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## THE RELATIONSHIP BETWEEN SCHOOL ARCHITECTURE AND SELF-EFFICACY OF STUDENTS WITH SPECIAL NEEDS IN SOME SCHOOLS IN LEBANON - THE RECIPROCAL ARCHITECTURAL DESIGN METHOD

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# THE RELATIONSHIP BETWEEN SCHOOL ARCHITECTURE AND SELF-EFFICACY OF STUDENTS WITH SPECIAL NEEDS IN SOME SCHOOLS IN LEBANON - THE RECIPROCAL ARCHITECTURAL DESIGN METHOD

## Abstract

This study sought to develop a new architectural design methodology for educational facilities. The design factors of inclusive schools built environment affect the self-efficacy of students with special needs. Self-efficacy being defined by Albert Bandura as one's belief in one's ability to succeed completing specific tasks in a certain environmental action. This research is conducted by following the sequential explanatory research design, surveyed by a mixed method. Participants were a group of 35 special education teachers and 25 students with special needs, conveniently selected from some schools in Lebanon. The two questionnaires and the individual interviews administered by the researcher formed the outcome of the study. Findings ascertain the importance of suitable school architecture, for the sake of increasing the self-efficacy of students with special needs in order to enhance special education standards in Lebanese schools. The Reciprocal Method is a new deterministic design framework in architecture that seeks for innovative design in educational facilities in direction of universal standards.

## Keywords

Architecture, Self-efficacy, Inclusive School, Architectural Universal Design Standards, Architecture Design Methodology, Special Education, Human-Centered Design

## 1. INTRODUCTION

Inclusive Education embraces learning environment that respects human diversity. Education must be lined with all students' needs and abilities, in order to increase their self-dependency to contribute with communities, cooperate with other people and extend in learning through their lives. Beyond the need of learning, architectural design spaces play an inspirational role in education. Recent studies give prominence to school's built environment and how it affects education negatively or positively (Jankowska, 2007).

Inclusion researchers determine special education as a process, not only accessible spaces, service or setting, which starts by removing barriers. Furthermore, special education must be collaborated with the psychological needs of students for better academic achievement. Therefore, self-efficacy is the driving force, which leads students toward their own learning conditions (Jinks, 1999).

### 1.1 School Architecture

Placing Architecture in the proper context, is considering spatial design as system recognized by the basic elements of form and space, and manipulate in building design. Spatial system in built environment is an integration of program elements and shapes in a three-dimensional form accommodates multiple functions (Ching, 1966).

Inclusive design approach in architecture ensure that the space can be accessed, understood and used by all occupants equally. Inclusive design or universal design is not an option to adopt in schools, it is mandatory in all educational facilities. Disability Act 2005 is a law that says, "Government departments and public bodies must work to improve the quality of life for people with disabilities" (Disability Discrimination Act 2005, 1996). Students with diverse abilities should be able to use school spaces comfortably and safely, as far as possible without special assistance. They should be able to find their way easily, understand how to use educational facilities independently. It is important to ascertain the needs of the range of students as early as possible, in order to check the practicality and usability of emerging designs with a diverse user board (McKevitt, 2012).

### 1.2 Students with Special Needs

Education is realized as a human right not a privilege and must be given equally to all children (the Universal Declaration of Human Rights, 1948). Therefore, students with diverse abilities are welcome to join the classroom. Diverse abilities of children may fall in at least one of the following capabilities according to (SEN Code of Practice 2001, 2015): Cognitive and learning, Behavior, emotional and social development, Communication and interaction, Sensory and/or physical needs and Health and personal care needs.

## 2. RESEARCH CONTEXT

### 2.1. Research Problem

Architecture inadvertently creates complications for human behavioral cognition and emotions, when ill designed and badly retrofitted. Lack of awareness regarding the relationship between people and their environment, exemplifies in school facilities and bring in inconvenient learning spaces for students with special needs. Successful educational spaces are designed with wide-ranging on environmental behavioral and neurology principles (Szczybinski, 2020). Students spend most of their school time in the classroom, ill-fitted classroom furniture bring discomfort for students in addition to lack of accessibility, pleasant design and convenient context.

Worldwide studies concerning the special needs educational spaces explicate that design of classroom are classified into integrated, segregated and inclusive. Those studies maintain that inclusive spaces may not encompass all kinds of children disabilities.

### 2.2. Purpose of the study

School building facilities profoundly inspire learners when the design incorporates all functions, needs and aesthetics. Recent studies reveal the unexpected importance of learning spaces' symbolic features, such as furniture, arrangements, accessibilities and wall décor in influencing students' learning and achievement (Cheryan, 2014). Symbols, colors and shapes enlighten learners that they are valued and belong within their classrooms. Furthermore, adding some structural features and specific design considerations, learning spaces will

become accessible to learners who have special needs. The purpose of this study is to inspect “The Relationship between School Architecture and the Self-Efficacy of Students with Special Needs in Some Schools in Lebanon”.

### 2.3. Research questions

This study attempts to answer the following questions:

1. Is schools’ architecture suitable for students with special needs in Lebanon?
2. Is there any significant relationship between school’s architecture and the efficacy of students with special needs?

### 2.4. Theoretical Framework

#### 2.4.1. Human-Centered Theory (Cooley, M. 1987)

Human-centered theory is an approach to problem solving, generally in design process as well as framework of managements. It is a developed solution conferring to human perspective. Problem-solving process is observed within a context by brainstorming and conceptualizing to implement the solution. This approach augments effectiveness and efficiency, and bring satisfaction to users of space as well as accessibility and sustainability (Cooley, 1989). Rationale behind adopting the Human-Centered Theory in school architecture is to meet the high demands of real-world implementation. Learners are the heart of design process. The instigation of forming guidelines in learning spaces design is human needs. A debate was noticed when studying the classroom design whereas; students with special needs are deliberated. Human-Centered Designers are inspired by people’s behaviors to approach innovative solutions for authentic space creation tailored with human needs (Matta, 2017) (*figure 1*).

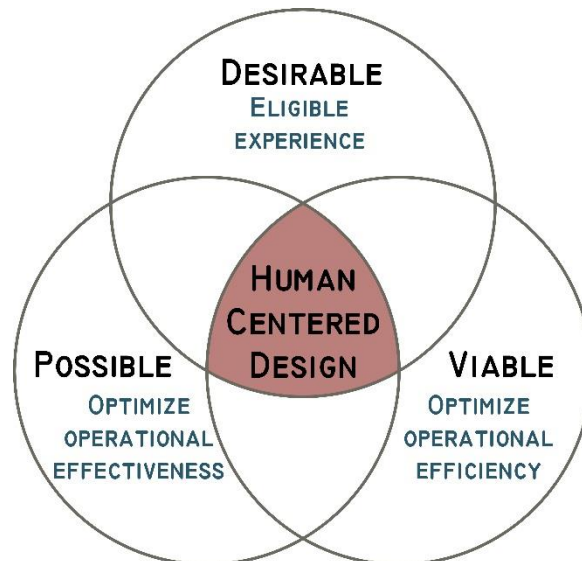


Fig. 1: Human-Centered Design

#### 2.4.2. Needs Theory (Maslow, A. 1943)

Maslow's hierarchy of needs is a motivational theory in psychology encompassing model of human needs, designated as five hierarchical levels within a pyramid (*figure 2*). Hierarchy of needs theory made major influence in teaching and classroom management in schools. Maslow adopts a holistic approach to education and learning. He looks at the complete physical, emotional, social, and intellectual abilities of students and how they affects their learning journey. Maslow suggests that students must feel valued and respected in the classroom, and the instructor should create supportive environment. Students will progress academically at an optimum rate when their self-esteem is reinforced (Maslow, 1954).

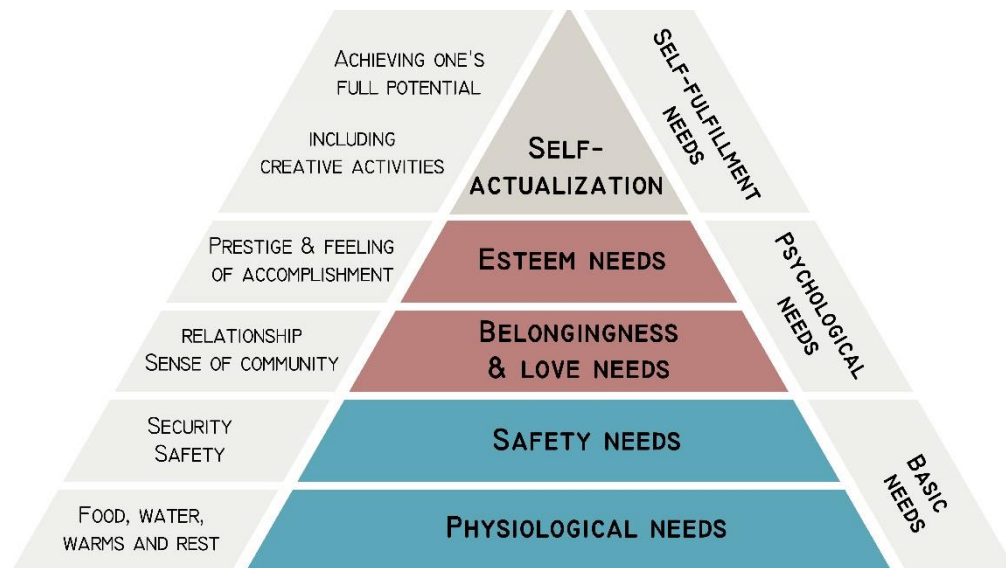


Fig.2: Hierarchy of needs (Maslow, A. 1943)

#### 2.4.3. Architectural Determinism Theory (Broady, M. 1966)

Early studies face some difficulties to prove the actuality of psychological effect of architecture. Nevertheless, some architects rise when they open the box to environmental psychology in architecture. Maurice Broady British Planner added new term for the architectural lexicon “the Architectural Determinism” also referred as Environmental Determinism. This term is adopted in urban planning, sociology and environmental psychology, which privilege the built environment as the shaper of social behavior. Architectural determinism indicates that people have the ability to adapt to any arrangement of space. Therefore, their behavior may be caused entirely by the environment’s characteristics (Golembiewski, 2014).

#### 2.4.4. Self-Efficacy Theory (Bandura, A. 1977)

Self-efficacy is a belief in one’s mental, motivational, emotional, and behavioral resources to situate required effort to perform a certain task and demand (Bandura, Self efficacy Changing Societies, 1995). Self-efficacy is regularly developed according to the person’s interaction with environment; therefore, the social structure’s effect on him should not be taken lightly (Gecas, 1989). Self-efficacy covers the sense of control and beliefs about causality, developed by interactions between and environment. Specifically, it is the environment’s responsiveness to the child’s actions that is critical in the development of sense of self and conception of one’s world (Gecas, 1989). Self-efficacy is the belief in our self-abilities, specifically the ability to meet the challenges ahead and complete a task successfully (Akhtar, 2008).

People’s lives are affected by environment yet; their behavior are not always a result of an environmental actions. Temperaments, intelligence, and other attributes explain human behavior. Self-efficacy when viewed from socio-cognitive perspective lights up on the agent causality that raises the fundamental issues of determinism and the freedom to exert some control over one’s life. Determinism is a term used to signify that some actions are a sequence of cause of doctrinal senses which, self-determining the. Behavior is codetermined by many factors within a reciprocally deterministic system (Bandura, Self-Efficay The Exercice of Control, 1997) (*figure 4*).

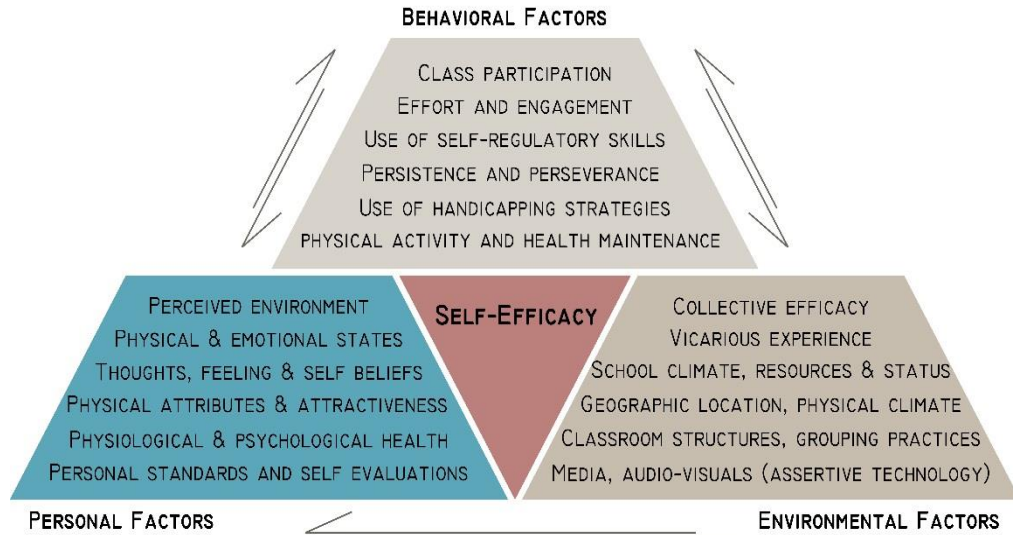


Fig.4: Education factors within Bandura's model of Triadic Reciprocal Determinism (Bandura, A 1986)

### 2.5. Conceptual Framework

Instigation of design in architecture coordinate art, science, engineering, style, form and functions. School architecture functionality for inclusive learning environment is followed up by adaptable design standards to human needs. Architecture is what obligates this study to follow an exceptional conceptual framework (figure 5).

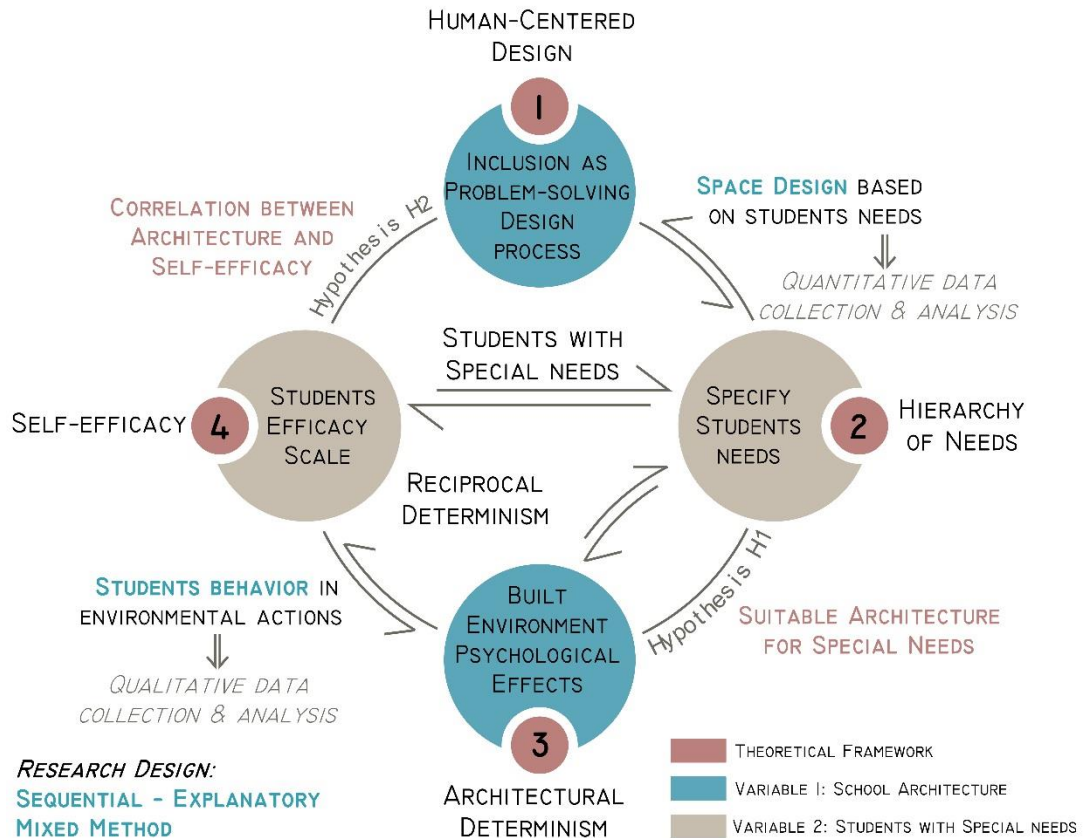


Fig.5: Conceptual Framework (Author, 2021)

## 2.6. Overview of School Architecture

### 2.6.1. Theory of Architectural Design

The practice of architecture in education buildings involves the integration of explicit and methodical connections between the formal attributes of an artifact and its social constraints, as well as its structural performance. Moreover, form-making design is concerned with cognitive processes and subjective decision-making related to the production of form. Therefore, school architecture is rational systematic analysis within a subjective interpretation. A synthesis of design logics or multi-logics occurs at the limits between rational and non-rational methods, and constitutes a highly productive ground for design investigations. Theory of Design maintains reasons that can explicate, direct or prove design intentions, such as the shape transformation in any architectural design. Besides, theory of design correlates more investigations and systems of problem solving in design than to the verbalization of other design decisions. Therefore, it helps in changing concepts of design or reorder design phases in order to address more creativity (Elsamry, 2014) (*figure 6*).

ORDERS OF DESIGNED SPACES	PHYSICAL	FORM AND SPACE SOLIDS AND VOIDS INTERIOR AND EXTERIOR	<ul style="list-style-type: none"> <li>• SYSTEMS AND ORGANIZATIONS OF SPACE</li> <li>• STRUCTURE</li> <li>• ENCLOSURE</li> <li>• MACHINES</li> </ul>
	PERCEPTUAL	SENSORY PERCEPTION AND RECOGNITION OF THE PHYSICAL ELEMENTS BY EXPERIENCING THEM SEQUENTIALLY IN TIME.	<ul style="list-style-type: none"> <li>• APPROACH AND DEPARTURE</li> <li>• ENTRY AND EGRESS</li> <li>• MOVEMENT THROUGH THE ORDER OF SPACES</li> <li>• FUNCTIONING OF AND ACTIVITIES WITHIN SPACES</li> <li>• QUALITIES OF LIGHT, COLOR, TEXTURE, VIEW, AND SOUND</li> </ul>
	CONCEPTUAL	COMPREHENSION OF THE ORDERED OR DISORDERED RELATIONSHIPS AMONG A BUILDINGS ELEMENTS AND SYSTEMS, AND RESPONDING TO THE MEANINGS THEY EVOKE.	<ul style="list-style-type: none"> <li>• IMAGES</li> <li>• PATTERNS</li> <li>• SIGNS</li> <li>• SYMBOLS</li> </ul>

Fig.6: Orders of Designed Spaces (Ching, 1966).

### 2.6.2. The Psycho-Spatial Architecture

Psychology as science and philosophy has many sections. Behaviorism or Freudian psychodynamics are psychological sciences that link human action to his environment. Behaviorists focus on behavior-environment relations and analyses overt and covert. The psychology of architectural design presents theoretical aspects of formalizing the design process. The new schools of architecture introduced this subject in different forms extending from aspects of design to course in architectural psychology or as a part of history and theory. Relating psychology to architecture is important to differentiate between the feeling of *space* and *place*. The perception of color and light, functions and aesthetics is linked to human needs. To wind up, environmental psychology discusses the impact of the built environments on human behavior (Sanlingaros, 2006).

Architecture develops a systemic perspective to visualize the reality of physical conditions in which physio-chemical, biological and social environments are conceived. The systemic perspective of architecture makes a paradigm shift from 'space' to 'place'. As space is an abstract concept, the place is a system (Rollino, 2014). Humans inscribe their activities in designed spaces and develop a mental representation of the surrounding environment. The mental capacities enable spatial cognition that is linked to behavior to demonstrate adaptation to the environment. Therefore, users through frequent uses of the space recognize a place. A place personifies the experiences and aspirations of people. Place must not be seen as the border frame of space but a reality to be observed through people's own perspective (Tuan, 1979). The Psycho-spatial Architecture is manipulating space to light, texture, and proportion of shapes through materials to fulfill psychological needs of users. The framework of spatial psychology theory in architecture might be seen in orders, chaos, symmetry or asymmetry of integrated spaces (Ledford, 2014).

### 2.6.3. School Architecture and Environmental Psychology

Designing an inclusive classroom requires a critical viewpoint, to recognize the hidden values and underlay the assumption of educational environment. Student's behavioral scenario in classroom are planned within the arrangement of space. The design of the classroom includes strategy to welcome students to be oriented to an inclusive environment along with students with special needs. Students will practice the mindfulness with physical arrangement of classroom, while mindfulness or conscious awareness is associated with psychological, cognitive and physical needs to communicate to their students with special needs (Grier-Reed, 2018). As common spaces tactile, graphic and audible signage are recommended in classroom regardless of student's sensory abilities, in order to make instructions clear. Therefore, nonessential physical effort is minimized. In addition, reducing visual distraction and complexity, and replace them with visual cues such as symbols and bold text to indicate important information.

### 2.6.4. Inclusive and Integrated Classrooms: The Architectural Solutions

Voegeli, A. suggested that Human-Centered Architecture is not a trend, style or design methodology, it is a solution-based approach to optimize the correlation between building and people to meet all needs. Human-Centered Architecture has made difference in schools since, conceptual design of spaces are built on ethnography, sociology and cognitive psychology. Therefore, space designs are results of holistic understanding of their intended users (Voegeli, 2020).

Another study conducted in Germany by Sheer, 2015 who stated that school system could be called "inclusive" if every child or adolescent has the same chance to take part in high quality educational settings. While the term "inclusion" is very global, the public discussion in Germany mainly concentrated on the "inclusion" of learners with special needs into the regular school system. Conventionally the term "integration" was used to describe co-education of children with and without special needs (Feuser, 1989). The terminologies "integration" and inclusion" are different since children with special needs when they are integrated into a classroom with other children they have partial opportunities. Moreover, classroom settings must be rectified according to specific needs. Inclusion comes with equal opportunities; therefore, the physical environment is designed to fit all children equally.

### 2.6.5. Classroom Design Based on Students' Needs, in the direction of "Universal Design"

For the sake of creating school architecture, that gathers all children. The concept of a universal design for all learners was held in the early 1990s, drew upon neuroscience and education research. Also, it supports the flexibility of digital technology to design learning environments for diverse learner needs. Inclusive Design is then, altered to Universal Design.

The role of architecture in the identification of obstacles and spatial solutions to inclusive education, was purposeful in the study of (Malik, 2018). In order to rehabilitate schools to become inclusive, existed building design of schools is major barrier among challenges. The researchers suggest that inclusive schools demand inclusive architecture while lighting up on "Universal Design". Interior and exterior design should be reflecting human needs in collaboration with human senses. Therefore, universal design in architecture when implemented in school facilities, bring benefit to inclusive learning environment. Well-planned learning spaces has obviously defined boundaries designating where different sorts of activities are. Effective learning spaces must have easy remodeled furniture and arrangement in order to get the proper area that reflects the function needed. Students must have their own desk where they feel safe and able to engage from their place. Suitable learning environment is realized when bonding architecture with education according to learners' needs referring to Maslow's hierarchy of needs. Therefore, it will be possible to create a symbiotic relation with learners and environment for a view to educational environment that influence the body, mind and spirit (*figure 7*).



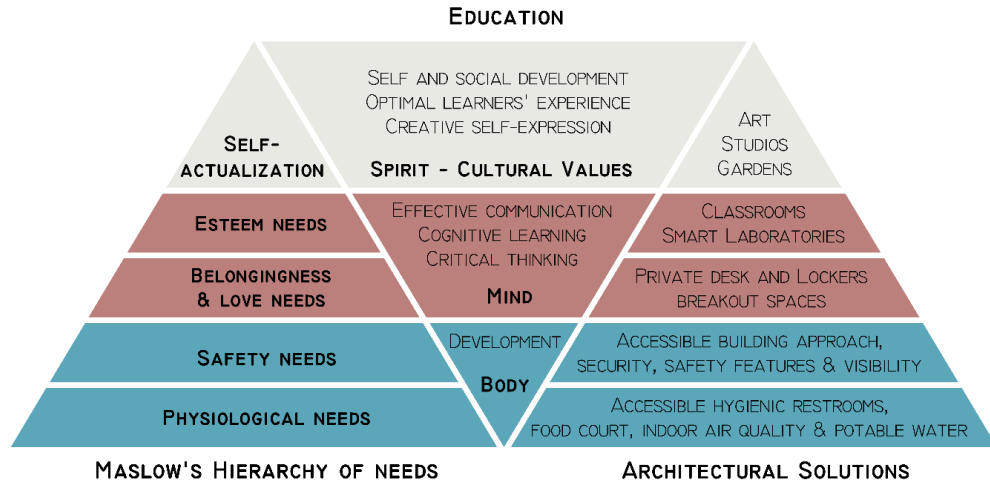


Fig.7: Architectural solution based on Hierarchy of needs (Author, 2021)

Built environment affects human behavior; architects have moral responsibility to the future culture to design spaces that positively influence the quality of relationships between spaces' users and their social and physical environments (Lawrence, 2005). Human behavior should be verified in any spatial design process. Since human behavior is a definable unit of activity instigated by certain inputs and which generates certain outputs as a result of its activity. It is also considered the primary focus of much of field of environmental psychology. Considerate the way in which environment effect people could enable the design of spaces, which has the ability to influence people's behavior and interaction with different space attributes (figure 8).

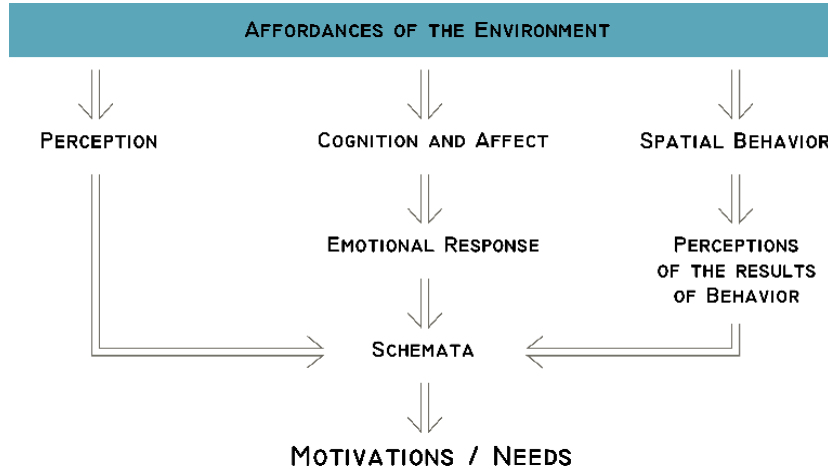


Fig.8: The Fundamental Processes of Human Behavior (Lang, 1987)

### 3. RESEARCH METHODOLOGY

#### 3.1. Research Design

Methodology refers to the overarching strategy and rationale of the research. Based on the conceptual framework, this research is conducted by developing a mixed method design. This chapter will explain the research design approach planned to answer the research questions and check the consistency of hypotheses. In the meantime, a good strategy in collecting quantitative data where instruments are two questionnaires and qualitative data powered by individual interviews. Instruments will tolerate good conditions to provide outcomes that are more effective. This chapter will wrap as well the procedure of data collection of quantitative and qualitative phases while specifying the participants, sampling and instruments structure in which, items are coordinated to theoretical factors. Then

manifesting validity and reliability of instrument and alignments of instruments to research questions.

For a better understanding of the research problem, mixed methods research produces results that assesses the frequency and magnitude of trends, and provide useful information from different perspectives. When combining quantitative and qualitative data, “we have a very powerful mix” (Miles & Huberman, 1994). Mixed methods can be approached by different designs. An Explanatory Sequential, is a two phase model in collecting data, prioritizing the quantitative data at the first phase that represents a major aspect of data collection. A second phase when collecting the qualitative, finally the interpretation. The follow-up between the two phases clears up the figure to look for extreme cases from quantitative outcomes to follow up in qualitative phase. The reason, which gives greater insights into the important predictors of cases when interpreting the qualitative data (Creswell, 2012).

### 3.2. Mixed Method data collection and Instruments Structure

The first questionnaire [Q1] addresses 35 teachers. It is formed to inspect if the school architecture is suitable for students with special needs. The second questionnaire [Q2] addresses 25 students with special needs is formed to examine the correlation between the suitable school architecture, and the self-efficacy of students with special needs. The research approach strategy of data collection for qualitative data are powered by interviewing six teachers of the same group of teachers who participate with filling the questionnaires. The interviews were powered by open-end questions. Such types of questions allow unlimited response that will deliver new and sometimes unexpected insights. Moreover, it gives more details reflecting participants self-experience and allow express more of sentiments and opinions. Instruments structure are build according to theoretical framework (figure 9).

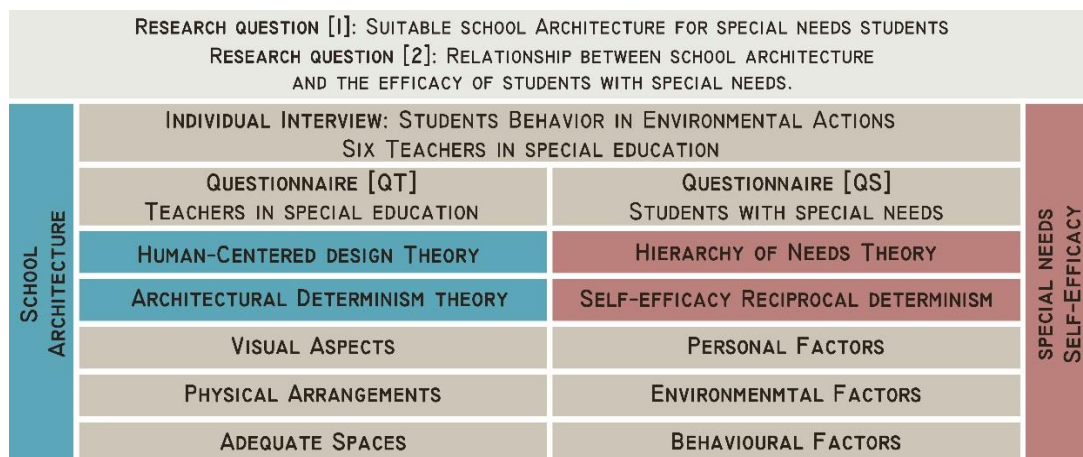


Fig. 9: Instruments Structure according to theoretical framework (Author, 2021)

### 3.3. Procedure

Quantitative Data collected are computed using SPSS (Statistical Package for Social Science) version 20 for analyzing the data using descriptive and inferential analysis. Describing the collected data referring to sampling of populations. Statistical inference is the process of using data analysis to infer material of an underlying distribution of probability. Inferential statistical analysis infers properties of variables. Alpha value has to be greater than 0.8 in order to have good support of reliability in the questionnaire. Later on, the qualitative data are descriptively analyzed after transcribing the recorded individual interviews (figure 10).

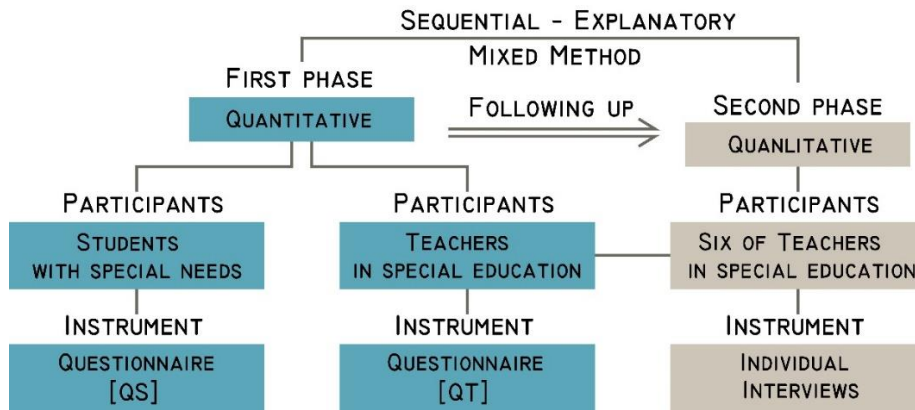


Fig.10: Procedure of Data Collection (Author 2022)

#### 4. RESULTS AND DISCUSSIONS

Correlation between school architecture and the efficacy of students with special needs was the intention of conducting this study. In this chapter, the data collection follow-on process is started by ordering, categorizing, manipulating and summarizing of questionnaires. Interviews results are categorized and interpreted as well. Results are presented using infographics.

The Interpretation of qualitative data results are collected through the individual interviews. Results are categorized in an indexing way in order to establish a framework of thematic ideas and opinion about stated problem. Coding is how defining what are the data that require analysis (Gibbs, 2007). Coding is not just labeling answers; it is also linking of data to the research problem and quantitative data.

The data collected in the qualitative phase of the research is categorized according three factors connected to theoretical framework. Each factor has two questions; the first question is compiled to three main types of spaces in the school. Whereas, in the second question of each studied factor is linked to specific design feature of school spaces. Data reflects each participant’s ideas, opinion and suggestions.

##### 4.1. Quantitative Results

The following tables [1] and [2] are answers of questionnaire [QS] and [QT]. Recorded answers in Likert scale show the agreement level and consecutively rated from 1 to 5, strongly disagree to strongly agree. Neutral is considered a confirmation of not positive or negative reaction. It is also an easy out for respondents who are less motivated to express their opinion, but theoretically, means a considerable proportion who favor or oppose a subject are not counted. According to this numerical rate for the agreement level, the rate 3 is the average. Likert scale for agreement is corresponded to numerical values from one to five as the following table (figure 11).

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1	2	3	4	5

Fig.11: Likert scale

**Table 1: Questionnaire [QT] & [QS] results for answering the first research question (Author 2022)**

RESEARCH QUESTION [1]: SUITABLE SCHOOL ARCHITECTURE FOR SPECIAL NEEDS STUDENTS				
SCHOOL ARCHITECTURE	QUESTIONNAIRE [QT] TEACHERS IN SPECIAL EDUCATION	RESULTS MEAN	QUESTIONNAIRE [QS] STUDENTS WITH SPECIAL NEEDS	RESULTS MEAN
	HUMAN-CENTERED DESIGN THEORY		HIERARCHY OF NEEDS THEORY	
ADEQUATE SPACES	[Q1.1] THE SCHOOL IN GENERAL ARE PHYSICALLY ARRANGED TO WELCOME STUDENTS WITH SPECIAL NEEDS.	3.37	[Q2.1] DO YOU HAVE ENOUGH DESK SPACE IN YOUR CLASSROOM?	4.36
	[Q1.2] STUDENTS WITH SIGNIFICANT DISABILITIES HAVE ACCESS TO THE FULL RANGE OF EDUCATIONAL FACILITIES OFFERED TO STUDENTS WITHOUT DISABILITIES.	3.71	[Q2.2] WELL-ARRANGED FURNITURE ACCORDING TO YOUR NEED WILL HELP YOU FIT BETTER IN YOUR CLASSROOM.	
	[Q1.3] CLASSROOM SIZE AND ARRANGEMENT OF FURNITURE ARE WELL FITTED TO SUPPORT STUDENTS WITH SPECIAL NEEDS' PHYSICAL ATTRIBUTES AND SELF-REGULATIONS	3.23		4.12
PHYSICAL ARRANGEMENTS	[Q1.4] THE CLASSROOMS IS PHYSICALLY ACCESSIBLE AND ACCOMMODATES THE STUDENT'S SENSORY NEEDS.	3.29	[Q2.3] DO YOU FIND SPECIFIC ASSERTIVE EQUIPMENT'S THAT SUPPORT YOUR NEED IN YOUR CLASSROOM?	4.12
	[Q1.5] VARIETY PHYSICAL ARRANGEMENT IS NECESSARY SO EVERYONE CAN PARTICIPATES IN LEARNING ACTIVITIES.	4.20	[Q2.4] FURNITURE ARRANGEMENTS REFLECTS YOUR PERSONAL STANDARDS AND SELF-EVALUATION THAT SUITS YOUR NEEDS.	
	[Q1.6] SEPARATING STUDENTS WITH SPECIAL NEEDS IN DIFFERENT CLASSROOM IS NOT NECESSARY WHEN CLASSROOM IS DESIGNED TO SUPPORT THEIR NEEDS.	4.00		3.72
VISUAL ASPECTS	[Q1.7] CLASSROOMS HAVE ENOUGH PENETRATION OF SUNLIGHT TO SUPPORT PSYCHOLOGICAL AND PHYSIOLOGICAL HEALTH OF STUDENTS WITH SPECIAL NEEDS	4.11	[Q2.5] THE AUDIO-VISUAL SETTINGS IN THE CLASSROOM SUITS YOUR NEEDS.	4.00
	[Q1.8] THE COLOR SCHEME, PATTERNS AND TEXTURES IN CLASSROOM CREATE PLEASANT VISUAL ASPECTS.	4.43	[Q2.6] THE LEARNING SPACE DESIGN IS ATTRACTIVE AND PLEASANT AND IMPROVE YOUR LEARNING JOURNEY.	3.84

**Table 2: Questionnaire [QT] & [QS] results for answering the second research question (Author 2022)**

RESEARCH QUESTION [2]: RELATIONSHIP BETWEEN SCHOOL'S ARCHITECTURE AND THE EFFICACY OF STUDENTS WITH SPECIAL NEEDS.					
SCHOOL ARCHITECTURE	QUESTIONNAIRE [QT] TEACHERS IN SPECIAL EDUCATION	RESULTS MEAN	QUESTIONNAIRE [QS] STUDENTS WITH SPECIAL NEEDS	RESULTS MEAN	SPECIAL NEEDS SELF-EFFICACY
	ARCHITECTURAL DETERMINISM THEORY		SELF-EFFICACY RECIPROCAL DETERMINISM		
ADEQUATE SPACES	[Q1.9] THE STUDENTS WITH SPECIAL NEEDS PARTICIPATE IN CLASSROOM AND SCHOOL ROUTINES IN TYPICAL LOCATIONS, SUCH AS THE EATING LUNCH IN THE CAFETERIA, AUDITORIUM ACTIVITIES ETC.	4.00	[Q2.7] YOU EASILY FIND YOUR WAY TO YOUR CLASSROOM, COMMON AREAS, RESTROOMS AND OTHER DESIRED SPACES.	3.84	BEHAVIORAL FACTORS
	[Q1.10] THE STUDENTS WITH SPECIAL NEEDS' BEHAVIORAL GOALS ARE ALIGNED WITH THE SCHOOL-WIDE BEHAVIORAL RULES THAT DEFINED BY SCHOOL SPACES AND COMMON SPACES.	3.49	[Q2.8] YOU USE CONFIDENTLY USE RESTROOMS, RAMPS, AND LANDING THAT ARE SUPPORTED WITH RAIL FOR SELF-AIDS.	4.04	
	[Q1.11] PHYSICAL AIDS MAKE STUDENTS WITH SPECIAL NEEDS CAPABLE TO ORGANIZE AND EXECUTE COURSES OF ACTION REQUIRED TO ATTAIN DESIGNATED TYPES OF PERFORMANCES AND INCREASE SELF-EXPECTATIONS.	4.20	[Q2.9] THE ARRANGEMENTS OF SEATS IN YOUR CLASSROOM MAKE YOUR CIRCULATION COMFORTABLE AND MAKES YOU FEEL SECURE.	3.88	ENVIRONMENTAL FACTORS
	[Q1.12] VISUAL AIDS, TACTILE ELEMENTS AND AUDIO NOTES TO BE IMPLEMENTED IN COMMON AREAS IN SCHOOL SUCH AS CORRIDORS, HALLS AND STUDIOS EFFECT OF SELF-EFFICACY OF SPECIAL NEEDS.	4.37	[Q2.10] YOU FEEL CONFIDENT USING ASSERTIVE TECHNOLOGIES AND ADJUSTABLE FURNITURE.	4.04	
	[Q1.13] PLEASANT DESIGN OF SCHOOL EFFECTS THOUGHT, FEELING AND SELF-BELIEFS OF STUDENTS WITH SPECIAL NEEDS.	4.57	[Q2.11] YOU FEEL CONFIDENT WHEN GIVEN EQUAL OPPORTUNITY TO ACCESS ALL FACILITIES IN SCHOOL BUILDING WITH OTHER STUDENTS.	4.44	PERSONAL FACTORS
	[Q1.14] WINDOW VIEWS IF THERE IS NATURAL ELEMENTS (GARDEN, TREES, WATER FEATURES) HAVE EFFECT ON STUDENTS WITH SPECIAL NEEDS EMOTIONAL BEHAVIORS.	4.60	[Q2.12] YOU FIND MOTIVATION AND ENCOURAGEMENT TO USE TEACHING MATERIALS IN THE CLASSROOM.	4.48	
	[Q1.15] FLEXIBLE SPACE DESIGN INCREASE THE USE OF SELF-REGULATORY SKILLS OF STUDENTS WITH SPECIAL NEEDS.	4.46			

4.2. Qualitative Results

Reciprocal deterministic factors of special needs students define their self-efficacy scale according to environmental actions. These studied factors are observed in the main spaces of the school starting from school building, then common spaces and finally the inclusive classrooms. Deterministic factors are inspected by asking two questions.

Table 3: Individual interviews questions (Author 2022)

SCHOOL ARCHITECTURE		SPECIAL NEEDS SELF-EFFICACY	
ADEQUATE SPACES	<i>ADEQUATE SPACES OF THE SCHOOL SPACES BEHAVIORAL FACTORS THAT AFFECT STUDENTS WITH SPECIAL NEEDS</i>		BEHAVIORAL FACTORS
	[Q3.1] HOW FAR PHYSICAL SETTING OF SCHOOL BUILDING SPECIFICALLY CLASSROOMS AND COMMON SPACES, AFFECT THE BEHAVIOR OF STUDENTS WITH SPECIAL NEEDS?	[Q3.2] WHAT DESIGN FEATURES DEFINES CONVENIENT LEARNING SPACE FOR STUDENTS WITH SPECIAL NEEDS TO ALLOW THEM COMPLETE EDUCATIONAL ACTIVITY CONFIDENTLY?	
PHYSICAL ARRANGEMENTS	<i>PHYSICAL ARRANGEMENTS OF THE SCHOOL SPACES ENVIRONMENTAL FACTORS THAT AFFECT STUDENTS WITH SPECIAL NEEDS</i>		ENVIRONMENTAL FACTORS
	[Q3.3] IMPROVING SCHOOL DESIGN TO MEET NEEDS OF STUDENTS, WILL INCREASE SELF-CONFIDENCE FOR STUDENTS WITH SPECIAL NEEDS?	[Q3.4] DO YOU BELIEVE THAT STUDENTS WITH SPECIAL NEEDS WILL BENEFIT FROM SCHOOL DESIGN IF GETTING SOME IMPROVEMENTS? WHAT KINDS OF IMPROVEMENTS YOU BELIEVE SHOULD BE TAKEN INTO CONSIDERATIONS.	
VISUAL ASPECTS	<i>VISUAL ASPECTS OF THE SCHOOL SPACES PERSONAL FACTORS THAT AFFECT STUDENTS WITH SPECIAL NEEDS</i>		PERSONAL FACTORS
	[Q3.5] HOW DO STUDENTS WITH SPECIAL NEEDS WILL REACT TOWARD SCHOOL INTERIOR AND EXTERIOR OUTLOOKS AND FURNITURE DESIGN?	[Q3.6] DOES THE SCHOOL PLEASANT DESIGN HAVE PSYCHOLOGICAL IMPACT ON STUDENTS WITH SPECIAL NEEDS, WHICH WILL IMPROVE HIS/HER CONFIDENCE TO EXCEL COMPLETING REQUIRED TASK?	

Table 4: Results of question Q3.1 of individual interviews

Space	School building		Common spaces		Classrooms	
	Minor effect	Major effect	Minor effect	Major effect	Minor effect	Major effect
Teacher [1]	X		X			X
Teacher [2]		X		X		X
Teacher [3]		X		X		X
Teacher [4]		X		X		X
Teacher [5]	X			X		X
Teacher [6]		X		X		X

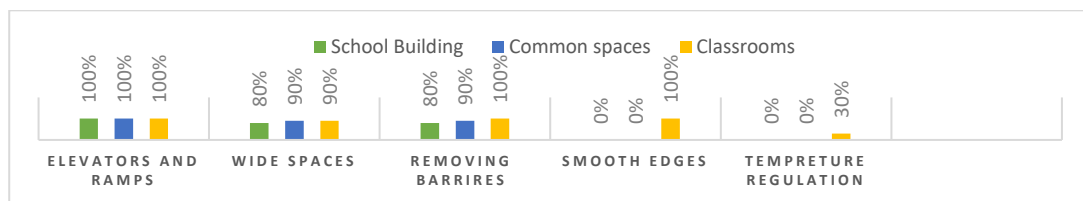


Chart 1: Results of question Q3.2 of individual interviews (DESIGN CONFIGURATION)

Table 5: Results of question Q3.3 of individual interviews

Space	School building		Common spaces		Classrooms	
	Minor effect	Major effect	Minor effect	Major effect	Minor effect	Major effect
Teacher [1]		X	X			X
Teacher [2]		X		X		X
Teacher [3]		X		X		X
Teacher [4]	X			X		X
Teacher [5]		X	X			X
Teacher [6]		X		X		X

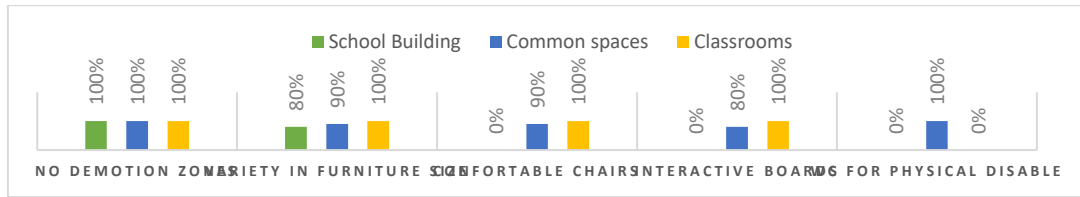


Chart 2: Results of question Q3.4 of individual interviews (SCHOOL DESIGN IMPROVEMENTS)

Table 6: Results of question Q3.5 of individual interviews

Space	School building		Common spaces		Classrooms	
	Minor effect	Major effect	Minor effect	Major effect	Minor effect	Major effect
Teacher [1]		X		X		X
Teacher [2]		X		X		X
Teacher [3]		X		X		X
Teacher [4]	X			X		X
Teacher [5]		X	X			X
Teacher [6]		X		X		X

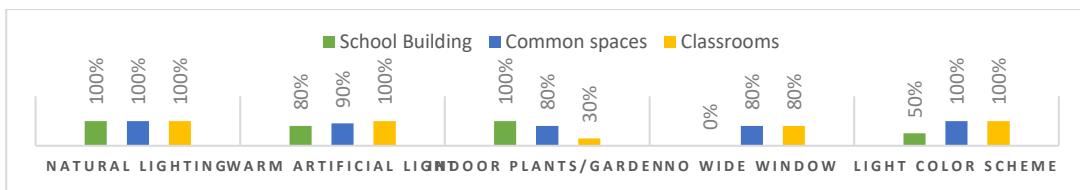


Chart 3: Results of question Q3.6 of individual interviews (PLEASANT DESIGN)

## 5. DISCUSSION AND RECOMMENDATIONS

### 5.1. Findings of the research

Findings being represented and interpreted in chapter 4 are analyzed separately and concurrently using triangulation techniques. Triangulation being a powerful process that facilitates validating the data and provides a better understanding while making sense of data and information. Moreover, this method refers to developing a comprehensive understanding of phenomena through convergence of information from different sources (Honorene, 2017). The triangulation techniques used in this research is the theory/perspective where multiple theoretical perspectives are used for examining and interpreting data.

This research is conducted after stating a problem bordered by two research questions. The first research question was to inspect if *the schools' architecture is suitable for students with special needs in some schools in Lebanon*. To answer this question an alternative hypothesis and null hypothesis were interposed between the proposed problem and the findings of the quantitative phase. Statistically, when analyzing the results concurrently using the T-test statistic, the total mean value of all items of teachers' questionnaire [QT] and students' questionnaire [QS] are equal to 4 greater than the average 3. Therefore, the alternative hypothesis was accepted as an answer to the first research question that claims that the school architecture is suitable for students with special needs. However, when analyzing the results separately using an Independent T-Test, *the mean values* of items according to each section of teacher questionnaire [QT] and student questionnaire [QS] are obviously uneven.

Results about the suitable architecture in this research are closely associated to the study of (Feuser, 1989). In his study when students with special needs join regular school system, some school setting are rectified according to their needs. The equal opportunity comes with physical arrangements that fit all children equally. Participants of this research stated that they had equal opportunity as other students because of suitable design spaces. Contrariwise, findings of the study of (Abouelsaad, 2017) when highlighting the importance

of gradation of different needs, it comes up that some students with exceptional cases should be separated in other classrooms. Reason behind this needed separation is to better arrange physical setting of classroom that lines up with students' needs. That result work together with differentiation that occurred between students answers and teachers in this study about the suitable school architecture, where some spaces in their school do not fit students' needs.

Consequently, that differentiation between teachers and students' answers affects results needed to answer the second research question. The question was for inspecting if *there is any significant relationship between school's architecture and the efficacy of students with special needs*. To answer this question as well, a second alternative hypothesis and null hypothesis were logically constructed to study the relationship between the first variable (school architecture) of the first research question with another variable (Self-efficacy). Statistically, if testing the correlation between school architecture and self-efficacy, using average of all items of questionnaires, the correlation will be weak. The reason behind a weak correlation, is that teachers' answers about the school architecture were beneath students' answers. Hence, studying the relationship between school architecture and self-efficacy continued in the qualitative phase of data collection. The follow-up phase after the quantitative phase, was drawing the path to the qualitative phase with six teachers from the quantitative data collection phase. The six participants claim a general disagreement on school architecture questions. In order to answer the second research question, the investigation about the school architecture was expanded where questions during the interviews are interrogated to assess all school spaces. All teachers' answers were mostly related to classrooms, whereas when it comes to common spaces and school building, they show less concern. That explains the variation of self-efficacy scale depending on design configurations of each space. In addition, it tells why the correlation between school architecture and self-efficacy was weak since, not all spaces within the school is suitable. Efficacy of students were high in their classrooms where their needs occur through physical arrangement of the space. Efficacy of students is decreased in other spaces within the same school for not being adequately designed to fit their needs. Consequently, the answer to the second research question is the alternative hypothesis; there is a significant relationship between school architecture and self-efficacy of students with special needs.

The results of this research that confirm existence of this relationship cooperate with the findings of newly conducted studies about universal design. Universal design being a progressive architectural standard where the intention adjoined the inclusion concept. Like the study of Katz 2016, where the finding of his study shows a notable gain in students' achievements and engagements. That success is gained when students with special needs perceived the classroom environment that was designed according to universal standard. Moreover, results of a study by Marcia 2014, comes hand-in-hand with this research. Conclusions of This study stated that students with special needs are able to develop a proper mind-set for each space according to activity. Reason behind students' high expectations and increment of their self-efficacy, is the well-defined functional areas in school spaces. Furthermore, Tanner's study in 2015 work together with this research where the results are closely associated. Tanner studied the impact of physical environment on students, he referred to Maslow's Need Theory to define the architectural space. With design improvements, students with special needs show more agility, coordination, and balance. Results of mentioned studies work together with results of this research and confirm a significant relationship with school architecture and students with special needs.

## 5.2. Retrospective examination of conceptual framework

Through theoretical triangulation techniques, the items of questionnaire are perceived separately to six sections referring to the theoretical framework. The logical listing of theories in coordination with research questions and data collection instruments, is related to the rational of deterministic theories. Determinism being defined as a philosophical view, which claim that human behavior and reactions are result of existed causes. That makes it reasonable to prioritize assessment of existed school architecture, through the Human-Centered Design theory that considered an approach to accessible architecture according to Liu, J. 2018. Looking deeply in Human-Centered Theory, a significant relationship with Needs Theory is observed. The study of Tanner 2015, showed how physical environment complements the

human behavior when associating the school architecture to Maslow's hierarchy of needs. Associating the findings of his research to the Human-Centered and Needs Theory was needed to assess the design configurations of schools (*figure 12*).

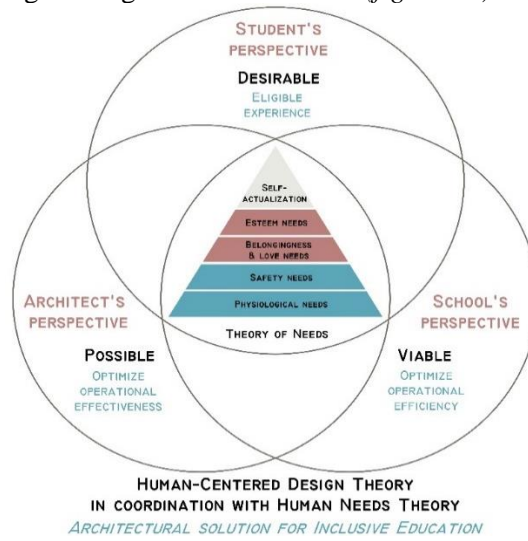


Fig.12: Coordinating Human-Centered Design and Human Needs (Author 2022)

The study of Hurt, 2012 about the importance of Natural Sensory engagement for more effective learning leaves no doubt that environmental actions affect human behavior. In 2005, Lawrence claims that human behavior should be tested in any architectural design process. Lawrence's recorded results is similar to the findings of this research and decided that design of spaces have the ability to influence people's behavior. Therefore, coordinating the architectural deterministic theory and the self-efficacy theory leads to philosophical doctrine to environmental psychology (*figure 13*).

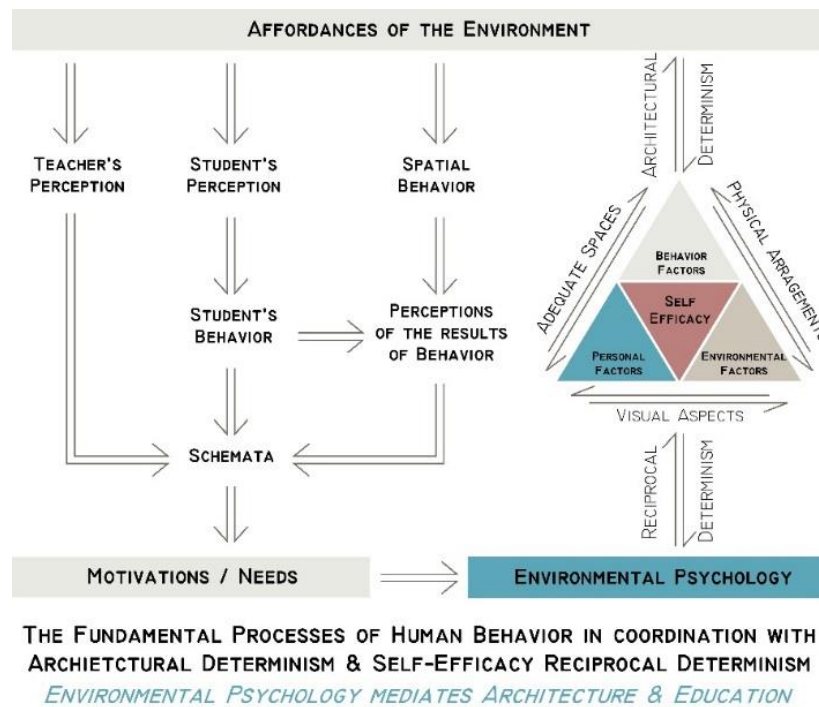


Fig.13: Environmental Education in Architecture and Education (Author 2022)

By referring to figure 13, the relationship between school architecture and self-efficacy existed when mediating environmental psychology to study the fundamental process of human behavior. Teacher's perception, students' perception with spatial behavior of students



in each of school spaces provides schemata. This schema demonstrates the needs provided by physical arrangements. Consequently, Self-efficacy scale is figured by studying the architectural determinism complementing the reciprocal determinism where environmental psychology is the common dominator.

### 5.3. Reciprocal Architectural Design Methodology

By fostering critical thinking and analytical skills through hands-on research, the school architecture design is recommended to be approached by a specific Design Methodology. A methodology that will emerges theories, strategies and educational requirements that are operated by architects and educators in line with universal design. Architectural design methodology is a development of systematic processes applied in design-activities in architecture. This process provides a deep understanding of design intention and practical strategies of development to construction phase (Plowright, 2014). Design intention or design method of school, is recommended to link the three disciplines of knowledge for a more effective school architecture. The Reciprocal Design Methodology develops the school design through Architecture, Educational Studies and Environmental Psychology disciplines of knowledge.

The Reciprocal method overarches the architectural design process and the rationale of spatial-related research in contrast with inter-disciplinary knowledge. The design approach is deterministic and linked to environmental psychology. The Design process is instigated by human-centered design theory that interferes with the users' self-efficacy. The Thinking Process model of Reciprocal Method (figure 14) is an innovative mindset to produce a design framework in direction of Universal Standards. The design strategy relies on observing with empathy the interaction of users with the built environment in order embraces the users' needs.

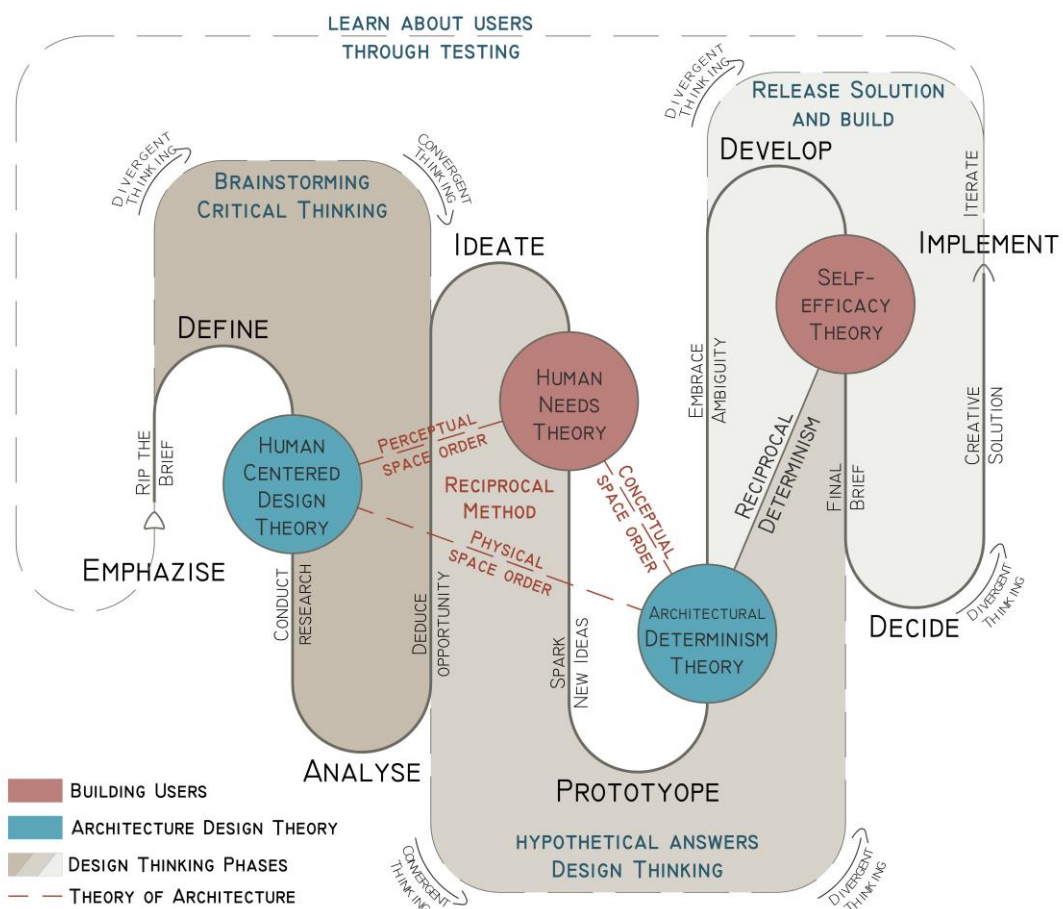


Fig.14: The Thinking Process Model of Reciprocal Design Method in coordination with theoretical framework and IDEO creative non-linear thinking process (Author 2022)

#### 5.4. Recommendations

Purpose of recommendations is the call for action by proposing a solution and removing barriers to open new paths for future studies. For better results when conducting similar studies, it is recommended to include design assessment for school physical conditions. That assessment will make it easier to researcher to compare data collected results to existed spaces to get a none-statistical validation as a first impression.

Design configurations in schools that fit needs of students with diverse abilities are more effective if taken into consideration in the design phase of school architecture. However, any additional spatial design modifications are needed for the sake of supporting students' needs, will be possible if following remodeling process of school building. At any time, ramps, elevators and special WCs can be added to the school building to support students with physical disabilities. Moreover, taking a wider look to common spaces and classrooms and observe if corridors width needs to be enlarged in order to make a special pathway for wheel chairs while leaving the space free of barriers. Wider corridors will give a chance to add floor tiles textured with braille symbols and handrails to guide students who have visual impairments to reach easily required spaces. Additional sensory classrooms will improve students with special needs learning conditions. Supporting classrooms with adjustable furniture size (tables and chairs) will help students to choose what most fit them to be more comfortable. As well as making re-distributing the furniture depending on needs more effective, in order to prevent demotion zones. Opening such as doors and gates must be wider and translucent using glass. Whereas windows are recommended not be wide to reduce heat in hot weather, since temperature regulation is important to overall ambiance. On other hand, wide window is not recommended for students with educational disabilities or autistic since it increases the visual distraction. Window location must be at the East or South geographic direction, in order to allow more penetration of sunlight for a space free of humidity and lighted with natural lighting. Adding another small window at the north direction (if applicable) will increase the airflow in the classroom and emphasize the natural ventilation. Support of Assertive Technologies such as magnifier, loop, special tablets and interactive boards are certainly helpful for students with educational disabilities. Visual aspects affect the psychological conditions of students therefore; light color scheme, indoor plants and additional outdoor facilities with green areas will boost personal factors of students with special needs.

#### 5.5. Conclusion

Finalizing the results in this research is actually an opening for a wider study to be conducted in the future. Looking back to the research problem that lies in the architectural design of schools in Lebanon, findings asserted that inclusive schools in Lebanon are "integrated". To explain more, according to Scheer 2015, a school building is not inclusive unless all children have the same chance to benefit from all facilities of the school. What is more, Lebanese schools welcome students with special needs in special classrooms not in mainstream classrooms with other students. That means common spaces and general school buildings do not have the same design configuration that fits all needs of students who have special cases. In some schools in Lebanon, a separate building within the school plot is designed for special needs as a special department. This separation according to functionalities of spaces dismisses "the inclusion" concept from the educational facility. Consequently, schools are "integrated" if classrooms are within the same building with the possibility of sharing other students' common spaces. Schools as well might be "segregated" if a separated building department is designed for special needs with no possibility of sharing the common spaces with other students.

Lebanese schools not being inclusively designed resulted in low self-efficacy of students with special needs. Furthermore, school architecture in Lebanon is not designed according to human-centered design, for that reason, human needs are clearly not well incorporated in design decisions. Tcheimegni, 2018 found a negative student learning progression when adding the students with special needs in mainstream classrooms for inclusion study. Reason behind the unsuccessful experience was the inappropriate physical design conditions. To conclude, inclusions will succeed when built environments meet students' needs (figure 15).



Fig.15: The inter-relationship between architectural design configurations and self-efficacy of students with special needs (Author 2022)

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