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Combining Value-Focused thinking and soft systems methodology: A systemic framework to structure the planning process at a special educational needs school in Brazil

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ABSTRACT

Soft systems methodology (SSM) is a well-known Problem Structuring Methods that has proven effective when tackling problematic situations. To model different perceptions of a problematic situation, SSM encourage stakeholders to propose possible transformation likely to improve the situation. The more transformations compiled the richer the process become; but in practice, managing higher number of transformations presents a challenge. Value-Focused Thinking (VFT) is an approach designed to obtain and structure stakeholders' value-based objectives. In an SSM application, stakeholders ascribe their value-based objectives to the transformations proposed; we propose a multi-methodological framework in which VFT analysis is added to a revised version of SSM (Re-SSM). This allows to reduce the transformations to a manageable number. We applied the (Re-SSM)-VFT framework to a single case-study to structure/define policies/practices in planning the inclusion of students with special educational needs in a Brazilian Federal High School. In applying the framework, we found that from more than 40 initial SSM transformations only 8 transformations were needed to reach 4 out of 5 objectives. Results suggest that it is possible to save time/effort in the planning process by considering transformations associated with the stakeholders' value-based objectives enabling efficient systemic plans, aligned with their expectations.

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Education; soft systems methodology; value-focused thinking; multimethodology; problem structuring methods

1. Introduction

Problem Structuring Methods (PSMs) are approaches to deal with ill-structured problems, in other words, problems without a clear set objectives, resources, and constraints (Kotiadis & Mingers, 2014; Rosenhead & Mingers 2001). Soft Systems Methodology (SSM) is one of the most traditional, well-known, and effective PSM to explore an ill-structured situation deemed problematic (Ackermann et al., 2014; Georgiou, 2015; Ormerod, 2014). SSM is an action-oriented approach which promotes changes that are both systemically desirable and culturally feasible to improve the situation (Checkland, 1985; 2000; Georgiou, 2015). Consistent with the motivations of these PSMs (Keisler et al., 2014), Value-Focused Thinking (VFT) developed by Ralph Keeney focuses on identification and articulation of the value-based objectives (Keeney, 1992), a fundamental step to any operational research study (Eden & Ackermann, 2013).

According to Georgiou's revised version[1] of SSM, Re-SSM (as we called it in this paper) focuses on developing transformations to convert an undesirable situation into a desirable situation (Georgiou, 2006, 2008, 2012, 2015). However, in an SSM intervention, many competing transformations may be revealed; this poses a challenge to design an effective plan to perform them. Georgiou (2012) uses Strategic Options Development and Analysis (SODA) to structure the transformations into a map that provides an overview on how transformations are linked and how they affect each other. Alternatively, this study offers the use of objectives – value-based objectives – to identify the most relevant transformations. By using VFT to reveal and structure objectives, values can be used to generate decision opportunities, develop systemic planning more efficiently, and save effort by performing only the transformations that help reach the fundamental objectives.

Usually SSM is combined with others PSMs (Howick & Ackermann 2011; Munro & Mingers, 2002). In any intervention, it is important to explore the objectives of any problematic situation and seems to be VFT is a useful approach for this purpose. However, the combination of SSM and VFT

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has been reported only in a few papers (Bernardo, Gaspar, & Antunes, 2018; Neves et al., 2009; Teles & de Sousa, 2014), in which the authors use VFT to structure a cloud of objectives generated by SSM. A multimethodological approach combining VFT with SSM can be efficient in developing and improving a systemic planning. Therefore, our research examines the following questions: (1) When planning a strategy, how can we deal and discriminate the many SSM transformations explored in a complex situation? and (2) How can we use stakeholders' value-based objectives to guide a systemic planning to improve the situation as a whole?

The paper aims to demonstrate how VFT can be used within the systemic planning stage of the particular SSM version (here called Re-SSM) provided by Georgiou (2015) to prioritize and identify the most relevant transformations for the problematic situation and help design their Human Activity Systems (HAS). In addition, we use a SODA map in conjunction with the initial stage of the Re-SSM to generate a strengthened understanding of the problematic situation under consideration. The main contribution is that the paper proposes a conceptual framework that includes VFT as an additional stage of an SSM intervention. The combined results of VFT and SSM in an enhanced multimethodological approach can increase efficiency and facilitate the systemic planning to solve problematic situations.

Our research approach was an action research case study of the application of a multi- methodological approach based on the pair Re-SSM + VTF combination. The proposed framework is then applied to a single case in a Federal High School to structure and define policies and practices for the inclusion of students with Special Educational Needs (SEN). In line with an action research approach, this research is based on a situation in which researchers and professionals undertake applied research to solve an extant problem (Kelly and Walker, 2004), it is a 'form of action inquiry that employs recognised research techniques to inform the action taken to improve practice' (Tripp, 2005). Furthermore, the present study can be regarded as an action research exercise in the sense that the perspective we adopted was to make neither the ideas nor the practical experience dominant and that the intention was to allow the tentative ideas to inform our practice (Checkland, 1981, Checkland, 1999). Moreover, in this intervention, we deliberately did not seek to be normative in our eventual findings, but rather we follow the phenomenological line. In other words, we proposed a multi-methodological framework from which we aim to gain theoretical insights (for us and OR practitioners). These lessons were derived from real case (a case-study to structure and define policies/practices in planning the inclusion of students with special educational needs in a Brazilian Federal High School) with real-world data very much in line with the suggestion of Eden and Huxham (1996).

The paper is organized as follows: Sections 2 to 4 contains a brief overview on Multimethodology, Re-SSM, and VFT respectively. In Section 5 we discuss the combination of VFT-SSM in the recent literature, which led to the modelling approach proposed for this study. In Section 6, we present the gaps and problems associated with SSM based intervention on a problematic situation and how including VFT as an additional stage could help to overcome these gaps. The proposal framework to deal with the problematic situations is composed by VFT to access what the stakeholders want, and Re-SSM is employed to plan how to obtain it. In Section 7, the framework proposed, in the previous section, is applied to a case study on a Federal High School that needs to support students with Special Educational Needs (SEN). Section 8 discusses the framework proposed together with its application. Finally, section 9 includes our conclusions, limitations and suggestions for future studies.

2. Multimethodology in management sciences/operational research

The family of methods called "soft" OR arose in the late 1970s/early 1980s, to deal with ill-structured problems (Ackermann, 2012; Cochran et al., 2010). The Soft Systems Methodology (SSM), Strategic Choice Approach (SCA), Strategic Options Development and Analysis (SODA), and Critical Systems Heuristics (CSH) are the some of the common approaches in this family (Franco & Montibeller, 2010).

For the last two decades, approaches have increasingly combined methods, methodologies, and techniques from various paradigms simultaneously. The interest in mixing operational research methodologies has increased since the publication of Mingers and Brocklesby (1997) about how methodologies from different paradigms can be mixed in material, social, and personal aspects (Henao & Franco, 2016). This OR mode of practice has been coined as multi-methodological (MM) practice in a multi-paradigmatic context. The recent OR literature evidences that the MM approach has been applied in various organisational contexts like sustainability (Kamari et al., 2019), healthcare (Small & Wainwright, 2018; Tako & Kotiadis, 2015), and community OR (Brocklesby & Beall, 2018; Henao, & Franco, 2016). The practice also has applications

Table 1. The 10 categories of helpful questions.

Category of questions	Specific questions
1. A wish list	What do you want? What do you value? What should you want? What are you trying to achieve? If money were not an obstacle, what would you do?
2. Alternatives	What is a perfect alternative, a terrible alternative, some reasonable alternative? What is good or bad about each?
3. Problems and shortcomings	What is wrong or right with your organization or enterprise? What needs fixing? What are the capability, product, or service gaps that exist?
4. Consequences	What has occurred that was good or bad? What might occur that you care about? What are the potential risks you face? What are the best or worst consequences that could occur? What could cause these?
5. Goals, constraints and guidelines	What are your aspirations? What limitations are placed upon you? Are there any legal, organizational, technological, social or political constraints?
6. Different perspectives	What would your competitor or your constituency be concerned about? At some time in the future, what would concern you? What do your stakeholders want? What do your customers want? What do your adversaries want?
7. Strategic objectives	What are your ultimate or long-range objectives? What are your values that are absolutely fundamental? What is your strategy to achieve these objectives?
8. Generic objectives	What objectives do you have for your customers, your employees, your shareholders, yourself? What environmental, social, economic, or health and safety objectives are important?
9. Structuring objectives	Follow means-ends relationships: why is that objective important, how can you achieve it? Use specification: what do you mean by this objective?
10. Quantifying objectives	How would you measure achievement of this objective? Why is objective A three times as important as objective B?

Source: Keeney (1996, p. 543).

in contexts of small and medium-sized enterprises, as cited in Silva Barros et al. (2013); Paucar-Caceres et al. (2015); and Castellini and Paucar-Caceres (2019). Furthermore, Mingers (1997a, b), Mingers (1999), Mingers (2001a, 2001b), and Munro and Mingers (2002) contain other relevant evidence in the OR literature about MM approaches.

Notwithstanding that, even with the large variety of publications previously cited, no studies could identify, articulate, and structure objectives to guide the intervention or, in other words, what we expect from systemic intervention. Notably practitioners that use SSM aim to improve the whole problematic situation, by planning all needed transformations, which can be a difficult exercise. Therefore, we propose that stakeholders' values can be used to obtain fundamental objectives to guide the approach to a systemic resolution of a problematic situation easing the related tasks. For this VFT can be applied in an analytical manner within Re-SSM. The result is an enhanced methodological combination which facilitate the systemic planning of resolutions of problematic situations. VFT (Keeney, 1992), detailed in Section 3, is a methodology which can identify, articulate, and structure objectives from stakeholders' values, on the other hand SSM, detailed in section 4, is able to record an understanding of the problematic situation, used to identify the required changes needed to improve the situation and finally design and debate models for operationalizing the transformations (Georgiou, 2015). By applying those two consolidated methodologies, we can define what we want, what we have, and how to move from what we have to what we want. Furthermore, we hope the application reported in this paper will contribute to MM trend.

3. Value-focused thinking (VFT)

Value-Focused Thinking, also known as Value-Focused Approach (Pourebrahim, Hadipour, & Mokhtar, 2011), has been developed by Keeney and described in his book, and many papers (Parnell et al, 2013). VFT is used in many areas, such as governmental, energy, production, and others (Parnell et al, 2013). It consists of a set of tools and techniques to identify and structure value-based objectives through stakeholders' interviews (Kunz, Siebert, & Mütterlein, 2016; Pacheco et al. 2019). When objectives are clearly defined, more and better alternatives and even criteria to evaluate them may be set (Siebert & Keeney, 2015).

VFT approach focuses on two context-dependent categories of objectives: Fundamental Objectives and Means Objectives (Keeney, 1992). The fundamental objectives are concerned with the ends that decision makers' values and are characterized as the essential reason for interest in the decision situation (Keeney, 1992; 1994). On the other hand, the means objectives are those that have implications on achievement to which another mean or a fundamental objective can be achieved or in Keeney (1996, p.538) words: "means objectives are methods to achieve ends". Following the means objectives enables a fundamental objective to be reached.

The core of VFT is thinking about values and to find out what is desired and then think about alternatives to achieve it. The key to identifying decision objectives is asking the right questions to the actors involved in the decision (Ferretti, 2019, p. 94), Keeney (1996) suggests 10 categories of helpful questions which can (and should) be adapted to the context of the problematic situation under consideration. These 10 categories of useful questions are presented in Table 1.

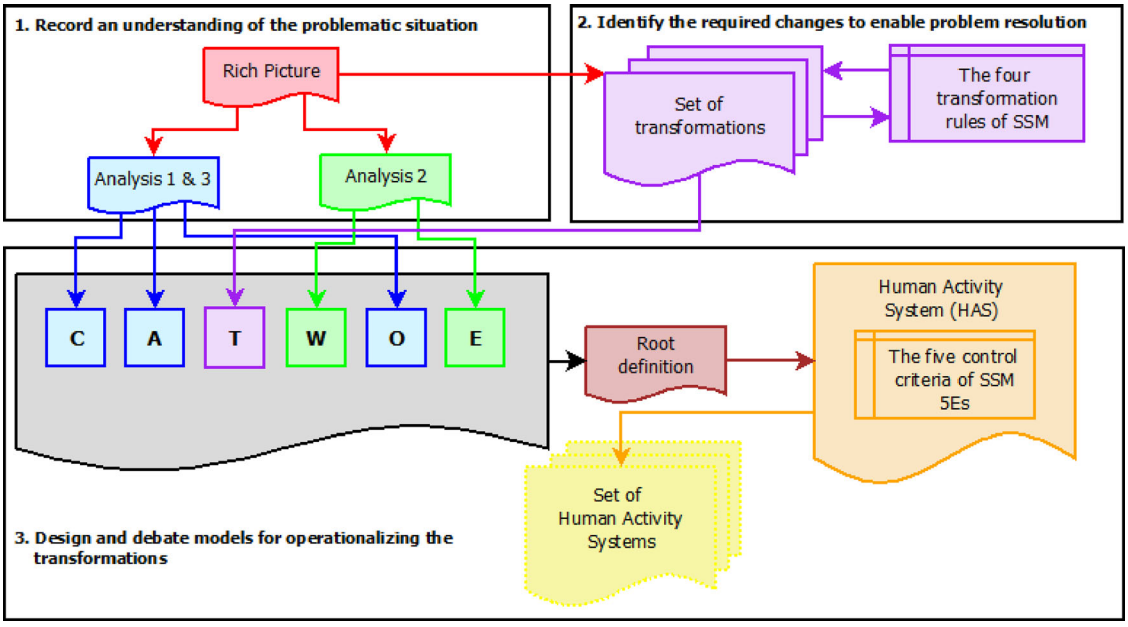

Figure 1. Visual overview of a configuration of SSM in three phases (Re-SSM). Adapted from Georgiou (2015).

VFT can be summed up in four steps (Sheng, Siau, & Nah, 2010; Tuhkala et al. 2017). The first step consists in generating a value list, by asking, "What do you want? What should you want? What do you mean?" and other questions about the problematic situation, categories of questions in Table 1 can help a lot at this step. The second step, converts those values into measurable objectives using verb + object format (Morais et al., 2013). In the third step, through the WITI (Why Is This Important?) test, the objectives are arranged in a priority or dependency order, distinguishing fundamental objectives, which is the end that decision makers value in a specific context, and means objectives to achieve specific ends. Finally, means-end network objectives are defined (Keeney, 1992, 1996)

The VFT practice in a specific context of problematic situation might result in many benefits, such as enabling more and better alternatives to tackle the issue that would not be considered the first time. Therefore, decision makers might spend more effort on decisions with more desirable consequences (Alencar, Priori Jr & Alencar, 2017). The identification of value-based objectives helps generate actions and obtains results in accordance with the decision makers' expectancy (Argyris & Schön, 1996; Keeney, 1992). The literature shows that VFT is widely used with MCDA (Multi Criteria Decision Analysis) methods such as AHP, MACBETH (Marttunen, Lienert & Belton, 2017). VFT has also been used with other PSMs, such as SODA (Georgiou, 2012) and SSM (Neves et al. 2009).

4. Soft systems methodology (SSM)

Peter Checkland's Soft Systems Methodology (SSM) is the most developed Systems Methodology in terms of its theoretical premises and philosophical underpinnings. It is also one of the most widely used in the UK and in other parts of the world (Ledington & Donaldson, 1997; Mingers & Taylor, 1992).

Being a flexible methodology, many SSM have been configured through four decades of development (Checkland, 2000). The original formulation has seven stages, starting from a rich picture to the design of a set of Human Activity Systems (HASs). Other formulations include two streams (Checkland, 1988), four main activities (Checkland, 2000) and, more recently, a three-phased SSM (Georgiou, 2015), which we used in this study. The choice for Georgiou's 'Re-SSM' has been due to that it is, in our view, more didactic and easier to understand. Additionally, Re-SSM explicitly states the CATWOE mnemonic and the resources that provide the information for CATWOE which is the focus of this study. Despite the many 'flavours', all SSM formulations share aspects from the original formulation, starting with a record and understanding of the problematic situation, then identifying and describing stakeholders, afterwards seeking transformations, designing conceptual models, and establishing control criteria.

The Re-SSM (Georgiou, 2015) is a revised version of the original SSM that groups all procedures to answer three questions (Georgiou, 2006): (1) Given a sparse knowledge of a problematic situation, how is it possible to extract information from it? (2) If such information can be extracted, how can it be structured in a way that enables rigorous problem definition? and (3) If a problem can be defined rigorously, how can this definition be used to inform a systemic approach toward resolution?

(Georgiou, 2006, p. 441). An overview of Re-SSM is illustrated in Figure 1.

The focus of the first phase is to record an understanding of the problematic situation. It consists in producing, as much as possible, given a problematic situation, with lack of clear facts, whatever knowledge and converting it in useful information. The pieces of information are produced with the Rich Picture, which is a free-form diagrammatic description about the problematic situation under study. Rich Picture also might provide clues about the transformations needed to improve the situation as well as relevant systems and stakeholders. Analysis 1, 2, and 3 are focused on the people related. Analysis 1 lists all the people that are involved in the situation, and Analysis 3 describes the power of intervention that each one has. Analysis 2 is focused on immersive questions like "What is it like to be in this situation?" "How are things done here?" "What sort of culture, organisational or otherwise, permeates this situation and, to a great extent, governs it?" (Georgiou, 2015, p. 423).

In the first phase, Re-SSM focuses on exploring a problematic situation. It can be combined with another PSM that has the same focus as SODA (Georgiou, 2012). The second phase uses the information produced to identify the required changes required to resolve the problem. This implies obtaining an undesirable state in the problematic situation that needs to be transformed into a desirable state. To obtain those transformations, Re-SSM stipulates four rules that must be followed:

1. Consider only one input and one output;
2. The input must be present in the output in a changed state;
3. An abstract/intangible input must yield an abstract/intangible output; and
4. A concrete/tangible input must yield a concrete/tangible output. A sample of transformation could be: "Unacceptable time lag in dealing with urgent demand" as input and "Acceptable time lag in dealing with urgent demand" as output (Georgiou, 2015).

When we are faced with a set of transformations, we start the third phase by contextualizing each one by means of mnemonic CATWOE that enables understanding of the contextual aspects for transformation. In CATWOE, a customer (C) is the one who will benefit or lose when the transformation (T) is performed. The actor (A) is the one who will do the transformation and the owner (O) delegates the work to be done and who will do it. The environment (E) is the constraint related with the transformations under consideration. Finally, *Weltanschauung* (W) is a German expression understood as worldview, the reason, perspective, or justification for the transformation. The terms of CATWOE are grouped in one expression called Root Definition, that provides answers for questions like: "What are you planning for?". A general sample for root definition could be: A system that does (T), for (C), realized by (A), due to (W), under command of (O) and limited by (E).

The last step is HASs, a set of linked activities that perform the transformations. Georgiou (2015, p. 430) provided six technical guidelines to design the HASs: Firstly, for each CATWOE and the accompanying root definition, identify tasks that will operationalise the respective transformation. Then, consider the interrelationships between the tasks in order to identify the precedent and successor activities. Third, design a network diagram of the activities, with the final activity being the right-hand side of the transformation in question (its output). Fourth, enclose the network diagram by drawing a boundary around it, thus creating a HAS. Lastly, identify the control criteria against which progress will be measured to ensure that the activities achieve their desired outcome, and finally, place the control criteria as a monitoring sub-system linked to the HAS. In the end, all the individual HASs are interlinked with each other thus originating a truly systemic plan called *supersystem*.

5. The literature on the VFT-SSM combination

Although both VFT and SSM are well-consolidated approaches for over 26 years, no many studies have combined them together. The studies from Neves (2009), Teles and de Sousa (2014), Kamari, Corrao, and Kirkegaard (2017) and Bernardo, Gaspar, & Antunes (2018) uses four phased SSM to generate a cloud of objectives and VFT to structure it. Others relevant studies can be seen in Abuabara et al. (2018) about aviation manufacturer and Abuabara, Paucar-Caceres & Burrowes-Cromwell (2019) related to circular economy through the recycling of coffee capsules, but they only used the initial SSM stage: the rich picture. The authors used SODA to describe the problem situation, obtained a list of objectives from SODA map, and employed VFT to structure it into a hierarchical tree of means and ends. The way how the VFT has been used in these studies throw away the better feature of VFT: thinking about values. These six studies all combined VFT and SSM are detailed in Table 2.

The low quantity of studies combining VFT and SSM might be partially explained by the fact that SSM is a traditional UK Soft OR approach cited in

Table 2. References concerning VFT + SSM applications.

Authors	Title	Context	Objective	Journal
Abuabara, Paucar-Caceres and Burrowes-Cromwell (2019)	Consumers' values and behaviour in the Brazilian coffee-in-capsules market: promoting circular economy	Promotion of the economy to circulate through the recycling of coffee capsules.	Propose a conceptual framework to support waste to resource management and applying reverse logistics to the coffee production supply chain	International Journal of Production Research
Bernardo, Gaspar, and Antunes. (2018)	A Combined Value Focused Thinking-Soft Systems Methodology to Structure Decision Support for Energy Performance Assessment of School Buildings.	Energy management in school buildings.	Elicit and organize the multiple aspects that influence energy efficiency of school buildings.	Sustainability
Abuabara et al. (2018)	A systemic framework based on Soft OR approaches to support teamwork strategy: An aviation manufacturer Brazilian company case.	Systemic intervention conducted in a strategy department of a Brazilian Aircraft Manufacturer.	Assist a recently appointed leader in making a full assessment of the roles of the team with the view of re-designing the department strategy.	Journal of the Operational Research Society
Kamari, Corrao, and Kirkegaard. (2017)	Sustainability focused decision-making in building renovation	Building renovation sustainability	Develop a sustainability framework for building renovation.	International Journal of Sustainable Built Environment
Teles and Sousa (2014)	Environmental Management and Business Strategy: Structuring the Decision-Making Support in a Transport Company.	Manage corporate environmental performance.	Provide a framework to support and evaluate environmental strategies and management approaches.	Transportation Research Procedia
Neves et al. (2009)	Structuring an MCDA model using SSM: A case study in energy efficiency.	Energy efficiency initiatives	SSM and VFT were used to elicit and structure, respectively, objectives to be used in MCDA models for evaluating EE initiatives.	European Journal of Operational Research

many field papers (In SCOPUS database, almost 50% of the citations of Checkland 1981 are from England), and VFT is an approach originated in the USA, where Soft OR has not been fully recognized as OR (Assad & Gass, 2011). Furthermore, although some authors advocate VFT as consistent with PSM motivation (Keisler et al, 2014; Urtiga & Morais, 2015), others do not explicitly include VFT as a member of the "PSM family" (Marttunen, Lienert, & Belton, 2017; Mingers & Rosenhead, 2004).

Considering that identifying, structuring, and articulating objectives are fundamental in any operational research study (Eden & Ackermann, 2013); that the VFT is an approach focused in getting and structure value-based objectives (Keeney, 1992); and that SSM in the version adopted in this study, Re-SSM, is an open methodology without boundaries and non-objectives oriented (Martinelli & Ventura, 2006). We argue that combining VFT and Re-SSM can provide many benefits in an intervention, making it more efficient and effective. We based our argument in two reasons: firstly, thinking about values enables the stakeholders to think about what would be ideal in the problematic situation in accordance with its values. Once the stakeholders identifies a desired state based on its values, it can make a counterpoint with a certain unwanted current state which facilitates the process of identifying Re-SSM transformations. Secondly, by relating the transformations to the objectives, it is possible to verify the transformations that in fact meet the wishes of the stakeholders.

6. Structured systemic planning using value-based objectives

PSMs like SSM has been developed to deal with unstructured or ill-defined problem situation with multiple actors, with potentially conflicting values or interests, reliable data, differing perspectives, perplexing uncertainties, significant intangibles, etc. (Rosenhead, 2006). SSM tackles these characteristics by improving the situation as a whole. However, there are two gaps associated with SSM. First, it does not focus on objectives, or have a tool to obtain them; however, when few transformations are needed, this is not really a problem, as not a lot of effort is required to improve the entire issue under consideration. Second and truly a problem, when there are many transformations, it can be very hard to implement all for them, so it is necessary to prioritize some of them (Martinelli & Ventura, 2006).

The second gap has been identified and addressed by Georgiou (2012), who structured the transformations in a SODA map called SODA-Transformations (SODA-T). The input and output of transformations fill two poles of each construct. The author suggests that some transformations have more influence in the systemic plan and thus could be prioritized. Alternatively, we propose that

transformations that meet fundamental objectives, in this case, value-based objectives must be prioritized.

The prioritisation of transformations by means of a SODA-T map is done based on the analysis of the influence of each transformation on the systemic level. However, prioritizing transformations that are directly related to the objectives may result in an improved selection of transformations by allowing the realisation of those that meet the real expectations of stakeholders. Prioritisation through objectives is neither incompatible nor a substitute for the solution used in the SODA-T map, depending on the complexity of the problem and the amount of transformations identified; there is no impediment to the solutions being used together.

Our framework, presented in Figure 2, begins by identifying the actual state of the situation or "what we have", then uncovers the objectives or "what we want" and finally prepares a systemic plan that helps move from what we have to what we want.

In short, stage 1 includes Georgiou's (2015) of Re-SSM (Georgiou's revised SSM version), first phase which is composed of the Rich Picture and Analysis 1, 2, and 3 described in the section 4. The Rich Picture works as an icebreaker (Georgiou, 2006) and could provide clues about the relevant systems and people involved that are described with Analysis 1, 2, and 3. This stage could be increased by an optional SODA map. The inclusion of SODA map here aims to obtain, if necessary, a better understanding of the problematic situation. More details about SODA map can be seen in Ackermann and Eden (2010, 2020) and Georgiou (2010).

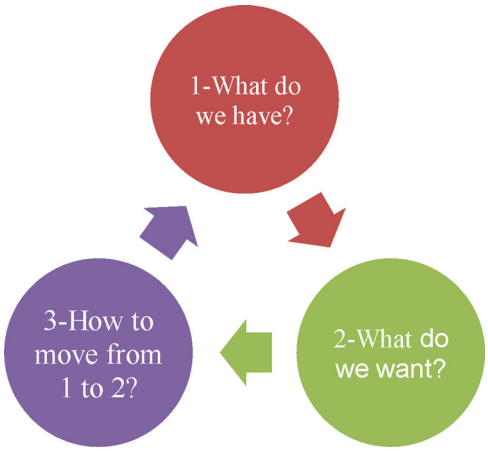

Figure 2. Overview of the proposed framework (Source: Authors).

Stage 2 is composed of the Keeney's (1992) VFT procedures. We start by obtaining a value list by interviewing stakeholders. Then we transform the values into measurable and tangible objectives, structure them, and finally establish a means-end network objective with a diagrammatic software tool. This task could help build HAS in the next stage. The ten categories of helpful questions presented in Table 1 could be tailored to the context.

The final stage includes the second and third SSM phases. In the second phase of Re-SSM, the transformations are raised by analysis of Rich Picture and SODA map. Each transformation is composed by one input – the actual and undesirable state – and one output – the desirable state. After this exercise, the transformations are linked to the fundamental objectives that help to meet. In the third SSM phase, are discussed the list of necessary activities to perform each transformation.

A detailed summary of the systemic framework proposed is shown in Table 3.

In stage 3, after identifying the transformations, we can prioritize some transformations by examining the network objectives and asking, "Does this transformation help us to meet our objectives?" If the answer to this question is yes, we then ask, "Which objectives are achieved with this transformation?" We thus save effort in the next steps, which is one of the benefits of using VFT. Using the Pareto Principle, it would not be a surprise if 20% of the obtained transformations met 80% from the objectives and vice-versa. Many transformations are required; but only a few transformations meet all objectives and few meets most of the objectives.

Table 3. Steps of the proposed framework.

	Tool
Stage 1: What do we have?	
Step 1.1: Abstract the context of the problematic situation	Rich Picture
Step 1.2: Identify and describe the related actors	Analysis 1 and 3
Step 1.3: Describe the context of the problematic situation	Analysis two
Step 1.4: Build and analyse the SODA map	SODA map
Stage 2: What do we want?	
Step 2.1: Set values	Wish List
Step 2.2: Transform values into objectives	Verb + Object
Step 2.3: Rank objectives	WITI Test
Step 2.4: Build means-end network objectives	Software
Stage 3: How to move from 1 to 2?	
Step 3.1: Identify transformations	Transformation Rules
Step 3.2: Contextualize transformations	CATWOE
Step 3.3: Describe transformations	Root Definition
Step 3.4: Set and interlink activities and establish control criteria for conceptual models	HAS, and 3 E's

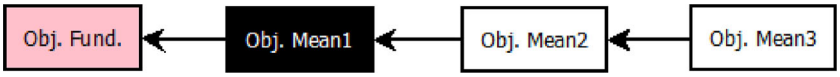

Figure 3. VFT means-end network sample.

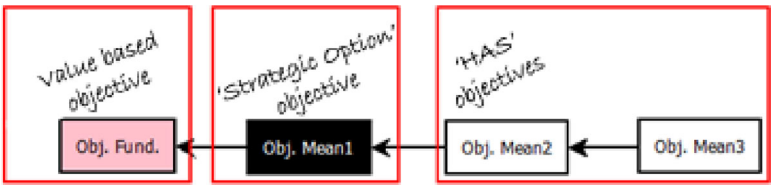

Figure 4. VFT means-end network sample structured.

The means-end network objectives have many structured objectives, but analogously to other PSMs like SODA, some are more significant than others. In SODA, Georgiou (2010, 2011) described "strategic options" as the constructs that are immediately below the head constructs, for they provide the options available to meet the ultimate constructs shown in the map. Strategic options provide a way to reach a result or consequence (head construct). The VFT means-end network or a graph theory does not have an equivalent, but we can appropriate this conceptual term to define which objectives we can use to prioritize the transformations. Figure 3 shows a simple sample of VFT means-end network.

The first objective is called Fundamental, because it indicates what we want at the end of the process. The means objectives 1, 2, and 3 are what we must do to reach the fundamental. Obj. Mean1 is the last objective before the fundamental. In other words, when we meet this objective, we reach our fundamental objective, and thus achieved what we want. To reach Obj. Mean1, we need to do Obj. Mean2 and Obj. Mean3. The Obj. Mean1 is for VFT means-end network analogue to SODA Strategic Option construct. Thus, we must seek these objectives when we select the transformations. In this sample, Obj. Mean2 and Obj. Mean3 could help us to think about the activity list that composes individual HASs and the supersystem. Figure 4 shows the idea for the sample of VFT means-end network.

The value-based objective in Figure 4 is reached when we carried out the previous objectives and Obj. Mean1, called here 'Strategic option' objective in reference to SODA. It is the objective with immediate link to value-based objective or fundamental objective. This concept does not originally exist in VFT. We have appropriated it from SODA. Strategic Options are critical constructs exactly because of their perceived immediate influence upon a head. The 'HAS' objectives are those previous 'Strategic option' objectives. For each transformation provided by Re-SSM, stakeholders need to think about the sequential activities or actions that must be done to perform a specific transformation, these activities as interlinked originating the HAS. This task demands new intervention with stakeholders. Showing them the objectives that need to be reached may help them to think about these sequential activities.

Each transformation is labelled with the identification of the 'Strategic option' objective to reach. When some transformations could not be related to any of these objectives, we labelled it with "-". Among the transformations not labelled with -, we selected all of them or some of them that are related to as many objectives as possible and perform the HAS. For each HAS, we identify the control criteria of 3 E's (Efficacy, Efficiency, and Effectiveness). The inclusion of control criteria enables measuring if the activities achieve their desired outcome. The last step is grouping the individual HAS in a supersystem and placing the control criteria for the supersystem too. The last step enables the plan to be truly appreciated as systemic.

In the next section, we present the application of our framework in a case-study related to inclusion and school attendance of students with Special Educational Needs (SEN).

7. A Case-study: Applying the VFT/Re-SSM systemic framework

Education for students with SEN in regular schools is a global agenda (Runswick-Cole, 2011) promoted by the United Nations Educational, Scientific, and Cultural Organization (UNESCO) and many other organizations. The most important document on this subject is the Salamanca Statement in 1994 (Unesco, 1994), in which the ONU member countries committed to include these students in the same schools as their peers. This commitment involves many issues about how to carry out the inclusion. Barton and Corbett (1993) advocate that the policies built must consider contextual aspects in the institutional reality and immersion. Ferguson (2008) claims the need for a movement to change from traditional education to the collective construction of knowledge, in a way that it is closer to

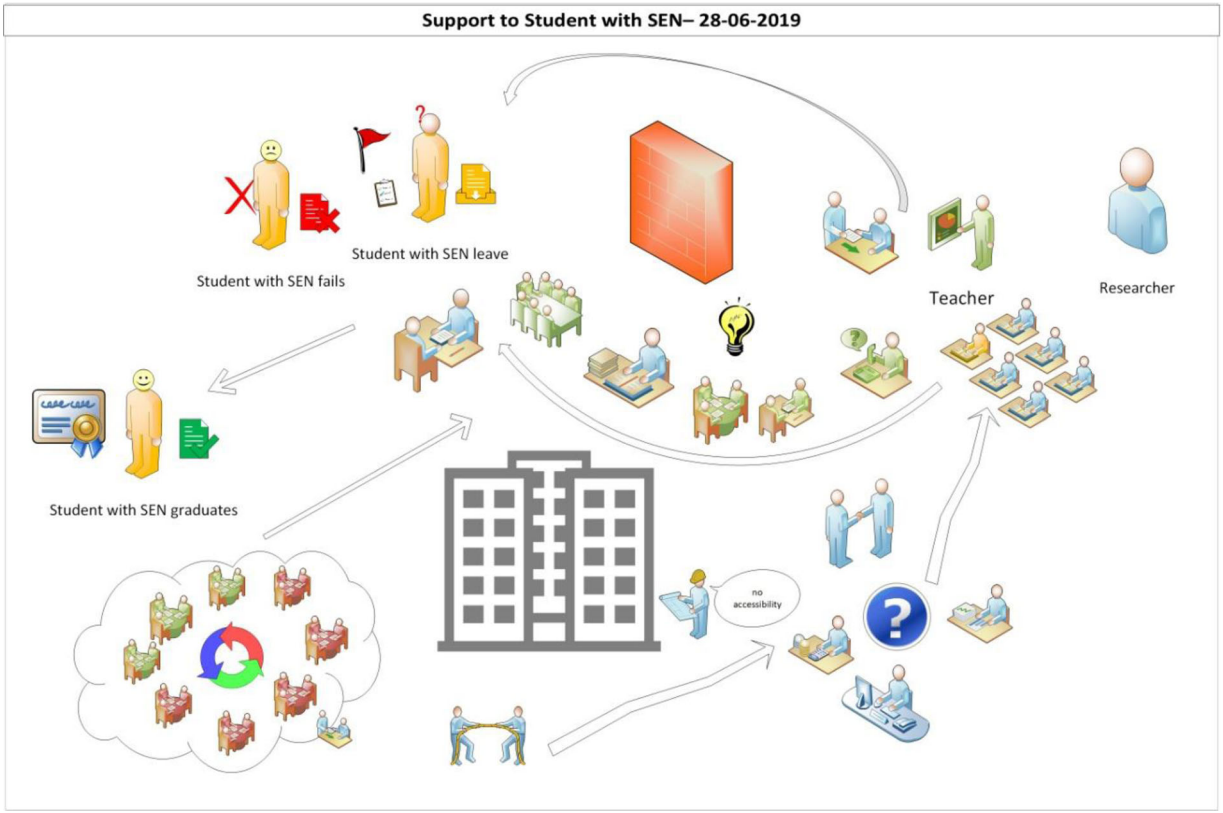

Figure 5. Rich Picture of Case Study.

what happens in society. Lindqvist and Nilholm (2014) highlight the influence of the head teachers, although there are many global and local policies, and the implementation is according to the context, values, insights, and beliefs of related people. In other words, the problem of inclusion of students with SEN has features that PSM can deal with, such as multiple actors, uncertainties, and contextual aspects.

Notwithstanding, education has many levels, from preschool education to post graduate and professional formation. Our case study is in a Federal High School that has students with and without SEN. The framework is shown in Table 3.

7.1. What do we have?

Following the steps of proposed framework (Fig. 2 and Table 3), the first stage is identifying what we have in our current state. The intervention has been conducted by one of authors of this study who is also a lecturer at the institution and who assumed the role of facilitator. We started abstracting the context of the problematic situation by drawing a Rich Picture with a head teacher designated by the institution's management to accompany the intervention and one the authors. The Rich Picture has been drawn many times freehand and redrawn with computer software called Microsoft Visio® with the head teacher's suggestion. The aim has been to represent what occurs during the passage of the student with SEN in the institution. Figure 5 shows the final form of Rich Picture.

During the discussions supported by Rich Picture, some related aspects (A) are identified and included:

1. New policies that ensure the reservation of students with SEN have been implemented.
2. There are no staff, technicians or teachers dedicated to special education.
3. Some teachers, especially in technical areas, have little or no pedagogical or special education training.
4. In previous schools, these students have been compulsorily passed to the next grade and had a lot of difficulty.
5. Many teachers do not see these students as capable and think that they should not be there.
6. The institution has a sector of volunteers to support students with SEN called NAPNE, but there are few adapted teaching resources.
7. The students with SEN who have joined the institution continually drops out or fail.
8. The nature of the school tries to promote social transformations and meet all kinds of people in society.
9. Currently, there are some SEN students and the total is increasing yearly, and the number is expected to rise due to the new policies of inclusion.

Table 4. Short dynthesis of gull SODA map.

Input	Process	Output
• Student reports that they have SEN • Student does not report that they have SEN • - SEN of student is already known	• NAPNE support student • Teacher makes necessary adjustments • - Teacher does not recognize student particularity	• Student systematically fails • Student drops out • - Student graduates

In short, the aspects inform that the institution is inclusive and has inclusion policies for students with SEN but meet the needs of each student implies an additional effort for which there is little or no support for the professor.

In the second step related with identifying and describe the related actors, the analysis of Rich Picture with the head teacher also provided clues about the potential stakeholders: general students, professors, student parents and administrative staff. Notwithstanding The initial wish has been to bring together all potential stakeholders in a workshop to continue with the framework stages but due to several factors such as deadline, calendar restrictions, refusal to participate and time conflicts it has been not possible to bring together all potential stakeholders so it has been necessary to select some. In the first time, three stakeholders have been selected by indication of head teacher. The selected stakeholders are core coordinators of special education who deal with the issue daily.

Although holding workshops with a large group of stakeholders has the potential to enrich the debate about the problematic situation under consideration, it is not unusual to apply PSMs with a small group of stakeholders without holding workshops due to existing constraints such as those contained in this study (Morton, Ackermann, & Belton, 2007). From this moment on, all the other steps have been carried out with the support of the three selected stakeholders.

Aiming to improve understanding A1-A9 aspects and the procedures to deal with SEN students, individual interview has been conducted with each one of selected stakeholders. The interviews questions have been developed with the help of the 10 categories of questions suggested by Keeney and shown in Table 1. Some questions are shown in the list below. Other questions have been asked during the interview according to the needs of the facilitator.

- What are the values and objectives of the school?
- Why is it important for the student to have a department at their disposal?
- Currently, what are the procedures regarding the SEN student?
- Even if hypothetical, what do you consider as the best environment for achieving the objectives?
- How is the relationship between the SEN core and the teacher? How and who may help the teachers?

The interviews have been conducted individually and lasted approximately 30 min each and have been useful to deepen the knowledge about the problematic situation and identify the values and objectives of the stakeholders. The interviews have been transcribed and validated with the stakeholders. During the validation some key aspects have been highlighted which facilitated the construction of individual SODA maps. The individuals SODA maps have been built by facilitator and validated with the stakeholders. Finally, the individuals SODA maps have been aggregated into one map which has been again validated with stakeholders who agreed that the ultimate SODA map generated, shown in Appendix A, represented the situation in a very detailed and comprehensive manner.

In brief, the interviews exposed values, objectives, and procedures related to the service offered to SEN students. A short synthesis of full SODA map reveals three crucial moments: the enrolment of student, the process of student in their course, and the outcome of student. Table 4 provides more details about these moments.

In short, the student enrols in the institution and their SEN is informed or not. During their term, the teachers and NAPNE members may satisfactorily support the student or not and as result the student fails, drops out, more desirably, graduates.

7.2. What do we want?

This stage consists in identifying and structuring mean and fundamental objectives to guide the transformations and help build the conceptual models. From the transcriptions of the interviews, some values have been identified: attention for all students, wish for an inclusive school and society, adapted environment, qualified staff, resources, etc.

Through new interaction with stakeholders, the values have been confirmed. Stakeholders have been requested to express the values in the form of a tangible/concrete goal using the verb + object format. This task resulted in a "cloud of objectives" without any structure and graphically represented in Figure 6.

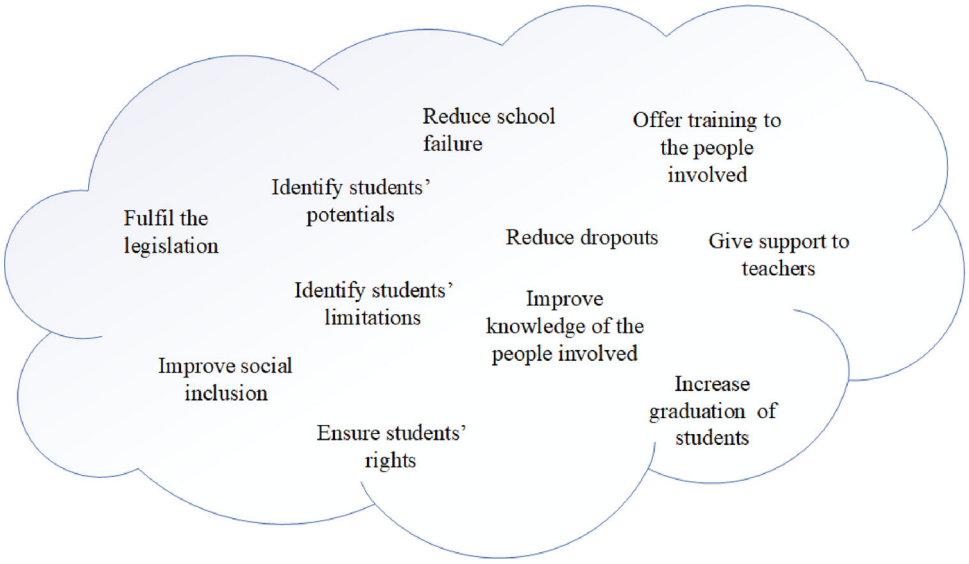

Figure 6. Cloud of unstructured value-based objectives.

Table 5. Hierarchy of objectives.

1. **Graduate innovative and responsible professionals**

Increase graduation of students
1. *Reduce school failure*
2. *Reduce dropouts*

Improve social inclusion
1. *Fulfil the legislation*
2. *Ensure students' rights*

2. **Induce social, local, and regional development**
3. **Ensure equity, ethical, quality entrepreneurship, and innovation**

Identify demands
1. *Identify students' potentials*
2. *Identify students' limitations*

Improve knowledge of the people involved
1. *Offer training to the people involved*
2. *Give support to teachers*

After identifying the objectives, the WITI test has been applied, for each identified objective in the Figure 6 the stakeholders have been questioned "Why Is This Important" the answers sometimes it pointed to other(s) objective(s) in the cloud, sometimes it generated a new objective(s). As a result of this task, the hierarchy of objectives has been obtained. The results are shown in Table 5.

The objectives: 1 – Graduate innovative and responsible professionals; 2 – Induce social, local, and regional development; and 3 – Ensure equity, ethical, quality entrepreneurship, and innovation are general objectives defined in institutional documents and there have been consensus among stakeholders that they should be classified as the fundamental objectives even though they have been generally quite intuitive. Just below these fundamental objectives are the five 'strategic option' objectives that have been labelled from one to five and listed here:

1. Increase graduation of students
2. Improve social inclusion
3. Compose infrastructure
4. Identify demands
5. Improve knowledge of the people involved

Through a similar procedure to the one adopted for the construction of the SODA map and using the WITI test, the objective hierarchy has been increased with more previous objectives that needed to be reached to perform the fundamental and 'strategic option' objectives. Figure 7 shows a fully interlinked network means-end objectives built with stakeholders.

The necessary transformations are those that help to reach the list of objectives immediately below the fundamental objectives. The other objectives will be used to help build each HAS of the selected transformations.

7.3. How to get from what we have to what we want?

Looking at the SODA map, the stakeholders noted almost 40 undesirable states that needed to be transformed into desirable states. When faced with the five objectives, they marked which objective the transformation would help reach. Of the 40 transformations, 28 have been unrelated to the fundamental objectives then only 12 transformations remained as presented in Table 6. The others would not help to reach any objective.

As we imagined, a little more than 20% of the transformations (6, 10, 15, 16, 17, 19, 20, and 21) help to reach 80% of transformations, four out of five (1, 2, 4, and 5). According to Table 5, three transformations (19, 20, and 21) help to reach two

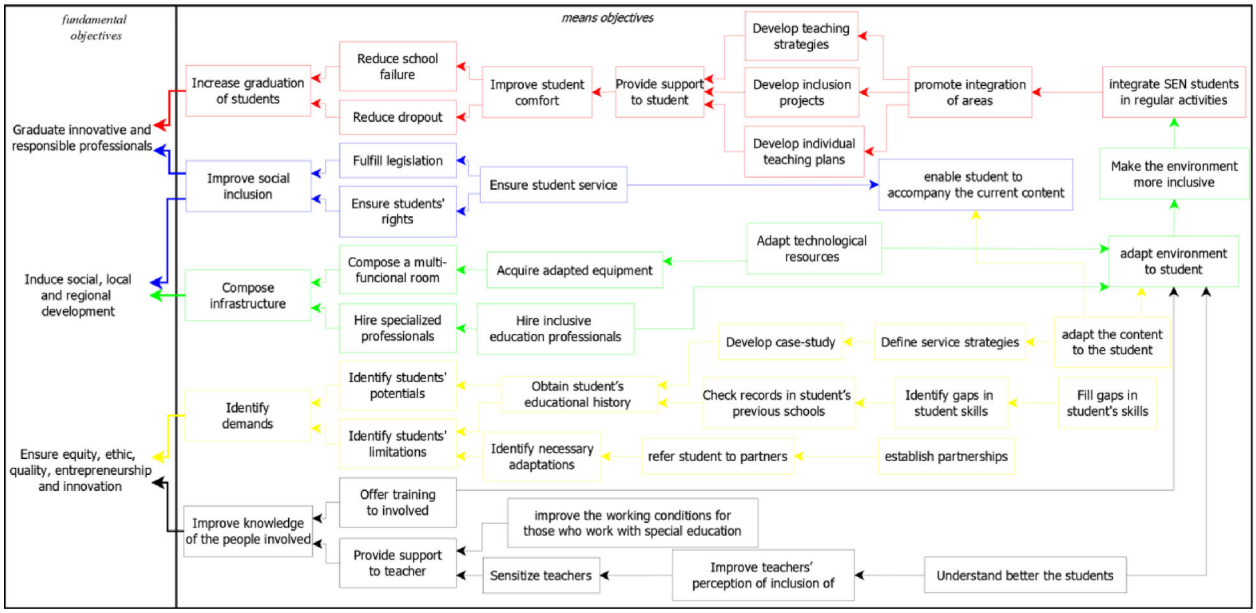

Figure 7. Case study VFT means-end network. Elaborated by the authors.

Table 6. Transformations aligned with the value-based objectives.

Id	Transformation	Construct	Objective
6	The teacher does not know aspects of inclusive education. The Regent teacher understands aspects of inclusive education	25	5
7	There is no multifunctional resource room for the specialized service … The Multifunctional resource room deployed in the institution	39	3
8	There are not enough adapted resources. Sufficient resources adapted	37	3
10	Current and future demands are uncertain. Current and future demands known	50	4
15	Pedagogical needs of the student are unknown. Pedagogical needs of the student are known	13	4
16	Clinical limitations of the student are unknown. Clinical limitations of the student are known	15	4
17	Lack of knowledge about the legislation. Extensive knowledge of the legislation.	46	5
19	Lack of empathy with inclusive education. People involved are more aware of the theme	51	2
20	Student systematically fails. Student advances the steps of the course.	28	1
21	Student has difficulty understanding content. Student overcomes difficulties and progresses.	21	1
22	There are no specialized services for students. Specialized services are available for students.	35, 49	3
23	There is no special education professional. Specialist professionals hired for special education.	36	3

out of five objectives (1 and 2). Therefore, we focused on three transformations. First, we needed to contextualize these transformations and we could do it with CATWOE and Root Definition. Tables 7, 8, and 9 show CATWOE embedded into Root Definition highlighted by each member letter that composed it.

Some activities are carried out to achieve each transformation, and in a new workshop with stakeholders, many other activities have been suggested. The activities from each transformation compose the individual HAS, and each transformation has one HAS with sequential activities that perform the transformation. The list of all needed activities is presented in Table 10.

Following Georgiou's (2006) guidelines, the individual HASs are built and merged into one called *Supersystem*. Figure 8 shows the supersystem. We highlight activities 19.1: identify students who demand specialized care; 21.1: support the student and the final activity is 20.7: service the student in the school environment. This means that the end of intervention expects to attend the SEN students as well the others. Finally, the last step is to place the control criteria. Based on Checkland (1999, 2000), Yolles (1999), and Georgiou (2006), it is essential to answer some questions related to the performance of the system in question: Efficacy, Efficiency, and Effectiveness.

Efficacy focuses on the processes and their output and checks if the means work. Efficiency is related to the use of resources if the resources are limited; and Effectiveness focuses on the strategy, if the transformation contributes to the attainment of the objectives and expectations. According to Georgiou (2006, p. 455), "Answers to the five criteria will be based on particular perspectives which do not arise independently of the wider environment". The author includes the criteria of Ethicality and Elegance, which we did not use in this study. Following the perspectives from the stakeholders,

Table 7. Root definition for Transformation T_{19}.

Transformation	Input	Output
T_{19}	Lack of empathy with inclusive education	People involved are more aware of the theme
Root Definition	A system that does the T: People involved are more aware of the theme, for C: general teachers, realized by A: NAPNE members', due to W: inform about the target audience and legal obligations, under command of O: general management and limited by E: an environment where there are pre-established cultural barriers.	

Table 8. Root definition for Transformation T_{20}.

Transformation	Input	Output
T_{20}	Student systematically fails	Student advances the steps of the course
Root Definition	A system that helps T: advances the steps of the course, for C: SEN's students, realized by A: teachers and NAPNE's members, due to W: Adjust the curricular activities to the student's specificities, under command of O: general management and limited by E: an environment with an inflexible curricular program.	

Table 9. Root definition for Transformation T_{21}.

Transformation	Input	Output
T_{21}	Student has difficulty understanding content	Student overcomes difficulties and progresses
Root Definition	A system that helps T: overcomes difficulties and progresses, for C: SEN students, realized by A: teachers and NAPNE's members, due to W: Adjust the teaching plan to the student's specificities, under command of O: pedagogical head teachers and limited by E: an environment without resource room and adapted materials	

Table 10. All activities raised to reach selected transformation.

Transformation	Label	Activity
T_{19}	19.1	Identify students that need specialized support
T_{19}	19.2	Identify teachers that do not know about SEN students
T_{19}	19.3	Disseminate legislation on rights of SEN students
T_{19}	19.4	Support teacher
T_{19}	19.5	Provide student assistance
T_{20}	20.1	Support student
T_{20}	20.2	Make teaching strategies
T_{20}	20.3	Make inclusion projects
T_{20}	20.4	Make individual education plan
T_{20}	20.5	Promote integration
T_{20}	20.6	Integrate SEN students in regular activities
T_{20}	20.7	Meet the student's needs
T_{21}	21.1	Provide student assistance
T_{21}	21.2	Adapt the content to the SEN student
T_{21}	21.3	Define strategies to support the SEN student
T_{21}	21.4	Realize case study
T_{21}	21.5	Make individual education plan
T_{21}	21.6	Identify and fill student's curricular gaps
T_{21}	21.7	Provide student assistance

the control criteria are defined as: Efficacy: Training that addresses the real needs of the students with SEN and their teachers; Efficiency: Selected teachers who serve as many students as possible with SEN; and Effectiveness: Adopted instruments used in the teaching practices. The inclusion of control criteria concludes the systemic plan illustrated in Figure 8.

Figure 8 shows a set of ordered activities that are necessary to help achieve two objectives: (1) Increase graduated students and (2) Improve social inclusion. Starting from two activities: 19.1 - Identify students that need specialized support and 21.1 - Provide student assistance, and performing the other subsequent activities, can reach the final activity: 20.7 - Meet the student's needs. The control criteria are in place to monitor and ensure that it meets the requirements for which the transformational plan has been designed. If any discrepancy exists between stipulated control criteria and results, some measures are needed to ensure that processing is completed according to the criteria. As this systemic plan is composed by interlinked HASs, it is called Supersystem because each HAS is a subsystem of overall decision. At the supersystem level, the plan may be seen as truly systemic due to the dependence among transformations explicit.

8. Discussion on the framework proposed and its application

The application of framework built under VFT, SODA and Re-SSM in the case study enable to get a better understanding about the ill-structured problem and, consequently, identify the relevant systems and sequences of activities leading to the action research, all guided by the stakeholders' value-based objectives. The particular configuration of SSM adopted in this study, called Re-SSM throughout the

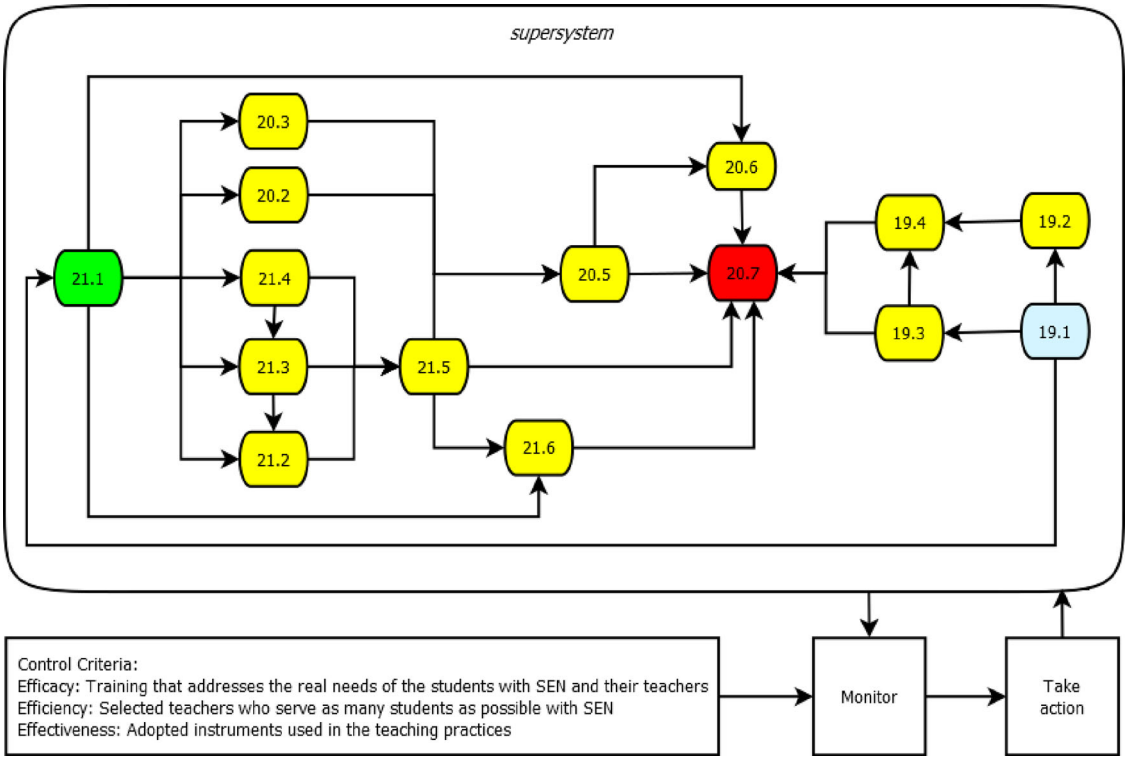

Figure 8. The supersystem constituted by the three selected transformations, T_{19}, T_{20}, and T_{21}.

sections, meets the Checkland's claim that the sequence of seven steps in original SSM formulation is only a rational way in which the methodology can be used (Checkland, 1993, p. 276).

In fact, Re-SSM includes the essential mechanisms of the original SSM formulation like as stating from drawing a rich picture, perform analysis 1,2,3, get CATWOE, HAS and supersystem with the control criteria in a very simple and didactic way. Just as original formulation of SSM, Re-SSM defines a course of action research that allows to lead in the direction to the changes judged relevant by stakeholders. The original formulation of SSM includes in its sixth stage the analysis of the both desirable and feasible changes. This analysis has no equivalent in the Re-SSM, the implication of avoid this analysis is get and planning unbridgeable changes (Checkland, 1993).

Beyond the analysis of desirable and feasible changes, the inclusion of VFT in the action research enable get the stakeholders' value-based objectives, some of these objectives could be hidden at the beginning of the intervention. Guiding an intervention by objectives based on stakeholders' values can result in consequences more aligned with stakeholders' expectations. Recent applications of SSM like Bernaola, et al. (2020), Khayame & Abdeljawad (2020), de Lima Medeiros, Terra & Passador (2020), Sharma, et al. (2019), Radfar, et al. (2014) and Hanafizadeh & Ghamkhari (2019) focus effort in a few transformations (or in a single transformation) but they do not provide details about any other transformations that may be discarded.

Focused in a few or a single one transformation is to waste opportunity to enrich planning achieve poor results. Considering objectives based on values in an action research has this potential to reveal hidden objectives and to enrich the situation with a greater volume of transformations that would not have been considered. Previous studies that combined VFT with SSM (Bernardo, Gaspar, & Antunes, 2018; Kamari et al., 2017; Neves et al., 2009; Teles & de Sousa, 2014) use SSM to generate a 'cloud' of objectives and VFT to structure it. The way VFT is adopted wastes its main characteristic: thinking about values.

In addition, our case study applies the combination Re-SSM + VFT to structure and define policies and practices for the inclusion of students with SEN. As mentioned previously, education for students with SEN in regular schools is an issue permeated with uncertainty and absent of clear facts and there is no grand theory that can answer the question 'How can we practice inclusively?' (Robinson, 2017, p. 175). Although the framework does not present a great general theory to answer the question elaborated by Robinson (2017), it provides a path to generate information, identify and structure changes needed within a specific context.

9. Conclusions, limitations and further research

In this paper, we proposed a multimethodological approach composed by Value Focused Thinking

(VFT) and Soft Systems Methodology (Re-SSM - Georgiou's revised SSM version) as way to get stakeholders' value-based objectives from VFT to guide a systemic planning with Re-SSM. Furthermore, linking Re-SSM' transformations with VFT fundamental objectives enable select the priority Re-SSM' transformations that help to reach stakeholders' value-based objectives. We argued that although SSM has been in practice since the 1970s and VFT since 1992, the combination of the two methods is unusual in the related literature and in the way it has been adopted in this study, using VFT to select priority transformations of SSM, has not been attempted before.

The paper reveals how VFT can be used within the systemic planning stage of the three-phased SSM version developed by Georgiou (2015) to prioritize and identify the most relevant transformations for the problematic situation, help design their Human Activity Systems (HAS) and bring improvement of a situation considered problematic. We illustrate the application with a real-world case study concerning the planning process at a special educational needs school in Brazil. In planning this process, a number of transformations has been identified to improve the problematic situation under consideration, but with the aid of the framework, we have been able to prioritize those which have been related to the stakeholders' true objectives. Because the VFT approach extracts the values that actually drive the stakeholders' actions, the framework warrants the selection of transformations and stakeholders are able to plan its implementation of improvements in the planning process.

VFT is generally used as an initial step to MCDA/MAVT problems. In this study, VFT has been used together with Re-SSM to guide strategic thinking in order to identify value-based objectives to select priorities transformations and help to reach it. As stated in the introduction, the main contribution is including VFT as an additional stage on Re-SSM based intervention. This combination resulted in an enhanced multimethodological approach that can improve, become more efficient and facilitate the systemic planning of solving problematic situations. The results suggest that the inclusion of VFT in a Re-SSM (revised SSM) based intervention can address a limitation of last one relates number of transformations uncovered.

In our case study, from 40 transformations that have been raised to improve the problematic situation under consideration, only 12 really are related to true objectives, in others words, with what stakeholders really want. Evidently plan and perform 12 transformations which in fact meet the objectives is more effective and requires less effort than planning and performing all 40 transformations of which 28 do not meet any objective. The task of planning and implement all transformations could be very hard and discouraging. Since the VFT extracts the values that actually govern the stakeholders' actions or that they really want, then some transformations have been selected and planned, its implementation enable identify and commit partial improvements rather than a global solution.

Although the study requires further observations to verify whether the results will actually contribute to the inclusion process, some partial improvements can already be mentioned. First, the application of the approach has generated a greater understanding of the issue by those involved. Secondly, the super-system, emerges as a protocol that assists those involved in how to proceed with the admission of a student with SEN to the institution, something that did not exist before. Finally, the application deconstructed the understanding of those involved of the need for sophisticated material resources and specialized professionals are indispensable for the care of students with SEN.

This study has one important limitation. While interventions based on OR model are developed through workshops involving a considerable set of actors, this study has been limited to individual interactions with 3 relevant actors. Deadlines, organisational and logistical aspects prevented workshops involving a larger number of actors from being held. This limitation of the study has been circumvented by the choice of the most relevant stakeholders; however, it is possible that different and more detailed results are obtained in a second application of the approach considering a larger group of stakeholders.

The limitation mentioned is not impossible to address, so the first suggestion as a further study is to consider applying the approach with a group of stakeholders in collective workshops. Another suggestion for further studies is to consider other control criteria such as Ethics and Elegance. Such criteria are associated with the SSM literature, however, VFT also has guidelines to define criteria to evaluate the achievement of objectives. The VFT criteria help to some extent in classifying the objectives into importance. Exploring the integration of the VFT criteria with those of the Re-SSM can facilitate the task of relating transformations to the objectives as well as selecting the most priority transformations to be planned and implemented. Another direction for further study is related to the original form of SSM in seven stages, in this form we argue that the VFT could be useful in stage 6 when the facilitator should analyse if the changes are both desirable and feasible.

We have based our multi-methodological intervention using two PSM approaches: (i) soft Systems methodology (SSM in its three-phased revised version by Georgiou which we call re-SSM in this paper) and (ii) Value-Focused Thinking (VFT). We are aware that the recursive nature of the planning process it might be useful to further research to include techniques such as systems dynamics, to link with soft OR methods used in planning (Torres, et al, 2017).

Finally, we hope that studies like the one presented in this document and as suggested for future research can be repeated and thus contribute to transform the society from its current non-inclusive state to a more inclusive, humane and welcoming state for all.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Note

1. Georgiou's three phases (Georgiou, 2015) revised version of Checkland's SSM is called Re-SSM throughout this paper.

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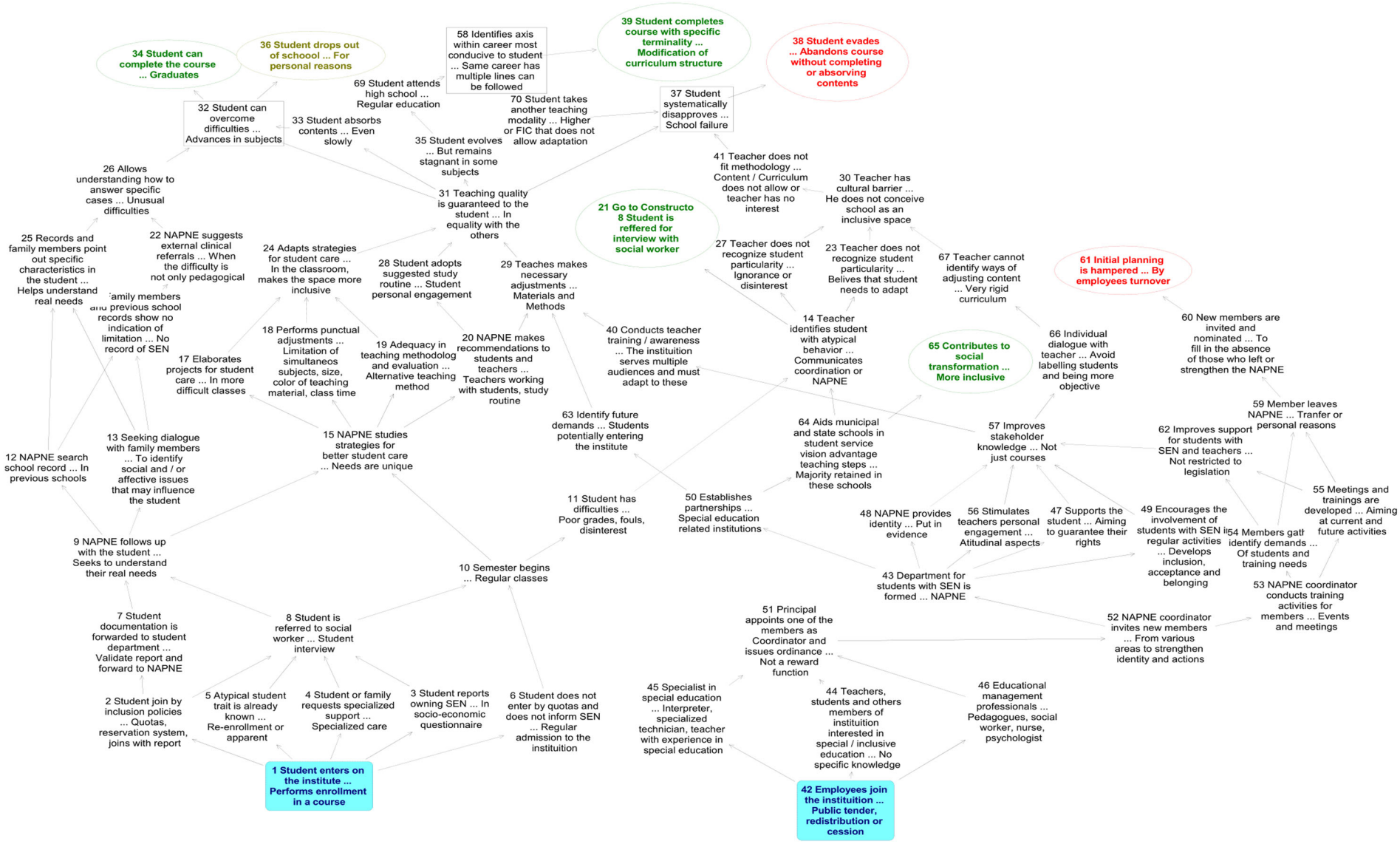
Appendix A.

Full SODA map


1 Student enters on the institute ... Performs enrollment in a course
2 Student join by inclusion policies ... Quotas, reservation system, joins with report
3 Student reports owning SEN ... In socio-economic questionnaire
4 Student or family requests specialized support ... Specialized care
5 Atypical student trait is already known ... Re-enrollment or apparent
6 Student does not enter by quotas and does not inform SEN ... Regular admission to the instituition
7 Student documentation is forwarded to student department ... Validate report and forward to NAPNE
8 Student is referred to social worker ... Student interview
9 NAPNE follows up with the student ... Seeks to understand their real needs
10 Semester begins ... Regular classes
11 Student has difficulties ... Poor grades, fouls, disinterest
12 NAPNE search school record ... In previous schools
13 Seeking dialogue with family members ... To identify social and / or affective issues that may influence the student
15 NAPNE studies strategies for better student care ... Needs are unique
17 Elaborates projects for student care ... In more difficult classes
18 Performs punctual adjustments ... Limitation of simultaneos subjects, size, color of teaching material, class time
19 Adequacy in teaching methodolog and evaluation ... Alternative teaching method
20 NAPNE makes recommendations to students and teachers ... Teachers working with students, study routine
22 NAPNE suggests external clinical referrals ... When the difficulty is not only pedagogical
24 Adapts strategies for student care ... In the classroom, makes the space more inclusive
25 Records and family members point out specific characteristics in the student ... Helps understand real needs
26 Allows understanding how to answer specific cases ... Unusual difficulties
28 Student adopts suggested study routine ... Student personal engagement
29 Teaches makes necessary adjustments ... Materials and Methods
31 Teaching quality is guaranteed to the student ... In equality with the others
32 Student can overcome difficulties ... Advances in subjects
33 Student absorbs contents ... Even slowly
34 Student can complete the course ... Graduates
35 Student evolves ... But remains stagnant in some subjects
36 Student drops out of schoool ... For personal reasons
37 Student systematically disapproves ... School failure
38 Student evades ... Abandons course without completing or absorving contents
39 Student completes course with specific terminality ... Modification of curriculum structure
40 Conducts teacher training / awareness ... The instituition serves multiple audiences and must adapt to these
41 Teacher does not fit methodology ... Content / Curriculum does not allow or teacher has no interest
42 Employees join the instituition ... Public tender, redistribution or cession
43 Department for students with SEN is formed ... NAPNE
44 Teachers, students and others members of instituition interested in special / inclusive education ... No specific knowledge
45 Specialist in special education ... Interpreter, specialized technician, teacher with experience in special education
46 Educational management professionals ... Pedagogues, social worker, nurse, psychologist
47 Supports the student ... Aiming to guarantee their rights
48 NAPNE provides identity ... Put in evidence
49 Encourages the involvement of students with SEN in regular activities ... Develops inclusion, acceptance and belonging
50 Establishes partnerships ... Special education related institutions
51 Principal appoints one of the members as Coordinator and issues ordinance ... Not a reward function
52 NAPNE coordinator invites new members ... From various areas to strengthen identity and actions
53 NAPNE coordinator conducts training activities for members ... Events and meetings
54 Members gath identify demands ... Of students and training needs
55 Meetings and trainings are developed ... Aiming at current and future activities
56 Stimulates teachers personal engagement ... Atitudinal aspects
57 Improves stakeholder knowledge ... Not just courses
58 Identifies axis within career most conducive to student ... Same career has multiple lines can be followed
59 Member leaves NAPNE ... Tranfer or personal reasons
60 New members are invited and nominated ... To fill in the absence of those who left or strengthen the NAPNE
61 Initial planning is hampered ... By employees turnover
62 Improves support for students with SEN and teachers ... Not restricted to legislation
63 Identify future demands ... Students potentially entering the institute
64 Aids municipal and state schools in student service vision advantage teaching steps ... Majority retained in these schools
65 Contributes to social transformation ... More inclusive
66 Individual dialogue with teacher ... Avoid labelling students and being more objective
67 Teacher cannot identify ways of adjusting content ... Very rigid curriculum
69 Student attends high school ... Regular education
70 Student takes another teaching modality ... Higher or FIC that does not allow adaptation
14 Teacher identifies student with atypical behavior ... Communicates coordination or NAPNE
21 Go to Constructo 8 Student is reffered for interview with social worker
23 Teacher does not recognize student particularity ... Belives that student needs to adapt
27 Teacher does not recognize student particularity ... Ignorance or disinterest
30 Teacher has cultural barrier ... He does not conceive school as an inclusive space