's social skills in abstract thinking and the multiple meanings of social stories' words. Finally, they confirmed the usefulness of TISIPfSEN for students with autism by teaching language interventions in social skills and the multimedia approach with a conventional and digital dossier.

**KEYWORDS:** TISIPfSEN, Language, Digital Cognitive Machine, Social Stories, Autism

### **I. INTRODUCTION**

Issues of teaching interventions in the development of social skills in autism [2] are approached with interactive electronic games based on the theoretical pedagogical principles of teamwork and student-centeredness, as well as the philosophy of the Framework Analytical Program for Special Education Needs [FAPSEN] [1]. Games are supported by Interactive Technology and Smart Education [3] in secondary inclusive education. These refer to dealing with learning difficulties in reading and behavior [4]. Modern trends regarding the school and social inclusion of students are formulated in the educational model, with Grandin [5] referring to computers, tablets, and the questions surrounding their use in terms of what is good or not. These interventions are meaningful in the linear continuum of compulsory attendance of students supported by inclusion programs within their classrooms. Researchers Williams, Wright, Callaghan & Coughlan [6] report that children with autism learn to read more easily with computer-assisted instruction than with traditional books in a pilot study published in the journal "Autism". According to the DSM-5 [7] classification system for psychiatric and neurodevelopmental disorders, autism spectrum disorders are characterized by difficulties in social interaction and communication, repetitive behaviors, and obsessions with interests and activities. Also, according to psychological learning theories, students with autism spectrum disorders often have difficulties understanding rules formulated through language [8, 9]. In this paper, the pedagogical tool TISIPfSEN [10] is applied to implement social skills teaching interventions with digital cognitive machines in the context of language differences in a student with autism. The criteria of TISIPfSEN are defined by the targeted, individual, differentiated, structured, inclusive special education and training intervention program [11, 12]. Also, a questionnaire given to a certain number of philologists (N = 104) confirmed (98.1%) the usefulness of the TISIPfSEN pedagogical tool, while a significant number of philologists (29.8%) use new technologies to implement teaching interventions according to the fourth phase of TISIPfSEN.

### II. SYSTEMATIC EMPIRICAL OBSERVATION OF SPECIAL EDUCATIONAL NEEDS

#### A. Research Objective - Hypothesis

The purpose of this paper is to study teaching interventions in social skills with digital cognitive and language machines in a student with autism. The case study explores how the philologist tries to deal with the reading difficulties and behavioral communication problems of a student with autism [9]. Furthermore, the views of other philologists are studied on the teaching of students with autism and the enriched differentiation by conventional means, with differentiated pedagogical materials [13], new technologies [14], and the creation of digital "software"—cognitive and language machines. The combination of digital tools and conventional diversified media enhances the flexibility of thinking. This combination was chosen because some applications, such as puzzles with language and communication games and virtual blocks, are also considered less efficient due to the lack of information processing through sensory tactile stimuli. As Grandin [5] states, children can learn better by touching objects, compared to their fingers touching the screen.

Furthermore, according to the Greek Ministry of Education-Pedagogical Institute [15] and the National Center for Special Needs in Great Britain, for the education of students with autism in school, it is recommended to create and alternate recycled digital materials and media in each language exercise of graded difficulty with individualized learning readiness activities. The book for the teacher of special education with learning readiness activities focuses on the issues of oral language, psychomotricity, mental abilities, and emotional organization [1, 15]. So, education with emotional organization activities [16] uses digitally differentiated pedagogical materials and emphasizes taking advantage of students' engagement with their favorite subject and their particular interest in new communication technologies with electronic devices. In addition, according to Grandin [5], some disadvantages are considered in the use of computers, tablets, and mobile applications in students with autism spectrum disorder [7], such as when they are repeated to stimulate oneself (stimming), constantly moving the image of a picture, which could serve as a mode of self-stimulating behavior [6].

#### B. Methodology and Systematic Empirical Observation of Autism

The research was based on qualitative, quantitative, and mixed methods approaches [17] in special education and training [18] and used tools based on observation methodology [19], [10], and intervention methodology [17] in a certain case study of a student with autism spectrum disorder [20].

Kostas is 13 years old. He is in the 1st semester of the first grade of Junior High School, the "6th Gymnasium of Kalamata," in the 15th semester of compulsory formal education in the linear continuum of interventions in the teaching of social skills that evolve according to the pedagogical instrument TISIPfSEN with the five phases [12, 10, 21].

Also, with a short anonymous Google Form questionnaire, the opinions of  $N = 104$  philologists were gathered and studied around the issue of teaching interventions in social skills with digital cognitive and language machines and differentiated teaching for students with autism.

According to the systematic empirical observation and recording protocols of the first phase of TISIPfSEN the script for the individual's history (T- [Individual] SIPfSEN) is recorded and supported with inclusion programs (TIS-[I]nclusion]-PfSEN) [21]. At the age of five (5), Kostas had difficulty expressing his speech and emotions, was sometimes intensely aggressive, and was diagnosed with autism spectrum disorder (ASD). He is observant and often overwhelmed by thoughts and feelings about what he sees, but finds it difficult to express them. He tends to engage in electronic games and has difficulty communicating and cooperating with his classmates, which worries his mother.

In the family history, it is stated that he comes from a bourgeois family. He lives with his mother (Elena) and his little brother, Stefanos, (10 years old). His parents are divorced. His mother is 40 years old and works as a secretary for a multinational company. His father is 42 years old and works at a car dealership. In Kostas' family environment, no one has shown symptoms of autism. His parents are aware of his peculiarities but often find it difficult to accept the situation. Kostas receives love from his family members, especially from his brother.

In the school's history, it is mentioned that Kostas refuses to write and makes repetitive finger movements. However, according to what his professors say, he appeals to the IT course and the use of new technologies. In primary school (in all classes), he had parallel support to control the aggression he sometimes displayed and also for his better performance in lessons. The teachers are aware of his peculiarities and state that they have limited possibilities to help him effectively.

#### C. Teaching Interventions

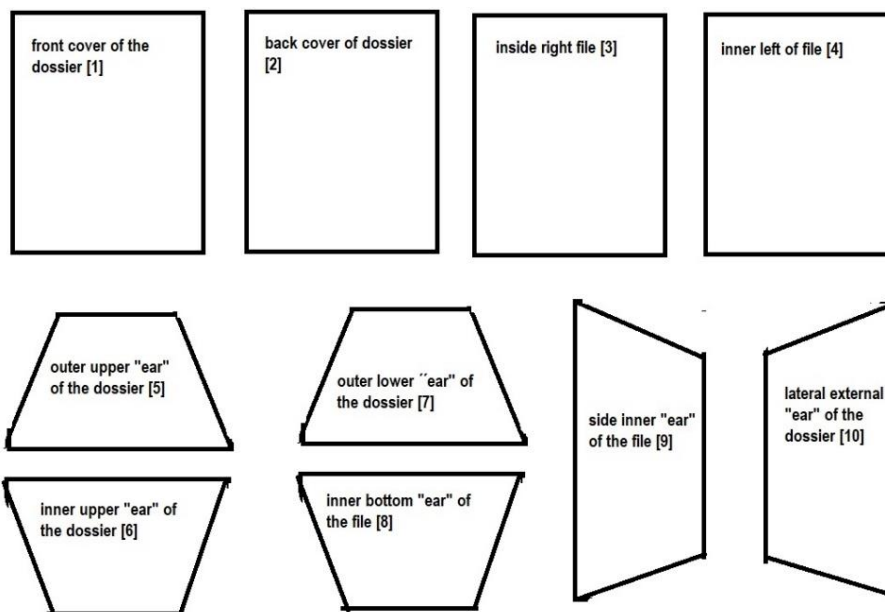
The intervention with graded language comprehension exercises with some social stories is drawn up according to the third phase of TISIPfSEN. The targeted teaching objective was defined as follows: "To cooperate with others" following the methodology of observations of special educational needs.

In order for Kostas to understand social story texts aimed at developing social skills and cooperation with others, the goal was structured into 2 steps using the task analysis method [1].

According to Christakis [2], the special teaching intervention for children on the autism spectrum, based on the teaching priorities set after the first two interventions, takes into account all the characteristics of the child, integrating them into the

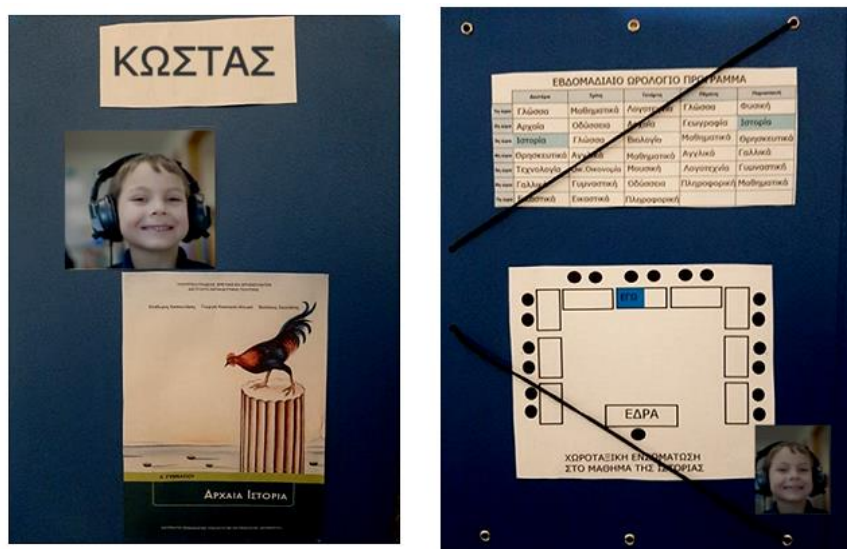
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teaching work in a pleasant and attractive process. The steps are structured, sequential, and oriented towards the successful integration of the child into the school context [22]. The teaching objective is described with a certain number of lines in the text, words, and visual meaning facilitators (VMFs). The implementation of the first step was done with a cognitive engine with a simple, three-dimensional dossier, and the implementation of the second step was done with a digital dossier [23], according to Figure 1. The parts of the cognitive machine are the front cover of the dossier [1], the back cover of the dossier [2], the inside right file [3], the inner left file [4], the outer upper "ear" of the dossier [5], the inner upper "ear" of the dossier [6], the outer lower "ear" of the dossier [7], the inner bottom "ear" of the file [8], the side inner "ear" of the file [9], and the lateral external "ear" of the dossier [10].



### 1. Parts of the cognitive machine.

The TISIPfSEN pedagogical tool was applied to both the simple and the digital dossier, individualizing Kostas' favorite color, "blue," which was chosen in both dossiers (simple and digital). On the front cover was placed the cover of the book we are working with (the history textbook), and the individuality was declared with his name, his photo, and his favorite object, "headphones" (T- [Individual] SIPfSEN). Accordingly, the weekly timetable was placed on the back cover, where the days with the history lessons are "colored" and, at the bottom, the graph of spatial integration, with the student's place in the class [22, 23].



### 2. The front cover (left) and the back cover (right) of the contract dossier of Kostas (in Greek).

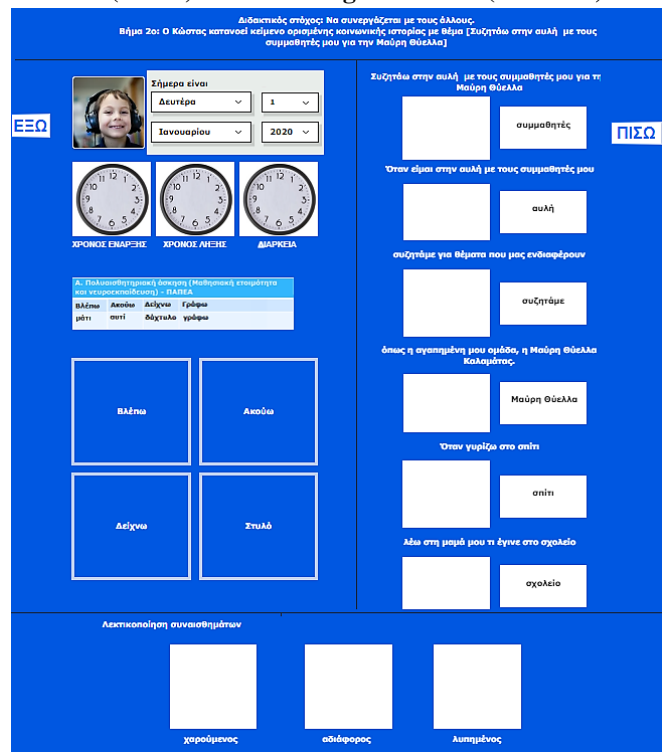
The first step of the teaching objective was implemented with the simple dossier, and the second step with the digital dossier. The digital dossier (<https://pan-alexopoulos.wixsite.com/kostas>) follows the structure of the simple one but incorporates some innovations. With this multisensory activity, Kostas learns to understand rules and interact with others. Visual meaning facilitators are accessed "with the computer mouse" or with the student's finger on touch screens. Thus, when access is made through touch devices, such as smartphones and tablets, the sense of touch is used, and the student understands the linguistic requirements of the

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exercises of escalating difficulty. With the buttons "In," "Out," and "Back," the student acquires a sense of the space of his digital dossier, a pursuit that focuses on the psychomotricity.



### 3. The front cover (above) and the back cover (below) of Kostas' digital dossier (in Greek).



### 4. The inside of Kostas' digital dossier (in Greek).

Inside the digital dossier, there is a uniform color throughout, and the space is organized into "parts," such as sentence writing with the date and reading options. A single color (blue) and font size (Verdana 16 bold) were chosen to facilitate the student. Also, three visual meaning facilitators representing clocks with the start time, end time, and duration calculation were placed on the left inside of the dossier. At this point, moving cards with arrows (< >) were placed, and the student could select the corresponding clock. Under the clocks, in the lower left part of the dossier, the visual meaning facilitators with the multisensory exercises with learning readiness activities were placed. The [hear-see-show-write] concepts are approached with automatic pop-up cards, which appear as soon as the mouse pointer "touches" the squares and "clicks up."



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In the right interior of the dossier, at the top, the teaching objective and the intervention step with a certain social story were placed. Immediately after, the social story text was introduced, which is made meaningful by visual meaning facilitators, with alternating moving cards selected with arrows. In fact, the first card is white in order to stimulate the student's curiosity to discover by reading the meaning of the VMFs and to choose the correct one. The reading choice is also matched with the word placed next to it on a fixed card. In the lower right part, the visual meaning facilitators were placed with three cards that represent three different expressions on Kostas' face that indicate when he is happy, indifferent, or sad. According to T-[Individual] SIPfSEN, reading the emotions by selecting the electronic card aids him in verbalizing the emotion and reinforces the individuality of the intervention.

The construction of the digital dossier was done through the Wix platform, which enables the construction of web pages. It was chosen because the freedom of movement it provides can turn the platform into a useful "software" building tool for the educational community [14].

According to the fourth phase of TISIPfSEN, the teaching intervention plan is implemented with the targeted differentiation of the social story text with activities implemented with 3D cognitive machines such as the simple rubber band and the "digital folder" with fixed and mobile cards. In particular, with the first social story, the targeted intervention aims for Kostas to understand a text of 9 lines and 65 words on the topic of "The Break" with 9 Visual Meaning Facilitators [VMFs].

**Το διάλειμμα** 

Όταν είμαι στην τάξη συνεργάζομαι με τον καθηγητή 

και τους συμμαθητές μου 

και χτυπάει το κουδούνι 

ο καθηγητής λέει «Ωρα για διάλειμμα» 

Τότε, εγώ σκέφτομαι τον κανόνα ότι όλοι βγαίνουμε έξω από την τάξη. 

Στην αυλή πλησιάζω τους συμμαθητές, συζητάμε και ξεκουραζόμαστε. 

Όταν χτυπάει το κουδούνι θυμάμαι τα λόγια του καθηγητή ότι «είναι ώρα για μέσα». 

Πηγαίνω στην τάξη και είμαι χαρούμενος. 

**Συζητάω στην αυλή με τους συμμαθητές μου για την Μαύρη Θύελλα** 

Όταν είμαι στην αυλή με τους συμμαθητές μου 

συζητάμε για θέματα που μας ενδιαφέρουν 

όπως η αγαπημένη μου ομάδα, η Μαύρη Θύελλα Καλαμάτας. 

Όταν γυρίζω στο σπίτι 

λέω στη μαμά μου τι έγινε στο σχολείο 

Έτσι είμαστε και οι δύο χαρούμενοι. 

### 5. The two social stories: "The Break" [1], "I discuss the Black Storm with my classmates in the yard" [2] (in Greek).

The second social story's goal is to have the student use seven visual meaning facilitators to comprehend a 7-line, 59-word text on the topic of "I am discussing the Black Storm with my classmates in the yard."

## III. LIMITATIONS AND RESULTS

### A. Research Limitations

The intervention script is inspired by the protagonist, a student with autism. Therefore, an important limitation was the digital adaptation of the differentiated pedagogical material. Although the development of user-friendly visualization on mobile devices and tablet computers may lead to greater use in enhancing and facilitating communication, the scope of this study has a limited number of applications in daily life. Finally, the digital dossier requires an internet connection in order for the pedagogical material to be accessible via the hyperlink.

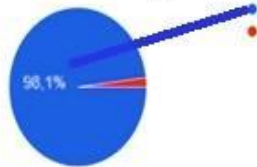
### B. Results

The pedagogically differentiated implementation of teaching in the "dossiers" was implemented following the fourth phase of TISIPfSEN and the plan of the teaching intervention in the targeted differentiation of text, in the context of the undergraduate course "Special Education and Training" in the Department of Philology of the University of Peloponnese. The polymorphic elastic binders are customizable and eco-friendly. They use fixed and movable laminated cards with velcro. Visual Meaning Facilitators (VMFs) are defined in content-specific texts, mainly by assessing the student's or young person's experiences with a predetermined number and type of words [23]. The intervention methodologies with the "dossiers" for children and young people with autism apply theoretical research data to individual practical interventions, taking into account any other special education interventions the student may receive with speech therapy, occupational therapy, psychotherapy, drama therapy, music therapy, play therapy, or other alternative therapeutic interventions.

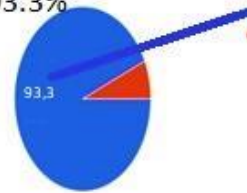
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According to the opinions of N = 104 Greek language teachers (philologists) who answered a questionnaire about TISIPfSEN, 98.1% stated that it supports people with Autism Spectrum Disorders. Most answers were given by women (71.2%), with the age range of 96.2% ranging between 20 and 30 years. 53.8% was from the Peloponnese (Greece), while 38.5% came from Attica (Greece).

N = 104. The TISIPfSEN, supports people with Autistic Spectrum Disorders [98.1% ]



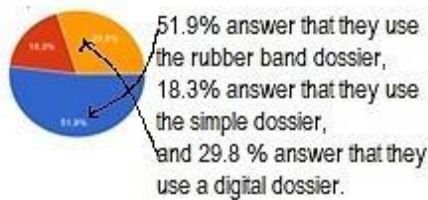
Teaching interventions with TISIPfSEN support social skills, 93.3%



### 6. Greek language teachers' (philologists') opinions (N = 104) about TISIPfSEN and teaching interventions in autism.

Also, on the five-point Linkert scale, 49% agree that teaching interventions with TISIPfSEN support specific reading difficulties in autism very much (20.2%), while for teaching interventions with TISIPfSEN that support social skills, a percentage of 93.3% of the responses indicate that they help a lot. When asked if they choose targeted, individual, didactically structured, integrated interventions of special education and training with a dossier for a student with autism, most (34.6%) answer that they choose it for social skills; 33.7% choose TISIPfSEN for reading interventions in the language class; and 22.1% responded that they choose it for behavioral interventions with social stories. Only 9.6% of respondents say they choose it for reading interventions with social stories.

The teaching interventions with the fourth phase of TISIPfSEN implemented with 3D cognitive and communication machines



[N=104] . From them [34,6%] answered that they choose targeted, individual, didactically structured, integrated interventions of special education and training to teach social skills with a dossier for a student with autism, and [33,7%] choose TISIPfSEN for reading interventions in the language class.



### 7. Responses to teaching interventions according to the fourth phase of TISIPfSEN.

Regarding the teaching interventions with the fourth phase of TISIPfSEN implemented with 3D cognitive and communication machines, 51.9% answered that they use the rubber band dossier, 18.3% answered that they use the simple dossier, and 29.8 % answered that they use a digital dossier.

## CONCLUSIONS

The discussion on the study of instructional interventions in social skills with digital cognitive engines in a student with autism emerged as multidimensional with dominant conclusion points. The first results come from philologists trying to deal with the reading difficulties and behavior of a student with autism. A second point that is reinforced by the opinions of philologists about teaching in autism refers to the enriched differentiation both with conventional means with differentiated pedagogical materials and with new technologies. The important bottom line is innovation in teaching. This is defined by the creation by the educator and philologist himself of digital "software"—cognitive machines that represent the targeted, individual, structured, and differentiated integrated teaching intervention according to the interdisciplinary principles of special education and training. Furthermore, one more concluding point refers to the combination of digital tools and conventional differentiated media that enhance the flexibility of thinking in autism. This option teaches children with autism and their teachers to share recyclable teaching materials and media and transforms them into smart learning readiness activities that help process information through multisensory stimuli. Finally, we consider that the present study needs to be extended and utilized in structured differentiation with a larger sample of teachers who support students with autism with teaching interventions.

In conclusion, the current paper tries to give an educational glance at the recent research knowledge regarding special education and training in social skills for students with autism spectrum disorder and how this knowledge could be used for psychopedagogical interventions.

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**TABLE OF ACRONYMS**

- 1) Special education and training (SET).
- 2) Targeted, Individually Structured, and Inclusive Intervention Programs for Students with Special Educational Needs (TISIPfSEN).
- 3) Framework of Analytical Special Education Program (FASEP).
- 4) Autism spectrum disorder (ASD).
- 5) Visual Meaning Facilitators (VMFs).



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