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MASTER OF ARTS BY RESEARCH

Design investigation of primary schools in Saudi Arabia

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Award date:
2011

Awarding institution:
Coventry University

Link to publication

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Abstract

Evidence suggests that school environments can contribute not only to the health and well being of staff and students, but also to higher levels of educational attainment. However the area of educational ergonomic is relatively new and as such many of the results have yet been applied to school and curriculum design. Additionally, comprehensive methods for evaluating schools are lacking. In Saudi Arabia no design criteria or guides-lines have been provided by the ministries. Therefore the importance of design of primary schools is ignored and their built environment may be unnoticed. The lack of guidelines, failure to assess current schools and the link between school design and student attainment provides a clear rationale for undertaking this study.

The aim of this research was to assess and evaluate the built environments of primary schools in Saudi Arabia using an adaptation of existing design checklists, and Post-Occupancy Evaluation Toolkits with a view to firstly providing recommendations for each of the schools to improve their learning environments; and secondly to assist in formulating a set of design principles which may serve as a model to inform future primary school projects in Saudi Arabia.

Three international schools were selected in Jeddah, Saudi Arabia as representative schools. The facilities of each school, were assessed in terms of effectiveness of :

1. The effectiveness of the learning environment (using the Design Assessments Scale of Elementary Schools (1999) and the Council of Educational Facility Planners, International Adequacy Assessment tool (2002)
2. The adequacy of the functions provided (using Nair and Fielding Design Patterns Checklist (2005) and Lackney's Learning Class Modalities).

The checklists were used to guide observations in the schools to provide data on the adequacy and functionality of the learning environments.

Following this a post occupancy evaluation was conducted with students, teachers and parents in each school to gain a detailed understanding of how the school was perceived by the different groups.

Results from the first study showed that 2 out of 3 of the schools failed to fulfil all criteria required for effective learning environments. For example, class rooms did not provide for flexibility and variety, were inadequately resourced, with too little storage and unpleasant interiors. On a wider level, important functions such as science labs, media rooms, gymnasiums and outdoor learning areas were not provided for.

The results from the observations were consistent with those obtained from the POE toolkit where students and teachers complained of similar issues such as lack of group work areas, poor interiors, and inadequate resources. Additionally, the toolkit also revealed several factors that students were particularly sensitive to such as noise, crowded classrooms, uncomfortable temperatures, and the need for quiet areas for individual study. Teachers were more sensitive to good lighting and pleasant interiors. Other concerns were storage, adequate resources, and flexible classrooms. The observations made prior to and independently of the POE explained the reasons for the responses and provided more insight into the nature of the problems in the school than the POE on its own.

In conclusion, together the assessment checklists and the POE can be used to determine the adequacy of educational environments and levels of stakeholder's satisfaction with the facilities. The results can be used to inform redevelopment of the schools that took part in the study and to inform future developments. It is recommended that both checklists and POE are used to provide a detailed picture of the school from the perspective of all stakeholders.

At the end of the study the results will be presented to the schools that took part in the study and recommendations made to the Saudi education environment regarding the current standard of educational facilities and the need to support evaluation studies of this nature to drive up educational standards.

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CHAPTER 1
INTRODUCTION

1.1 Statement of the problem

Over the past fifteen years, expectations on education have increased tremendously, with waves of reforms to raise the standard of education. Students are mastering various subjects and content that were unheard of in the 1980s (Tanner 2000). For example Tanner explains

"…..fifth grade students in the USA are expected to develop Internet Web pages and be able to describe advantages and disadvantages of various computer processing, storage, retrieval and transmission techniques. Teachers, to stay abreast of new curricula, cultural changes, instructional theory, and educational technology, are expected to fulfil more requirements than ever. (Tanner 2000:1).

However, with the demands on curriculum changes and new methods of teaching, the planning and design of the buildings in which these activities take place may be ignored. In Saudi Arabia the built environment of primary schools goes unnoticed. Conditions in schools may be poor. Interviews with architectural firms, confirmed that the Ministry of Education has not issued design guidelines or building codes for primary schools. The only by-laws that were issued by the Ministry of Planning related to the number of gas, water, sewerage, electricity and telephone lines permissible before authorization is granted for construction.

The lack of regulations and recommendations is of great concern considering that the built environment has been shown to have a direct impact on student achievement (Moore and Lackney, 1993, Earthman 2002, Smith 2007, Tanner, 2009) and can facilitate teaching and learning (Lackney 1994, Dudek 2000, Lackney 2005, Lyons 2001).

Although academic standards have been raised in the UK and USA, school buildings may not be fit for purpose (Woodcock, 2008). The incorporation of safety codes for school buildings were heralded by the news in 2007 with headlines stating 'Saudi Arabia to Base Building Code on I-Codes'(HIS 2007).The I-codes being safety standards established by The International Code Council (ICC) dedicated to building safety and fire protection. Although the ICC signed a Memorandum of Understanding with the Saudi Building Code National Committee (IHS 2007), the codes still have not been implemented.

The Educational Planning Board under the Ministry of Education Saudi Arabia stated their aims for 2004 as being:

- To design and execute projects that cater to the requirements of the Ministry such as construction of educational buildings, and
- The renovation of existing educational sites

As yet (2010), these aims have not been achieved. Therefore the current situation of the physical environment of schools in Saudi Arabia is in need of evaluations. As Tanner stated 'bad school houses are silent killers of teaching and student learning' (Tanner2000:5).

The lack of guidelines, failure to assess current schools and the link between school design and student attainment provide a clear rationale for undertaking this study.

1.2 Aims of the Study

The aims of the study are:

1. To understand what makes a good primary school environment.
2. To assess the physical environment of representative primary schools in Saudi Arabia against known design patterns and provide insight into the conditions the overall conditions of schools in Jeddah.
3. To gather the views of the stakeholders about their schools
4. To provide recommendations about the way in which primary schools in Saudi Arabia can be evaluated.

This will be achieved by assessing and evaluating three International English-medium Primary schools in Jeddah.

In **Stage 1** an assessment/audit of the facilities will be conducted to gauge the physical conditions and quality of the schools against best practice. Four instruments will be used in order to create a triangulation of the result.

1. CEFPI Educational Adequacy Assessment Instrument
2. DASE (Design Assessment Scale for Elementary Schools).
3. Fielding's and Nair's 31 Design Patterns checklist which provides an overview of items that must be present within schools in order to provide ideal learning environment
4. Lackney's Learning Modalities.

The results from this stage of the research will provide valuable and practical data which can be referred to by other schools in Saudi Arabia inform their future building plans, renovate existing facilities, and create student centred learning environments (Monk 2006)

In stage 2 a Post Occupancy Evaluation (POE) will be conducted. This is a systematic analysis of the building and its design issues from the view points of all the users. The POE will be used with selected students, teachers and parents to understand how they perceive the school building and where improvements can be made. The outcome of this will be in provide insight on the perception of the schools' environment from which design recommendations can be made.

The outcomes of the study will therefore consist of

- Detailed recommendations to the three selected schools in terms of short-term improvements such as colour change, signage, better lighting, more landscape, or even soft furnishings all of which will contribute to the improvement of the facility and enhance the learning environment.
- Appraisal of the contributions the assessment and POE can make to informing the design of schools.

1.3 Research Methods

The aims will be met through the following methods

1. A literature review will be conducted to understand what constitutes good school design and the key ergonomic factors and design patterns that lead to a environment that facilitates learning and teaching. The review will encompass educational ergonomics, design of schools and ways in which school environments are evaluated

2. The physical environment of representative primary schools will be assessed through observation and semi structured interviews, and quantitative assessments using standardised checklists.

3. The views of other stakeholders were collected using an adapted form of Post Occupancy Evaluation Toolset.

The research conducted in 2 and 3 will produce a comprehensive set of data for each school, highlighting where facilities are poor or missing and allowing recommendations to be made for each school. Comparisons were also made between the schools.

1.4 Significance of the study

Setting up an evaluation process provides schools with the opportunity to create an on-going process of improvements independent of external involvement. This helps foster a sense of belonging, control, competence, and a sense of commitment (Watson 2003) to the process and the school. Setting up a Post Occupancy Evaluation process within these three schools can be used as a model for other educational facilities. If the results are shown to be effective, this could become embedded as a standard process by the Ministry of Education.

Saudi Arabia is facing high growth rates in population, educational literacy, facility, and technological development. Projected population growth will be 185.385% ranking 12th in the world in 2015 (CIA World Fact book 2000).

The number of school students in Saudi Arabia has risen from 147226 to over two million students between 1990-1998 (Ministry of Education 2000). Jeddah and many others cities in Saudi Arabia will be faced with an increase in the number of sophisticated students, who have greater needs and expectations. Education providers must be prepared to meet the new challenges and be prepared to use the latest research to inform the design of the curriculum and educational facilities to address the needs of their students.

Research conducted by Black (2001) and Lewis (2000) (cited by Monk 2006) indicates a positive relationship between facility design and the learning environment. The findings in this study will provide current, applicable data on this relationship so that growing cities such as Jeddah, can effectively address primary school student learning needs with appropriate facilities. Understanding the adequacy quality, and impact that our current educational facilities have on learning environments can guide facility renovations and the construction of new facilities that are more conducive to learning.

1.5 Relevance of human factors and the built environment to the study

The question that arises is how the building supports teaching and learning and is there indeed a relationship between the built environment and student outcomes. Several international organizations are now investigating the impact of the built environment on education. The most widely-known organizations are

- **CEFPI** Council of educational Facility Planners International,
- **PEB** Program on Educational building,
- **SDPL** School Design and Planning Laboratory,
- **DFES** Department for Education & Skills,
- **OECD** The Organisation for Economic Co-operation and Development

- **CABE** The Commission for Architecture and the Built Environment
- Design Share
- Exemplar designs.
- RIBA
- Joined Up Design for Schools

These particular organizations were specifically created to foster interest in educational architecture, help set standards and maintain a tie between architects and educators. Research shows that specific building features and conditions relating to human comfort (such as flexible classrooms, clearly defined pathways, positive outdoor spaces, large group meetings, lighting, acoustic control, and overall impression of the building can lead to improved performance (Uline 2008).

Public school districts in US invested $15 billion dollars in school construction in 1999 alone, the highest rate of construction in the nation's history (Tanner 2000). In UK there have been huge increases in capital investment in schools during the past 5 years – from under £700 million in 1996-97 to £3.8 billion in 2003, rising to £5.1 billion in 2005-06 (DfES 2003).This clearly indicates that it is believed that the built environment can influence teaching and learning outcomes and the urgency with which this problem needs to be addressed.

In designing a school, architects and planners must do more than just meet building codes. Research indicates that aesthetic values of the facility contribute greatly to student performance (Weinstein 2004). The attractiveness of environments has been found to influence learning.

Environmental experiences are the most influential in a child's life and therefore school design and the architecture has a direct and symbolic impact directly effecting student learning (Tanner 2000; Rydeen 2003).

Understanding the relationship of what constitutes good school design and what factors contribute to ideal learning environments is crucial to this study. Recommendations to the participating schools will be based on standard ergonomic factors, design criteria, and the POE results. The standard ergonomic factors will

ensure safety and comfort for the occupants where as design criteria will contribute to the aesthetics and pleasantness of the school which will in turn influence the overall experience of the students. Design criterion will also provide the basic framework of facilities and learning spaces that must be integrated in order to support learning. Lastly the POE results will provide an insight into the occupants' view of their school allowing the researcher to formulate design recommendations specifically addressing their concerns.

1.6 Summary

Education authorities are now searching for ways to comfortably transfer new knowledge to students and teachers. Students are mastering subjects that were unheard of just a few decades. Teachers at the same time must stay abreast of the new curricula imposed upon them.

However, until recently there has been a tendency to ignore the planning and design of the very building that facilitates teaching and learning. This is still the case in Saudi Arabia. Although there are plans for developments, renovations and implementation of more strict safety codes, as of yet, none have been implemented. No attention has been given to the voice of the users of the buildings.

Understanding the relationship of what constitutes good school design and what factors contribute to ideal learning environments is crucial to this study. Prior to the evaluation process, it was essential to develop an understanding of how school buildings can support teaching and learning and the relationship between the built environment and student learning outcomes.

The significance of this study lies in its aim to establish an evaluation process which can provide private schools with the opportunity to create an on-going process of improvements independent of external involvement and in turn foster a sense of belonging, control, competence, and a sense of commitment. If shown to be effective, and gains government support, this could provide a blueprint for evaluation in other schools in Saudi Arabia.

The next chapter will discuss in detail the research methods and tools used for the assessment of the built environment and the evaluation of the stakeholders perception on their built environment.

CHAPTER 2

LITERATURE REVIEW

'*A good school is one which promotes learning; an effective school is one where the pupils achieve more academically than could be predicted from their intake*'. Peter Mortimer (Dudek 2000)

This generalized definition is widely agreed upon throughout the world. OFSTED further defines effectiveness for schools in terms of the following eleven factors.

Table 2.1 Factors for effectiveness in schools

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unabridged version of the thesis can be viewed at the Lanchester
Library, Coventry University
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Dudek (2000)

The focus of this study will be on factor 3 'learning environments'. The aim of this review is to identify from the literature, the ways in which effective learning environments can be created and evaluated.

2.1 The learning environment

In order to understand an effective learning environment it is important to explore multiple factors related to learning. The physical environment is only one component, although it is an important one, cultural and social factors are also contributing entities. The word 'environment' is generally understood as the physical space where learning occurs, typically a school. However, in *educational literature*, the learning environment relates to the pedagogical landscape (i.e., student-centred teaching and learning) (De Gregori 2007)

Since the focus of this study is a design investigation, only the physical aspects and its relationship to the learning environment will be explored. De Gregori (2007) stated that the learning environment is directly affected by three important factors

a. The power of place
b. School climate
c. Built environment

2.1.1   Power of Place:

Students inhabiting in the learning environment need to perceive that the space in which they spend several hours of the day and important years of their life is *a* meaningful, inspiring, safe, comfortable space that conveys a 'sense of place' (Rydeen 2003; DeGregori 2007). The notion of a sense of place is related to the student's acquaintance with the facility, such as entrances, classrooms, auditorium, entry sign, lockers, landscaping and so on (Rydeen 2003; DeGregori 2007). In essence, it is the perception of non-material characteristics such as a sense of belonging, ownership, meaning, familiarity and purpose which is essential to creating effective learning environments. (Rydeen 2003; DeGregori 2007) According to Norberg-schulz, creating a positive sense of place within a school should be a goal

for every designer as it acts as a catalyst for the learning climate and the student learning engagement.

Gallagher (1994) recorded children's school days, recording their interactions and came to the conclusion that the settings were more important determinants of his subjects behaviour than their personalities (Gallagher 1994). The implication for the school environment is that everything in it encourages people to maintain the state of being and behaving by the sense, or power of place (De Gregori 2007).

De Gregori concludes that the sense of place is the direct psychological human response that architecture can produce as a result of this relationship. Consequently the sense of place is an important factor in architecture of learning environments, as it could encourage the student to engage in learning behaviour.

2.1.2   School climate:

"The school climate is an important subject of learning environments because its concept captures important attributes of the social context and contributes to the identity of each individual environment" (De Gregori 2007: 23). Climate has been given different names, atmosphere, milieu, or culture (Halpin and Croft, 1963) including all aspects of the physical environment, beliefs and values (Tagiuri 1968 as cited by De Gregori 2007). Norberg-Schultz describes it as the 'spirit of place, an expression that translates an ancient Roman concept, denoting the character of the place, its "genius loci" and supports students' learning engagement. It has the ability to symbolize and instil various characteristics of hope, stability and a safe haven (Lyons 2001) or even a place of creativity, learning and dynamism, depending on the school's curriculum. In regard to the school facility characteristics, studies have found that student behaviour and academic achievement tended to be better when schools were clean, good appearance features, and walls without graffiti (Rutter et al., 1979 as cited by De Gregori 2007). The built environment has impact on school climate influencing student morale, values, aspirations, expectations and performance (Lyons 2001; De Gregori, 2007).

2.1.3 Built environment - Its effect on learning
Focusing on Human factors and Ergonomics In educational Design

Ann Taylor has been pioneering studies on the educational importance of the school's built environment and quotes

'The architectural settings can facilitate the transmission of cultural values, aid creativity or slows mental perception. There cannot be a separation between the learning process and the physical environment; they are an integral part of each other'

The built environment has a direct and symbolic impact on children (Tanner, 2000) assisting in establishing a sense of place focusing mainly on people's behaviour as they interact and use spaces. The major contributing factor is the architectural design which comprises of aesthetics (including colour and texture), building age (Rydeen 2003; Earthman 2004; Monk 2006), flexible classroom arrangements, clearly defined pathways, positive outdoor spaces, building conditions, age, and overall impression all of which have been shown to enhance performance (Lackney 1994; Tanner, 2000; Lackney 2001, Rydeen 2003; Uline, C 2008) and student behaviour (Earthman 2002). Physical factors such as natural lighting, noise, thermal conditions, class size, ventilation, and colour as well as building condition can have a mediating effect and link to student achievement and successful learning (Lackney 1994; Department for Education Skills 2003; Building Futures 2004; Woodcock 2007; Newman 2009)

By simply improving facilities an improvement in standardized test scores of between 5.5 to 11% was also noted (Lackney 1994). In another study, stimulating environments, newer facilities, and overall impression promoted positive attitudes, fewer incidents, higher attendance records and in turn, higher scores in school up to 5-7% higher (Tennessee Advisory Commission 2003, Earthman 2004, TACIR 2003). According to a recent report by the Council of Educational Facility Planners "Facility conditions may have a stronger effect on student performance than the combined influence of family background, social economic status, school attendance and behaviour" (Lyons, J.B 2001).

In conclusion school buildings, overall impression, physical characteristics, age and profile are the key external factors that lend themselves to the learning process urging discipline, control and creativity (Dudek 2000; TACIR 2003). High quality facilities nurture a positive climate and higher levels of student achievement. (Uline 2008). The following heading describes design implications that may be adapted to the built environment (See Appendix A1 for design implications).

2.2 Exterior Design Patterns affecting academic achievement

Students' interactions and attachments with physical settings and environmental experiences often become their primary medium for learning (Tanner 2000). Within the school settings, attachments to these objects and places are central to the emotional life of a young child (David and Weinstein 1987) and therefore school design has a direct and symbolic impact directly effecting learning (Tanner 2000; Rydeen 2003).

"A School building should open itself to the surrounding context, gardens, sunlight, views and external areas with free flow and movement, which is a fundamental part of the learning environment and encourages individual creativity as the building is not enclosing or confining" (Dudek 2000)

The physical environment may be divided into four basic design patterns that have significant effects on learning

2.2.1   Movement and Circulation
2.2.2   Outdoor and public spaces
2.2.3   View
2.2.4   Cleanliness
2.2.5   School Size

2.2.1   Movement and Circulation

A clear sense of entrance and circulation influences educational function of a building as entryways provide occupants a sense of welcome (Uline 2008) and

pathways are like highways through the building defining the nature of traffic flow (Tanner 2000).

Movement and circulation can be further categorized into the following:

a. Thresholds and Pathways

These are spaces of significant transition and are important variables in occupants' perceptions where expectations are heightened and shift from place of origin to destination (Uline 2007; Tanner 2009). Cleary marked pathways define the nature of traffic flow through a school building, allowing for freedom, orientation. (Tanner and Lackney 2006; Tanner 2009) and assists in way finding (Lueder and Rice 2008; Barret and Zhang 2009, Tanner 2009). In schools where there were clearly defined areas for free movement, high scores were noted for the Iowa Test of Basic Skills. According to Tanner, lack of expansive pathways implies higher density and restrictions leading to a sense of crowding. This influences learning as crowding decreases attention, lower task performance, behavioural issues and withdrawal (Tanner 2000).

b. Entryways

These provide occupants a sense of welcome and anticipation. Staff students and parents always focus on the entranceway (Uline, 2007) (See Appendix A2 for design implications).

2.2.2 Outdoor and Public spaces

Public areas such as auditorium, dining area, cafes and outdoor areas not only foster a sense of community for socializing but gives children choices and freedom of movement by preventing congestion (Tanner 2009). The public promenade or covered walkway is also considered as public spaces to gather; exchange and share ideas and enhances an informal style of learning. Promenades are also part of the global design pattern (Tanner 2000) which is a checklist of usable design vocabulary that addressed school needs and key features in educational design (Fielding and Prakash 2005).

Research indicates that variety of textures adds to the aesthetic value and the quality of life when an abundance of useable outdoor space is present (Gaunt 1980, Freeman 1995, Tanner 2000). New interest in outdoor learning brings outdoor rooms into focus (Freeman 1995) and should be part of all schools along with places for indoor/outdoor play since it is through play that children acquire social, cognitive and physical skills (Gaunt 1980; Tanner 2000). Sports and recreation areas help develop muscles and bones, increases motor coordination, eye-hand coordination and has a positive effect on the brain's processing skills such as decision making, paying attention and planning which can improve academic performance (Lueder and Rice 2008). ITBS scores were much lower in schools where the outdoor spaces were poorly designed. Positive outdoor areas naturally blend with the schools functions and form, giving the children a sense of being in a natural setting and not in an institution (Prescot 1987; Tanner 2000).

2.2.3   Views:

Views to the outside provide necessary visual rest and relief (Uline 2007) putting students in touch with the outside world. Students need outside views which are unrestricted and without obstructions. Students should be able to see at least 50ft outside the classroom (Tanner 2009). They should be able to view indoor spaces and outdoor spaces with natural elements such as gardens, wildlife, fountains, mountains and sky (Tanner 2009).

2.2.4   Cleanliness

Cleanliness and neatness of the building is a factor that functions as an indicator of building quality. A well maintained, clean facility plays an important role in teaching and learning process (Uline 2007).

2.2.5   School Size

Research shows that the advantages of smaller school are higher attendance rates, higher graduation percentages, greater participation in extracurricular activities, fewer social behavioural problems (Moore, G.T and Lackney, J 1993; Lyons 2001; Monk 2006), decreased vandalism (Frumkin; Geller; Nodvin, 2007) and more effective

learning environment (Monk 2006). Activities and tasks performed in such schools leads to higher student performance up to 11-34% higher than when compared to children in overcrowded schools, 15% higher in math scores (Monk 2006) and 4 to 9% higher points in reading scores (Earthman 2002). It was also noted that in smaller schools, there were fewer teacher-student interactions and more learning independence. Students were found to have greater self-esteem, personal responsibility and leadership qualities (Lyons 2001; Moore, G.T and Lackney, J 1993; Frumkin, Geller, Nodvin, 2007). Amongst the negative effects of larger schools, a negative relationship was noted between maths and verbal ability (Moore, G.T and Lackney, J, 1993). Other difficulties noted were achieving privacy and over stimulation (Frumkin, Geller, Nodvin, 2007).

2.3 Interior Ergonomic design patterns affecting academic Achievement

This next section considers how the design of the school interior influences learning performance.

The key factor leading to student achievement is classroom design as students spend most of the day in their classes (Monk 2006; Smith 2007). Caldwell (1992) provides estimates that poor classroom design and maintenance can lead to decrements of 10-25% in student performance in schools (Earthman 2004; Smith 2007)

In 2004, the School District (USA) spent 4.6 billion dollars on school renovations where the main priority was ambient upgrades. 50% of the renovation budget was spent on heating, ventilation, air conditioning (HVAC), electrical upgrades and 44% to lighting upgrades, Other areas of focus were restroom improvement, roofing, building code compliance, and windows improvement (Monk 2006).

Based on a review of the literature, the physical and environmental/ergonomic factors that have the greatest impact on students in school buildings:

2.3.1   Lighting and natural lightings
2.3.2   Noise
2.3.3   Thermal conditions
2.3.4   Indoor air quality
2.3.5   Colour
2.3.6   Class Density and size
2.3.7   Classroom Furnishings
2.3.8   Classroom layout
2.3.9   Technology and resources
2.3.10 Shared spaces

2.3.1   Lighting and natural lighting:

Natural light has profound influence on body and mind, providing visual relief from tasks (Lyons 2001; Monk 2006; Tanner 2009) improves health, reduces vandalism and mental fatigue (Frumkin, Geller, Nodvin, 2007). It has been linked to behaviour and learning with daylight offering a more positive effect on student outcomes potentially due to the biological effects of the human body and is considered one of the most important environmental inputs (Heschong Mahone group 1999; Uline 2007; Lyons 2001; Tanner 2000; Bailey & Nicklas 2002). There have been striking conclusions of performance in day lit schools where researchers noted that students in full-spectrum light were healthier and attended school 3.2-3.8 days more per year (Bailey& Nicklas 2002). Furthermore, in schools with superior lighting, it was noted that noise levels dropped significantly (Bailey and Nicklas 2002) and progressed faster than those in the least daylight rooms (Plympton, Conway, Epstein 2000; Jacobs 2009). The Heshong Mahone group estimated up to 20% faster than their counterparts without daylight (HMG 1999). A study of 21,000 students found that those schools with day lighting scored 20% better on mathematics and 26% on reading (Lyons 2001; Earthman, 2004; Monk 2006; Tanner 2009).

Artificial lighting enhances the overall quality of the building and users environments (DFES Exemplar Schools; Monk 2006). Full-spectrum lighting with ultra-violet content has been shown to have significant positive effects on attendance and scholastic

performance (TACIR 2003; Earthmen 2004; Monk 2006). However, inappropriate lighting can cause eyestrain, blurry vision, negative visual development, headaches and can directly affect mental concentration and learning (Lueder and Rice 2008). It can also lead to confusion, slow reaction, increased stress and poor visual processing (Chan, 1998 cited in Monk 2006) and a form of jet lag (Tanner 2009, Building Futures 2004). A balance amongst full spectrum fluorescent, cool white fluorescent and natural lighting can improve student behaviour (Lackney 1999) as it affects mental attitude, attendance and performance (Lyons 2002) and is a crucial factor in learning (Monk 2006). Ergonomic studies show that since a child's visual development occurs directly in response to visual demands, lighting is a critical factor for children (Lueder and Rice 2008) (See Appendix A3 for design implications)

2.3.2 Acoustics

A study conducted by the Government Accounting Offices reported that poor acoustics was their most serious environmental concern in schools (Monk 2006). Good acoustics in classrooms, particularly for primary aged students, can have significant positive effect on academic achievement and is vital for learning, particularly as students need to spend 45% of their time listening (Weinstein 1979; Lyons 2001; Smith 2002; Monk 2006; Newman 2009). Chronic noise exposure and poor acoustics hinders cognitive functioning (Uline 2007) effecting reading, memory, concentration, thinking, listening, behaviour and distracts from visual tasks such as teacher instruction (Lueder and Rice 2008). Noise creates distraction, dissatisfaction, stress, lack of persistence in task completion, high blood pressure 'learned helplessness' and lowers performance (Weinstein 1979; TACIR 2003; Tennessee Advisory Commission 2003; Earthman 2004; Uline 2008) and decreases motivation which is an essential feature for successful task completion (Frumkin, Geller, Nodvin, 2007).

Newman's literature review concluded:

"*It is now widely concluded that noise and poor acoustics in classrooms can have detrimental effect on children's learning and academic achievement (Hetu 1990; Evans 1993; Lunquist 2000, Mackenzie 2000; Maxwell 2000; Gifford 2002). Effects have been found to be particularly deleterious amongst primary aged children (Green 1982; Crandell 2000). Excessive noise impacts on attainment in various areas of children's learning, for example reading (Bronzaft 1975, Mackenzie 2000; Shield and Dockrell 2002), memory (Fenton 1974; Johansson 1993) and concentration and behaviour (Lehman 1983; Evans 1993)*"

"The UK Department for Education and Skills has recognized the potentially negative effect of poor acoustics on teaching and learning and recently produced mandatory guidance on the acoustic design of new schools" (Jacobs 2009).

A Californian study found 3rd grade students in noisy buildings were .4 behind in reading and .2yrs behind in math. 6th grade students were .7 yrs behind in reading (Earthman 2004). Students require higher level of acoustic quality to attain good speech recognition necessary for optimal comprehension and learning (Lyons 2001). Internal noise of combined talking, desks and chairs sliding and papers shuffling is detrimental to learning as it leads to a constant state of aggravation, restlessness, and increased movement (Smith 2002). Without good acoustic environment, learning activities can be severely hindered (Smith 2007) particularly where children have to work in a second language (Lueder and Rice 2008), such as in the context of the Jeddah International school case studies (See Appendix A4 for design implications).

2.3.3   Thermal Conditions

Newman (2009, 52-3) writes that temperature is probably the most important indoor air quality parameter in schools where slight variations lead to discomfort effecting subtraction and reading. If temperature rises, it leads to an increase in body temperature which may produce harmful physiological effects.

Reports indicate that good thermal conditions have a direct impact on student behaviour, reducing absenteeism and increasing performance. 15 studies conducted have identified a strong relationship between air-conditioning and higher student performance (TACIR 2003). Earthman (2004) noted that children in a non-air-conditioned classroom scored 3-12 percentile rank points lower on various measures compared to students in air-conditioned rooms. There seems to be a consistent pattern of higher achievement in air-conditioned schools, particularly when allowed for individual temperature control (TACIR 2003).

An effective temperature range is 67F-73F. According to Earthman's study, 15% less physical work is performed at 75F than 65F, leading to a 28% decrease in work performed. Additionally temperatures above 74 degrees produce harmful physiological effects which also lead to a decrease in work output and efficiency (Monk 2006). Such findings have led to a recommendation in the US that all schools maintain a temperature range between 68-70F with relative humidity of 50% and with sufficient air movement to eliminate odours and stale air (Earthman 2004, Monk 2006) (See Appendix A5 for Design implications).

2.3.4   Indoor air quality

Good indoor air quality also contributes to the performance of students as Heath and Mendell (2002), Lackney (1999), and Lyons (2002) stress the criticality of indoor quality as a key component of the learning environment.

Newman (2009, 54-55) found in her search of the evidence literature that

'*Poor indoor air quality has been associated with reduced attendance in schools and respiratory illness (Mendell and Heath, 2004) Addressing air quality in schools is important because growing children are more susceptible to the health problems associated with them than adults are*'.

US Environmental Protection Agency estimates 10 million days lost each year by students due to asthma attacks caused by high counts of settled dust and fibre (Earthman 2004). Poor air quality causes respiratory infections, aggravates allergies,

drowsiness and shorter attention spans which leads to absenteeism and a feeling of being unwell which leads to poor learning (TACIR 2003). The ability to open windows for fresh air is an important factor for students. Studies show that students performed 7-8% better in classes with windows that can be opened (Heschong Mahone 1999; DFES 2003) (See Appendix A6 for Design implications).

2.3.5   Colour – Visual Ergonomics

Colour has been proved to have a great impact on human s psychological well-beings. The perception of colour in the environment always carries visual associative and symbolic effects with it (Barret and Zhang 2009). It affects individuals' impression of temperature, size of object and distance of the space (Barret and Zhang 2009) For example, danger being associated with the colour red (Lueder and Rice2008).

a.   Relieves eye fatigue

Within a classroom setting, applying neutral tint to the end wall reduces eye strain and visual monotony by helping the eye to relax as the student looks up from a task (Engelbrecht 2003).

b. Increases Productivity

Passive colours, can improve attention span, sense of time, and mental stimulation by assisting and encouraging the student to stay focused. Harry Wohlfarth's (1983) study as cited by Engelbrecht (2003) noted that improved colour showed the largest improvements in academic performance and IQ scores. Reduced absenteeism and positive attitudes were also noted (Monk 2006).

c. Aids in way finding

Colour can further articulate smaller learning communities by developing place identity through colour codes, creating order and assisting in distinction of important elements in the environment. Colour also plays an important role in way finding particularly in primary schools where visual and tactile senses are heavily relied upon (Engelbrecht 2003) (See Appendix A7 for design implications)

2.3.6 Class Density and size

Increased class density and overcrowding in classrooms effects performance creating behavioural problems, aggression, social withdrawal, dissatisfaction, stress (Evans 1998), distraction, cognitive fatigue, high blood pressure and result in less time spent in group involvement and more time in solitary play leading to reductions in physical interaction (Moore and Lackney 1993; Weinstein 1979, Frumkin, Geller, Nodvin, 2007). It was also noted that students loose motivation to pay attention or complete a task in high density classes (Frumkin, Geller, Nodvin, 2007). These detrimental effects may affect the performance (Aiello 1979) in both primary and secondary schools leading to lower graduation rates and negative impacts on teachers (Earthman 2004).

Children in smaller groups were found to score higher in all standard achievement tests, especially for reading and maths with an improvement of up to 15% (Finn 1990). Reducing classroom size from 30 students to 20, yields 6% points on scores and reducing classroom size from 20 to 10 students resulted in a 13% points in achievement scores, (Moore and Lackney 1993; Lackney 1994).

2.3.7 Classroom Furnishings

A comfortable classroom greatly impacts learning, productivity and creativity (Heath 2008). Research indicates school children complain of high rates of discomfort in the back and neck causing a source of distraction and interfering with their ability to learn and function (Lueder and Rice 2008). Furniture design should accommodate free movements for all sizes but discourage unnatural extreme postures (Lueder and Rice 2008). Hard and soft classrooms contribute to the positive effect and comfort that student's associate with a productive classroom. Soft classrooms are characterized by warm colours, soft furniture and textured floor coverings. Weinstein (1979) found soft classrooms encouraged better attendance, greater participation and improved attitudes towards the class, instructor and peers. Even minor changes to class arrangements may produce increased engagement with instructional materials (Building Futures 2004; Uline 2007). Hard classrooms refer to

unyielding and unresponsive physical attributes of spaces such as the walls, the floors, and structure.

These hard and soft features affect school dynamics including the quality of student interaction, participation and vandalism (Sommer and Olsen 1980).

2.3.8 Seating and Layout:

Findings suggest that the change from row seating to the use of cluster arrangements typical of 'cooperative learning' may lead to superior academic achievement, better attendance, motivation, self confidence, cultural acceptance (Patton, Snell, Knight and Gerken 2001) and greater student interaction (Frumkin, Geller, Nodvin, 2007). However it has been noted that rows are supportive for learning related behaviours and easier to pay attention (Frumkin, Geller, Nodvin, 2007).

a. Action Zone:

Layout and seating positions effect student outcomes as it may enhance participation, confidence, higher achievements, motivation and persistence of task (Lackney 1994; (Patton, Snell, Knight and Gerken 2001). Research indicates that students especially sitting in the front row and centre of the classroom known as the action zone have higher achievement and rate of verbal interaction and participation (Weinstein 1979; Lackney 1994) with course grades dropping at rear and sides of classrooms. Students in front row seats were more attentive and engaged in on-task behaviour (Weinstein 1979).

b. Open Classrooms:

Open versus traditional classrooms also contribute to the overall effectiveness of learning and teaching. Open classrooms lead to increased interaction among teachers, creating a greater sense of autonomy (Lackney 1994) satisfaction and ambition. Student's participation is also enhanced where there is a willingness to take risks, perseverance in task completion and engage in a greater variety of activities. (Educational Facilities Laboratories 1970; Meyer 1971; Lackney 1994). In

an open self-contained classroom students were noted to be more independent, and self-directed (Educational Facilities Laboratories 1970; Weinstein 1979). However, disadvantages have been noted with open classrooms such as a greater degree of time-wasting, movement between activities with less time spent on educational tasks. Teachers perceived there to be more noise (Lackney 1994)

Studies also indicate that within the open classroom it is necessary to arrange for individualized instruction with group contingencies and that there can be an increase in academic production, positive social behaviour and interaction with students in smaller, more intimate group clusters (Lackney 1994). Zifferblat (1972) as cited by Weinstein (1979)(see Appendices A8 and A9 for design implications).

2.3.9 Technology and resources

The use of technology impacts student interaction and learning (Tanner 2000; Health 2008) ICT improves students' rate of progression (Building Futures 2004) resulting in higher ITBS scores. Computers within classrooms and within several locations arranged throughout the campus for teachers and students are highly valued by teachers and students and are seen as enhancing learning and teaching (Tanner 2000; Building Futures 2004; Department for Education and Skills 2003; Heath 2008)

The availability and accessibility of high quality resources and accessibility are an essential feature to responsive classrooms and are crucial in creating effective learning and teaching environments. Communication with fax machines, printers and internet access, telephone lines in classrooms was also noted and valued amongst teachers. (Tanner 2000). This reduces their sense of isolation and creates better collaboration amongst their peers (Uline 2007).

2.3.10 Shared Spaces

Shared spaces are considered to be connections. It refers to the relationship between the spaces, the building, the building with the campus and its neighbourhood. In order to foster a meaningful partnership with neighbourhood and enrich the school life of students, it is important to create opportunities with the community and its resources.

Collaboration areas or break-out spaces can be designed in a number of ways. The following are a few practical solutions for collaboration areas:

a. As an extension of the teacher's prep area and functions as a common space within a classroom cluster (**Figure 2.20**)

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Fig 2.20 and 2.21 has been removed due to third party copyright. The
unabridged version of the thesis can be viewed at the Lanchester
Library, Coventry University
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Figure 2.20: Collaboration area within classroom cluster;
(Trailside Elementary, Park City,   UT - VCBO Architecture) (Source:AIG.org)

b. As an extension of the classrooms with provision for lectures and presentations with ICT and arena style seating (**Figure 2.21**)

Figure 2.22: Plan of extended collaboration area (Nibley Park Elementary, SLC, UT –
VCBO Architecture) (Source: AIG.org)

c. Set within support areas and specialized learning areas as a casual break-out area with the main circulation corridor (**Figure 2.22**)

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Fig 2.22 has been removed due to third party copyright. The unabridged
version of the thesis can be viewed at the Lanchester Library,Coventry
University
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**Figure 2.22: Collaboration space as part of circulation corridor (Sunset Ridge Middle school, UT – VCBO   Architecture)
(Source: AIG.org)**

2.3.11 Scale

Scale is concerned with the fit between individual personality and the physical environment with which it is concerned. Ergonomics is concerned with creating interesting and engaging spaces which accommodate all the needs of the children using it and how their bodies interact with the entire environment (Barret and Zhang 2009)(See Appendix A10 for design implications)

2.4 Conclusion: 21st Century School Design learning environments of the future

The built environment must be carefully designed as it plays an important role in enhancing and facilitating learning and teaching. Good school design must infiltrate the visual standards of everything from signage, graphics, furniture and materials. The focus should not be the building alone but on the spaces and environments with in that in turn support teaching and learning styles (Sanoff 2007).

Current learning and teaching styles suggest the need for new forms of learning environments characterized by different activity settings. Several emerging models of what constitutes good design have been established by organizations such as CEFPI, Exemplar and CABE. The following is a list frame work examples that have been published by various organizations as a guide for new primary schools

    i.   Wallbridge and Gillies ((Arnold, D., Olcayto, R., Olliff, M. 2009)

    ii.   Six Essential Elements that define educational facility (Fielding 2006)

    iii.   DfES Exemplar Models (2003)

    iv.   Building Futures- 21st Century School: Learning Environments of the future

    v.   12 Design principles for school design (Lackney 1999)

The commonalities between these frame-works can be summarized into specific criterion that contributes to good school design that facilitates learning (See Appendix A11 for design criteria).

2.5 Post-Occupancy Evaluation in the educational system

If we consider Tanners, Lackney or Moore's theory of school architecture influencing academic achievement to be true, then the next concern is how one does gauge or evaluate whether the building is successfully facilitating learning and teaching. For this purpose a systematic analysis of the of the building and its design issues from the view points of all the user has been formulated known as Post Occupancy Evaluation which will be the tool used to assess Saudi Primary schools and the condition of the educational adequacy. Post-occupancy evaluation of schools has an almost forty-year history starting in the late 1960s in Scotland. Over 50 schools were appraised and provide seminal examples of post-occupancy evaluations (Lackney 2001). In the United States alone dating back from 1975 numerous university studies were conducted on Post-occupancy evaluations

The need for effective POE in the educational setting has been recognised (Lackney 2001, Sanoff, Pasalar *et al.* 2001). It should aim to assess the extent to which the building supports the educational goals of the school by measuring its physical appropriateness to its function (Hawkins 1998). POE should "describe, interpret and explain the performance of a school building" (Sanoff, Pasalar *et al.* 2001:7).

POEs are a valuable tool in educational design practice as Zimring and Rosenbeck (2001) summarize a number of benefits ranging from communication among stakeholders, quality monitoring, supports fine-tuning and renovating existing settings, to accelerating organizational learning. To further support POEs, the findings and design solutions of using the POE are invaluable to the design process resulting in the most unique, functional and uplifting spaces as the design solutions originate from the occupants themselves. The occupants are in control of the final outcome and tailored to their needs (Watson 2003).

Chris Watson, a specialist in POEs discusses in his articles how conducting POEs are extremely beneficial since it assists in identifying key issues for easy fine tuning of the building such as providing additional signage, taps or shelving provides significant improvements. It improves the design for future buildings but more importantly it assists in evaluating the existing building through the view points of all

parties concerned using a walk-through interview method that allows transparent reports and minimizes evaluator biasness (Watson 2003).

The Scottish Executive, responsible for Scotland's school facility funding along with the local authorities aimed to achieve excellence in the school estate by implementing POEs and engaging with the stakeholders (Watson 2005). A demonstration was set out to showcase how the local education authorities can learn from completed school projects to inform future school design and formed part of the Scottish Executive's publication 'Evaluation' launched in June 2003. It offers guidance on evaluating and learning from completed school projects and is intended to assist local authorities in assessing how well a completed school building project meets the needs of pupils, staff, parents and the wider community. The guidance has contributed to a growing emphasis by local authorities on the importance of evaluations as both a quality and continuous improvement tool. The Scottish Executive stated that implementing a POE into Scotland's system for producing high quality schools is a good solution to satisfy schools, local authorities and architects (Watson 2005). The UK Treasury guidance on economic appraisal emphasized the need for evaluation for school estates in regard to major government expenditure (Watson 2005).

In Brazil, Post-Occupancy Evaluation (POE) has been applied by teams of researchers and consultants in important universities, research institutes and consultancy firms since the early 1980s such Centre for Research in Technology of Architecture and Urbanism (NUTAU) and the School of Architecture and Urbanism (FAU) of the University of São Paulo. In this regard, many studies have been carried out recently on POEs applied to school facilities, ranging from kindergartens (Elali, 2002) to secondary schools (Ornstein, 1997;Azevedo, 2002; Roméro, Ornstein, 2003; Ferreira, 2005. NUTAU has carried out important studies in the field, together with the IBPE (International Building Performance Evaluation) Consortium, coordinated by W.F.E. Preiser (Orneisten 2005; Preiser and Vischer 2005)

A number of Brazilian researchers have explored the potential of a POE as an effective evaluation tool in an effort to strengthen the connection between school

design and educational design. Many of these studies have been informed by international sources such as Sanoff (2001) and Zeisel (2006).

Between 2005 and 2007 the Organization for the Economic and Cooperation Development (OECD) through the centre for Effective Learning Environments (CELE) and Programming on Educational Building (PEB) joined forces to develop internationally recognized, user-friendly tools to evaluate the performance of school buildings by using the POE. The goal was to inform pre-design and design activities and refine building quality (Ornstein 2008). Brazil has also taken part in OECD's program for POE implementation as a partner country along with Israel, Chile and the Russian Federation. The survey was implemented in 43 countries in 2000 and 41 countries in 2003, 57 countries in 2006 and 62 countries registered to participate in the fourth assessment in 2009.

The author discusses, as an example, how Ministry of Higher Education, New Zealand conducted a POE for their first school with a National Technology Curriculum. The POE was conducted as a model to evaluate and identify the strengths and weakness of the school before similar designs were replicated based on those results. In principle, this strategy is an adept approach giving the opportunity for replica models to be streamlined.

In several developed countries such as UK, Portugal and New Zealand, Ministries of Education now require the application of POE to inform school buildings improvement programs and countries such as the U.S.A., Canada, Germany, and others (Ornstein 2005; Voordt and Wegen 2005; Federal Facilities Council,2001) have been applying the POE for decades.

In a cursory review of the literature available, there seems to be a tremendous amount of activity in post occupancy evaluations. However the reality of the situation is that over the past decade thousands of new school buildings and renovations have been planned, designed and constructed but only a small fraction of them will ever be evaluated against the educational needs of the students and teachers (Lackney, 2001). Furthermore empirical evidence shows that the POE in the practice of educational design in general, is scarce and rarely practiced (Lackney,

2001). One of the greatest obstacles is that professionals guard their reputation and avoid litigation. If used it is seldom for the improvement in educational design practice but to conduct cursory facility assessments to determine renovation or construction needs (Lackney 2001).

2.5 The Role of the End-User in POE

Often building assessment in the past has relied on the judgements of "experts" as to the success or otherwise of a school building. However this research takes as its premise that those who are the most expert are the end-users. As Sanoff says:

"A key issue is whose judgements should be sought in an assessment. There is a tendency to regard expert opinion as always more reliable and correct. For many aspects of the environment, the experts are the people who know most about using it - the user." (Sanoff, Pasalar *et al.* 2001:8)

The post-occupancy toolkit was designed to consult all users, positioning children and adults who use the school as expert.

The questionnaire, designed as the first stage in the POE, was tailored to ask questions specific to each adult user group. Rather than one generic questionnaire for every user group, or only asking more senior members of staff about the building, the questionnaire assessed each adult user group's needs and the extent to which these needs are met, thus drawing on the expertise of each adult group.

Children were likewise regarded as experts of their own experience, and the scheme of work that was developed as part of the evaluation drew upon knowledge, both tacit and explicit, that was specific to children's experiences of school.

Implications:

It can help prevent the repetition of errors in new designs and serve as a basis for consolidating and recommending better architectural and construction practices (Ornstein 2008). It can also inform specific future development decisions and supports development of policy as reflected in design and planning guides (Zimring and Rosenheck (2001).

2.6   Summary:

A learning environment is directly affected by three important factors:

a. The power of place

b. School climate

c. Built environment

Exterior design patterns that directly affect student achievement are

1. Movement and circulation

    a) Threshold and pathways

    b) Entryways

2. Outdoor and public spaces

3. View

4. Cleanliness

5. School Size

FACTORS	IMPLICATIONS
Movement and circulation	• Allows freedom, improved concentration and assists in developing way finding • Standardized scores were higher
Outdoor and public spaces	• Develops a sense of community and socializing skills • Develops social, cognitive, and physical skills. • Develops muscles, bones, motor coordination, eye-hand coordination, process skills and decision making
Controlled School size	• Higher attendance rates • Greater participation • Fewer incidents • Decreased vandalism • 15% higher in maths, 4-9% better in reading • Better self-esteem and leadership

Interior Ergonomic Design Patterns that affect academic achievement

FACTORS	IMPLICATIONS
Lighting and natural lighting	- Improves health, - Reduces vandalism and mental fatigue - Better attendances - Noise levels drop 20% faster in maths and reading - Improves concentration
Acoustics	- High cognitive functions - Improves reading, memory, concentration, listening, and behaviour.
Thermal conditions	- Effects maths and reading directly - Reduces poor behaviour and absenteeism - Increases performance - Poor conditions lead to 15% less physical work leading to 26% decreased output
Indoor air quality	10 million days lost in a year due to absenteeism - Causes drowsiness, reduced attention spans, - Better air quality improves work by 7 to 8%
Colour – visual ergonomics	- Creates mental stimulation and better attention spans - Decreases absenteeism and creates better attendance
Class density	Poor class density creates cognitive fatigue, distraction, behavioural problems, aggression, withdrawal, stress and dissatisfaction
Appropriate class furnishings	- Creates a productive class - Better attendance, greater participation and attitudes - Interaction, motivation, persistence to complete the task - Able to complete tasks and engage in a variety of tasks - Self directed studies and independence
Technology and resources	Better progression in class Reduces isolation Creates better collaboration with peers
Shared spaces	Fosters partnerships and sense of community

Incorporating the above design patterns is not the only concern in creating an effective learning environment. Ensuring Post-occupancy evaluations are also necessary. This becomes a valuable tool for continuous quality monitoring, fine tuning improvements and contributes to the design process. It strengthens the connection between schools and design. The POE can also be used to inform other school design.

When designing a learning environment that can improve academic achievement exterior and interior design patterns must be considered and implemented. According to the experts physical factors have a mediating effect on successful learning, where standardized tests have improved between 5 to 11%. When the following exterior and interior design patterns were introduced into schools, higher achievement scores were recorded, better attendance, reduced vandalism, higher cognitive functions, better concentration, reading, memory and behaviour, and all round improved performance. Studies have also shown that not incorporating these design patterns have induced forms of jet lag, affected their behaviour negatively, social withdrawal, lower graduation and more aggression. Physical characteristics of the facility have a stronger effect on student's performance then the combined influence of family background, social economic status, school attendance and behaviour. Studies have also shown that academic achievement tended to be better when schools were clean and had good appearance features influencing student morale, values, aspirations, creativity, expectations and performance. It also enhances their sense of belonging and ownership. To summarize creating an ambience (school climate) that creates a positive sense of place within a school should be the goal of every designer as it acts as a catalyst for the learning climate and the student learning engagement.

CHAPTER 3

METHODS

3.1 Introduction

The aims of this chapter are to provide a rationale for the mixed method approach and techniques developed as part of this research. Firstly, the chapter will provide the philosophical position underpinning the research. Secondly it will provide a detailed account of the research design throughout the study; i.e. assessment of the built environment using design checklists and the POE toolkit.

3.2 Philosophical grounding of the method

3.2.1 Developing and understanding of the occupants perception

Understanding the behaviour of the occupants' experiences; how they feel, think and interact with their built environment is the key approach to this study. In order to develop design principles that cater to their needs specifically, the key philosophical consideration for this study will be an Interpretative paradigm. An Interpretivist epistemological approach strives for understanding of human action within the context (Taylor n.d) and will require detailed qualitative research methods through interviews and observations of the occupants within the schools. This will provide the researcher with 'rich descriptions' to generate understanding of the 'insider's view' and to allow critical categories and patterns to emerge from the encounters (Hoey n.d).

However to ensure the validity of the study, and to anchor stakeholders perceptions on design features, a quantitative method was used in parallel to support and verify the data collected through the qualitative methods. In this research, the aim was to reduce any interpretative biases of the analysis and to allow a more objective

perspective by using structured questionnaires (POE toolkit) that are standardized and repeatable. This blends more with a positivist approach. The quantitative analysis allows the data to be analysed using simple descriptive statistical methods (such as frequencies and distributions) from which recommendations can be made which can be fed back to the schools.

3.2.2   Assessment of the built environment

The aim of the study was to provide recommendations and formulate a new set of design principles for primary schools in Saudi Arabia. These recommendations would be based on the results of the evaluation of the stakeholders' perception using the POE toolkit and on the assessment of the physical environment of the representative schools. The assessment of the built environment must allow for a more scientific and standardized approach.

Four assessment instruments were used to measure the quality, functionality and adequacy of the school's built environment. These were

1. The CEFPI Educational Adequacy Instrument (2002). This provides a score out of 100 that can be used indicate the overall adequacy of the school and allow the researcher to locate the weaknesses within the spaces.

2. The Design Assessment Scale for Elementary Schools (1999). This provides a checklist of items according to best practice. This allows the identification of missing items such as instructional zones, group areas, or activity zones. Again the school can be rated out of 100. This enables a judgement to be made of the function and quality.

3. Fielding and Nair's Checklist of Design Patterns (2005) designed to evaluate ideal learning environments was used.

4. Lackney's Class Learning Modalities.

This phase of the study was conducted through a more positivist approach to minimize the researcher's subjectivity. The final conclusions and recommendations will be based on patterns and regularities seen through both the qualitative (interviews and observations) and quantitative methods (Assessment tools) used.

3.3 Research Design and Methods:

The research was conducted in 2 phases
1. Assessment of the built environment through observations and completion of checklists, and interviews.
2. Multi-stakeholder evaluation of the school using the POE.

Table 1 provides a brief summary of the techniques adopted in these phases.

Table 3.1: Summary of techniques used in the empirical phases of the research

Phase	Research Method	Techniques	Sample size	Role performed by study
Assessment	Qualitative	Observation		To generate an understanding of the context
		Photo Documentation		
	Qualitative	Semi- structured Interviews for teachers	38 teachers	To provide insight into the users' perspective of the schools
	Quantitative	Assessment form		To assess the built environment
Implementation of the toolkit	Quantitative	Questionnaires to different stakeholder groups	51 Teachers	Assess the way in which the school is perceived by the different stakeholder groups.
			73 parents	
			334 Students Key stage two children	

3.3.1 Ensuring validity of data:

Social research needs to demonstrate validity, or as some researchers have suggested quality, rigor and trustworthiness (Lincoln and Guba 1985, Seale 1999, Stenbacka 2001, Davies and Dodd 2002). Triangulation has been defined as 'a validity procedure where researchers search for convergence among multiple and different sources of information to form themes or categories in a study' (Creswell and Miller 2000). Triangulation is a key concept underpinning the adoption of a mixed method approach for this research in order to ensure its validity, rigor and trustworthiness. According to Denzin there are four forms of triangulation in research that have been identified (Denzin, 1970). These are

a. Data triangulation [e.g. several sampling methods, different groups of participants]

b. Investigator triangulation [more than one researcher involved in the collection and analysing of data]

c. Theoretical triangulation [the use of more than one theoretical position in analysing the data]

d. Methodological triangulation [more than one method for data collection]

For this study the researcher used methodological and data triangulation for the two phases. In the assessment phase several data collection methods were used and in the second phase the POE toolkit was used to assess the views of different groups of participants (data triangulation).

In the assessment phase, the methods used were observations, interviews and four assessment instruments as can be seen in Table 2. In the second phase, the implementation of post-occupancy evaluation toolkit, both quantitative and qualitative methods were used. A set of closed questions were used to provide data for analysis as quantifiable variables as well as open questions to give participants the opportunity to respond to other information that may have been missed thus providing triangulation. Finally the entire population of the three target schools that were surveyed resulting in 456 provided further validity to the research. The phases, triangulation methods and instruments used can be seen in table 2

Table3.1: Triangulation method and instruments used

Phases	Triangulation Method	Method	Instrument
Assessment	Methodological triangulation	Observation and Photos	Field notes
		Interviews	Interview schedule
		Assessment scale for school 1	DASE
		Assessment scale for school 2	CEFPI Adequacy Assessment
		Assessment of classrooms	Fielding/Nair Learning Modalities
		Measuring against Design Patterns	Fielding/Nair's 28 School Patterns
POE	Data triangulation	Teachers Survey	TLEA + CEFPI
		Parents Survey	TLEA + CEFPI
		Students Surveys	Newman's POE toolkit

3.3.1.1 Validity of Data for the Assessment Phase

Building assessments, according to the literature, should be conducted by architects who are equipped with the knowledge of space planning, design criteria, aesthetics and architectural standards. As a trained architect I had the knowledge required to assess the schools in a professional manner and was able to recognize areas of weakness and strengths within each of the schools. All methods used during the assessment phase were done in accordance to architectural and design practice such as ideal planning layouts, standard sizes, circulation patterns, and aesthetics.

As mentioned earlier the assessment phase comprised of 4 parts, observations and photo documentation, semi-structured interviews and assessment tools. These methods rely heavily on the perception and interpretations of the researcher. In order to avoid bias and conduct these studies in a professional and repeatable manner, methods were executed in accordance to techniques used by recognized experts in the field of effective learning environments; namely Sanoff, Council of Educational Facility Planners International (CEFPI), Fielding and Nair, Tanner (University of Georgia's School Design and Planning Laboratory) and Lackney.

After the start of the study, all observations were made in accordance to criteria set by Sanoff's Initial Building Observation form (See Appendix B1) to ensure that all key issues would be addressed and that photo documentation could be used to verify the concerns and deficiencies within each school. In order to validate the observation data, results were then corroborated with the results of two of the assessment tools which addressed key design patterns that should be present in order to have an effective learning environment; Fielding and Nair's Design Pattern checklist and Lackney's Learning Modalities Checklist for Classrooms. These two checklists were used as a means to ensure that observations were made in accordance to specified criteria and not simply a matter of the assessor's personal opinion. In order to support this data, the next two assessment tools, Design Assessment Scale of Elementary schools (DASE) and Council of Educational Facility Planners International (CEFPI) Adequacy Assessment were used to determine a score for each of the schools which also verified the observations made. If the

observations indicated for e.g. classrooms appeared congested, ill-maintained, lacking several resources or storage, poor lighting etc., the DASE and CEFPI would not only determine a score that would indicate the adequacy, functionality and quality of the classroom but also validate and confirm through the scale that the conditions observed by the researcher were indeed poor. These results will then be triangulated with the POE to validate the concerns and to determine emerging themes such as crowded classes, noise levels or poor lighting conditions.

3.4 Description of Methods

3.4.1 Rationale for school selection

The research study took place in three primary schools in Jeddah. All three schools were English-medium international schools mostly targeting the expatriate community and with a small percentage of local students (forming an average of 20-25 percent of the total student population in the past 5 years). These schools were targeted as Local Saudi private schools or government schools do not allow visitors and have strict policies against photography which render the assessment difficult without governmental permission. Secondly, local schools in Saudi Arabia are segregated. Females would not be allowed to enter the male premises. As the researcher is female that eliminated the option of local schools. Lastly, local schools are Arabic-medium which means Arabic is the official language used and means of communication would have to be in that language. It would make the evaluation process difficult as well as inaccurate as the researcher would have to rely on translations and would not be able to communicate freely with the faculty or students. Together these factors lead to the final decision to target international English-medium schools as a target example of schools in Saudi Arabia that have been evaluated according to

1. Assessment phase using methods of observations, interviews, checklists and assessment tools (DASE and CEFPI measuring tools)
2. Evaluation phase using Newman's POE toolkit to understand the perception of the stakeholders.

The findings would be used to make final recommendations for all three schools to improve their learning environments. Additionally this study will also be used to demonstrate to the Ministry of Education, the advantages of conducting Post-Occupancy Evaluation and to embed this as a process in the educational system as an ongoing tool for improving quality.

3.4.2 Methods used in the assessment phase

As seen in Table 1 the assessment of the school environment was conducted using four methods.

1. Observation
2. Photo documentation
3. Semi-structured interviews
4. Assessment tools

1. Observation

   This method was used to observe how the built environment impacted the way the occupants worked, played and interacted with the building during the day and allowed the researcher a better understanding of the operations within the facility.

2. Photo documentation

   Photography is well established as an effective method when conducting research with children (Aitken and Wingate 1983, Orellana 1995, Burke 2005) and has been cited as particularly effective in educational research (Fischman 2001). Photographs were taken in all phases of the research. A note must be added that MJIS School did not authorize photo documentation.

3. Semi-structured interviews

   Interviewing is a useful way of getting very specific information and developing a deeper understanding of problems (Sanoff 2001). A semi-structured style was adopted focusing on the agenda of effective learning environments and themes that emerged from the observations.

4. Assessment instruments and checklists

For the purpose of this study, four different assessment tools were selected to evaluate different aspects of the school. Each tool has been designed to evaluate a certain aspect of the school environment, so using a combination of them was needed for full coverage. For example, the Design Assessment Scale of Elementary schools (DASE) can only be used to identify which items are deficient within the school according to best practice where as the Council for Educational Facility Planners, International (CEFPI) Assessment tool assists in determining whether areas such as science labs, library or dining area are adequate in terms of quality and student needs.

i.   Design Assessment Scale of Elementary schools (DASE)

This instrument was developed by Kenneth Tanner (1999) to assist educators and architects in planning and designing appropriate learning environments of primary schools and is intended to measure various aspects of best practices existing in the schoolhouses (See Appendix B2).

ii.   Council of Educational Facility Planners International Educational Adequacy
        Assessment

This instrument was developed by the CEFPI School Building Association in 2002 to assess the educational adequacy of school buildings. The assessment was carried out for each campus and compared. (See Appendix B3).

iii.   Nair's 28 Design Patterns

All schools require a shared vision or an actual design vocabulary allowing designers, staff and teachers a set pattern language to supplement their requirements (Fielding and Nair, 2005).The 28-item school design pattern provides a comprehensive set of design principles that define best practice (Fielding and Nair 2005)(See Appendix B6).

iv.   Learning Modalities for Classroom

A successful learning environment must accommodate and nurture the 18 learning modalities which are all the positive attributes that classroom should nurture (Nair

2005). This instrument functions as a checklist of items to measure the effectiveness of classrooms. The Learning Modalities Checklist allows the assessor to recognize the lack of facilities and organization within the classroom (See Appendix B7).

The methods used in this phase not only document the current conditions of the learning environments but also show how occupants interact with the building. Together these, assist the researcher in recognizing patterns such as circulation, behaviour, or congestion.

In addition, the researcher's observations and concerns informed the interview schedule giving insight into teachers' perception on these matters and the opportunity to clear any uncertainties.

The various assessment tools used provide clear indications according to best practice where the deficiencies and strengths lay within the built environment. This triangulation of methods in this phase ensures a complete and unbiased assessment, which in turn provides the researcher with the knowledge to interpret the data gathered from different user groups using the POE and provides a rationale for adopting the POE toolkit where necessary. The POE was specifically introduced as none of the assessment tools considered the views of the stakeholder groups. In short, the assessment informed the POE phase by enabling it to be tailored to suit the local conditions of each school.

3.5 The Post-Occupancy Evaluation toolkit

3.5.1 POE Rationale

In order to assess and evaluate the schools in Saudi Arabia, a physical assessment alone would not be sufficient. Understanding the occupants' perceptions of how they feel about their built environment is essential to the design and evaluation process. Determining what the end-user actually wants and needs should play an important role in school design and final recommendations. For this reason a Post-Occupancy Evaluation were conducted that provided 'an appraisal of the degree to which a designed setting satisfies and supports explicit and implicit human needs and values for whom a building is designed' (Friedman 1978:20). This is

acknowledged as a means of improving the quality and sustainability of buildings (Bordass and Leaman 2005a). In the Egan report (Egan 1998) commissioned by the Deputy Prime Minister's Office to investigate the reason behind the dissatisfaction within the construction industry clearly stated the reasons for using POE:

"…construction can learn from other sectors of the economy in tackling these problems by focusing the construction product on delivering the needs of the end-user or consumer through the end product" (Egan 1998:19)

In the POE the end-user is considered to be the expert and not the external observer. The post occupancy evaluation is crucial in the process of the construction industry meeting user requirements. Sanoff says:

'A key issue is whose judgements should be sought in an assessment. There is a tendency to regard expert opinion as always more reliable and correct. For many aspects of the environment, the experts are the people who know most about using it – the user. (Sanoff, Pasalar *et al.* 2001:8)

Two POE toolkits were used that were designed and tailored to ask questions to specific user groups rather than one generic survey for all users. The first questionnaire was Newman's post-occupancy toolkit designed to consult children who use the school as experts and to evaluate the built environment through their perception. The second questionnaire for teachers and parents was developed by the researcher for the Saudi context from an amalgamation of The Learning Environment Assessment (TLEA) and the Council of Educational Facility Planners International (CEFPI) and Newman's POE.

3.5.2   Students POE

The first instrument used to survey the students was Newman's Toolkit developed in her doctoral research (2009) for use in her dissertation. According to Newman's research, a gap had been identified of the various methods available for POE of primary schools. Of the available toolkits: 'schoolworks' was developed for secondary schools, the Building Use Study for commercial buildings. Neither the Design Quality Indicator developed by the Construction Industry Council, the Centre

for Effective Learning Environments for the evaluation of learning environments or even the Council of Educational Facility Planners International's questionnaire targeted elementary schools. Questions were not specific to the needs of children nor were the questionnaires suitable for young children, making it difficult for them to understand. Newman developed a toolkit that was designed to evaluate the perception of how the students felt about their schools and to produce a set of data that could be analysed to see the areas that most children thought supported their learning or detracted from it (Newman 2009). The toolkit was viewed by staff at Coventry City Council prior to being used to evaluate five schools.

The survey was specifically developed for key stage two students, ages 7-11. It consisted of a workbook which revolved around a set of characters called the Cool Crew to which the students could relate. The characters were shown in a variety of situations and activities that children would encounter throughout the school day which the children were then asked to reflect on. All questions were developed to evaluate the student's perception of their facilities. The instrument is categorized into 14 sections questioning students on their school, lunchtime, PE, classrooms, art, science, home time, library, ICT, shared areas, toilet, playgrounds and assembly. The sixty six questions were categorized into closed yes/no questions that formed the majority of the survey and allowed for enough data to be collected and the rest of the questions were a descriptive selection of words that implied positive or negative responses of the individual areas of the school. The children were also given the opportunity to write sentences and reasons and to draw maps of their school and visually represent their understanding of places of significance, a technique used by many researchers when dealing with children who might not be able to express themselves verbally (Matthews 1984, Matthews 1987, Young and Barrett 2001a, Darbyshire, Macdougall *et al.* 2005, Hume, Salmon *et al.* 2005) (See Appendix C1).

3.5.3   Teachers and Parents POE

The second instrument was an amalgamation Total Learning Environment Assessment (TLEA) survey, Council for Educational Facility Planners, International (CEFPI) Post-occupancy evaluation for primary schools and Newman's toolkit. All three instruments were designed to target teachers and senior staff. The three

surveys were merged to develop a more specific evaluation for Saudi Arabia focusing primarily on effective learning environments.

The first instrument, TLEA was developed and validated by O' Neil (1999) and consisted of two sections (Monk 2006). The first section measures the Educational Adequacy using 47 questions that to investigated Academic Learning Spaces or those areas most commonly used by teachers and students, Specialized Learning Spaces such as science, labs or library and lastly Support spaces such as cafeteria, teachers lounges and shared areas. This uses a four-point Likert agree scale. The second section measures the quality and adequacy of the environment. This consists of 35 questions regarding both exterior environment and interior Environment. This instrument was designed for architects as a widely usable and applicable survey.

The CEFPI evaluation form (See Appendix C2) comprised 60 questions focusing on perception of the occupants on components such as building features, classrooms, overall impression, and safety and support areas. The survey focused on specific questions on what the occupants felt about ambient factors such as noise, ventilation systems, light quality etc. The survey was designed to understand how the teachers felt about safety and supervision and whether design features such as stairwells, restrooms, sidewalks and outdoor areas were easy to supervise and had clear sightlines. It deals with education adequacy concerns such as sufficiency of storage and materials for teachers and students, if the classroom permitted a variety of arrangements or allowed individual study. This survey focuses on many factors directly related to comfort, flexibility, and functionality of learning environments. This also used a four-point Likert agree scale

Lastly, Newman's toolkit was used which comprised of four sections (See Appendix C3). Section A which comprised of questions related to classrooms. Section B which was concerned with other areas of the school such as toilets, cloakrooms and shared areas. Section C which was concerned with the Internal school environment such as sufficiency of display areas, ICT provision, storage for personal belongings, and if the design caters to the physical needs of the children. Lastly section D which comprised

of aspects related to the outdoor environment such as landscape, play areas and relaxation spaces. This survey used a 7-point scale from strongly agree to strongly disagree and not applicable.

Using these as a starting point, a final measurement instrument was compiled consisting of 117 questions, each of which could be rated on a 4-point Likert scale. (Strongly agree=4, agree=3, neutral=0, disagree=2, strongly disagree=1). The primary purpose of this final instrument was to determine the educational adequacy and quality of school buildings focusing specifically on effective learning environments (Hawkins and Lilly, 1998). The instrument consisted of seven categories. Academic Learning spaces, specialized Learning space, support space, cleanliness and maintenance, building features, safety and security, classroom workspace (See Appendix C4). The parents were only required to fill in the section on overall building features (See Appendix C5).

3.6 Methods of Data Collection

Prior to arriving in Saudi Arabia, head teachers were contacted via email in Jan 2010 and appointments were set for February. Participating schools were informed an assessment would be made by the researcher with final recommendations for improvement of the learning environment, in exchange for participation in the study. All schools agreed to participate provided their schools remained anonymous. Each school would be assessed and given the POE toolkit consecutively. The time frame for the entire study was estimated at 2.5 months from February 2nd – April 15th 2010. It was also estimated that an average of 3 weeks would be required to conduct the study within each school.

The 117-item survey was submitted as a hard copy to be filled by the teachers. Completion time was estimated at 20min. The students were given Newman's 66-item toolkit and the teachers were requested to supervise their class during the survey time to avoid students influencing each other's responses. If they had any

queries they may request for the teachers assistance. Completion time was estimated at 45min.

<u>BISJ School 1</u>

The first meeting with the Head teacher was conducted on 2nd Feb 2010 for official authorization and introduction to the study. The researcher was assigned a liaison officer who determined the teachers and classes that could participate in the study. As the study targeted only key stage 2 (Ages 7-11), the coordinator assigned two classes from each year group and their respective teachers. This resulted in a population of 140 expected participants out of the total number of 400 students in key stage 2. The expected population for the teachers was 28 participants.

On February 6, 2010 surveys were sent out to all participants in a hard copy format. On February 15, 2010, 75% of the surveys were returned by students and 54% by teachers. On February 20th, 2010, 93% of the surveys were collected from the students which results in 131 students and 64% from the teachers which resulted in 18 teachers.

A target population of 50 parents were requested by the researcher. On March 1, 2010, 25% of surveys were returned by parents. On March 3rd, 2010 additional emails were sent out to the parents encouraging them to return the surveys. On March 9th 2010, a further 35% surveys were returned. This resulted in a sample size of 30 participants.

<u>AISJ School 2</u>

The first meeting with the Principal was conducted on February 3rd 2010 for official authorization and introduction to the study. Final permission was granted on February 21st 2010. On February 28th 2010, the surveys were sent out to students, parents and teachers. This resulted in a population of 115 expected participants out of the total number of 252 students in key stage 2 and 24 teachers in key stage 2 out of the 45 in the primary school. On March 8th 2010 40% of the student and 20% teacher surveys were returned. On March 14th 2010, 55% of the students and 30% of the teachers' surveys were returned. Finally on March 24th 2010, 78% of the

students and 75% of the teachers' surveys were returned which resulted in 90 students and 18 teachers. Parents' responses were slow and after 36 days on April 3rd 2010, only 30% were returned with a total population of 21 subjects.

<u>MJIS School 3</u>

The first contact was made to the third primary school via email on March 7th 2010 to set a date for the first meeting with the principal. This was finally conducted on March 17th 2010 for official permission and introduction to the study. On March 20th 2010 the surveys were submitted to the teachers and students. The target population was 144 out of 260 students and 27 teachers in key stage 2. On April 3rd 2010, final responses resulted in a total population of 113 participants which was a 79% returns rate. On April 10th 2010, 66% of the teachers responded resulting in 18 participants.

The parents' responses were returned three days before the end of the study on April 12th 2010 with a return of 20 surveys in total which corresponded to 28% of the expected returns. Parent results were quite low for a number of factors. Firstly due to the fact that it was an all female school, fathers who were not permitted to enter the premises, could not complete the form. Secondly, as many of the children were from non-English speaking families, many of their mothers could complete the survey.

Data collection methods used for the assessment phase will be given in detail in the next chapter.

3.7 Summary

The aim of this study was to assess the learning environments of the representative schools in Jeddah according to best practice and the perception of the stakeholders and to formulate a new set of design principles and recommendations. The study had to be conducted in a manner that would reduce any interpretative biases. This was achieved by using structured methods that could be standardized and repeatable. Furthermore validating the data collected from these methods was an essential part of the study.

To ensure the validity, methodological and data triangulation were used for both phases. In the first phase (Assessment phase), a methodological triangulation approach was adopted by using several methods for data collection and in the second phase (POE), data triangulation was adopted by using several participant groups.

In the assessment phase, the methods used were observation, photo documentation, interviews and assessment tools. Observation allowed the research to get insight into how the occupants interacted with the built environment and the photo documentation allowed the recording of these conditions. This phase then informed the interview phase to clear any uncertainties or concerns that may have arisen during the observation. In addition 4 assessment tools were used that focused on different aspects of the learning environment to provide a full coverage of the conditions of the facilities.

1. Design Assessment Scale for Elementary Schools (DASE) instrument that provided a checklist of items that would allow the degree of functionality and quality to be measured.
2. Council of Educational Facility Planners International (CEFPI) instrument that measured the adequacy of the various functions
3. Fielding and Nair 28 Design Pattern Checklist provided a comprehensive set of design principles that define best practice
4. Lackney's Class Learning Modalities provides checklist of items to measure the effectiveness of classrooms.

In the second phase (POE), understanding the occupants' perception about their learning environment was an essential part of the design and evaluation process and was considered as the experts. The participants used for this study were students, teachers and parents. To fully understand the perception of how the occupants felt about their school, Newman's POE toolkit was used which was specifically designed for this purpose. The data collected would enable the researcher to note areas that the occupants thought most supported their learning environment or detracted from it. A specific instrument was designed for each participant group.

1. Students were given Newman's POE toolkit that was a combination of closed yes/no questions and a set of descriptive questions that allowed the students to give reasons for their answers or how they felt about specific areas of their school.

2. Teachers were a given a toolkit that was an amalgamation of surveys that specifically focused on learning environments; academic learning areas, specialized learning areas, support and building features.

3. Parents were given a toolkit that only required them to answer questions regarding building features such as light, landscape, ambience, welcoming entry and easy way finding.

The final conclusions and recommendations were based on patterns and regularities seen through both these qualitative and quantitative methods. Additionally the data from both phases was triangulated, not only to validate both methods but to determine patterns on which to base final recommendations.

CHAPTER 4

Study 1 - Assessment of the Built Environment

4.1 Introduction

As mentioned in the previous chapter, the study was conducted in two phases; the assessment/audit of the built environment and the implementation of the Post-occupancy toolkit. This chapter deals with the assessment of the built environment and the methodology used during this phase. It looks in details at each of the schools that participated such as the age of the building, the total enrolment and built environment.

The assessment phase was conducted in parallel with the POE after the initial tours were arranged by the head teacher to allow the researcher to familiarize herself with the site. All staff were instructed and informed about the study and permission was granted to observe all areas of the school for the duration of the study.

4.2 POPULATION: Participating schools

4.2.1 Selection of schools

The first two schools (BISJ, AISJ) are two-storey buildings with central air-conditioning and concrete frame structures, placed in a suburban setting (See Appendices D1 and D2 for plans). However the third school (MJIS) has pre-fabricated construction with a concrete exterior shell, located in a commercial area (See Appendix D3 for plan). The three schools have an average enrolment of 443 students. **Table 4.1** identifies the year built, age, square footage, enrolment of primary school students and percentage of total campus enrolment. It illustrates the strength of the primary school as compared to the overall campus.

BISJ School has an ideal student enrolment / built area ratio whereas MJIS with highest enrolment and the lowest built-area may suffer from overcrowding and congestion. AISJ School is the oldest at 55 years old and BISJ School was recently re-developed and is only 9 years old. The table also shows that 52% of the enrolments

at AISJ are primary school children whereas only 30% of the children are enrolled at primary level at BISJ School. These schools are considered amongst the top three International schools in Jeddah that were initially founded for the expatriate community but have in the past 5 years opened their school to local children.

Table 4.1: Jeddah Primary School Description: Year constructed, age, enrolment, built-area

Campus	Year Built	Age	Total Campus Enrolment	Primary section Enrolment	Percentage of the total Enrolment	Built Area
BISJ	2001	9	1550	480	30%	1734.4
AISJ	1955	55	950	500	52%	6147
MJIS	1980	30	1200	450	37.5%	520
AVG		31	1216	443		

4.2.2 Facilities assessed

Each school was physically assessed to gauge the effectiveness of its learning environment. **Table 4.2** illustrates the facilities that were assessed for each campus. The facilities were divided into 4 categories relating to academic areas, specialized learning Spaces, support Spaces and play areas. BISJ school had the widest variety of facilities totalling 23 where as Campus MJIS had the lowest with a total of 7.

Table 4.2: Facilities assessed

Campus	FACILITIES			
	Academic Learning Spaces	Specialized Learning Spaces	Support Spaces	Play areas
BISJ	1. 24 Class bases 2. 3 Learning Support 3. 3 group areas 4. 2 Work room 5. Activity room 6. Gymnasium 7. Sport Centre	8. Library 9. 4 ICT pods 10. Music Room 11. Science prep 12. ICT Suite 13. Art Room	14. Main hall for dining 15. Assembly hall 16. Teacher's Lounge 17. Administration 18. Clinic 19. Toilets	20. Shaded seating area 21. Play equipment area 22. Football pitch 23. Swimming pool
AISJ	1. 23 Class bases 2. 1 special Ed room 3. 4 Arabic classes 4. 5 Teaching support classes 5. Gymnasium	6. Library 7. Music Room 8. ICT Suite 9. Art Room	10. Teacher's Lounge 11. Clinic 12. Administration 13. Reception 14. Toilets 15. Main dining hall	16. 1 Playing field 17. 1 sports Grass field 18. 1 Playing equipment area 19. 2 shaded area
MJIS	1. 16 class bases	2. ICT suite 3. Art Room	4. Central courtyard 5. Teacher's Lounge 6. Toilets	7. 1 small shaded entry court

4.3 DATA COLLECTION: Observation

The section considers the methods used during the assessment phase. These have been organized in accordance to the order in which they were conducted. After the initial guided walk-through tours, observations were made and measured according to Sanoff's Initial Building Observation form. The assessments were then conducted using the 4 toolkits and checklists. Lastly any concerns that arose were discussed in detail during the interview stage to understand the teacher's opinion about their facilities.

4.3.1 Walk-through tours:

Prior to conducting the observations of the school day, the researcher was given a guided tour with a member of staff to familiarize herself with the facility. Walk-through tours were given by the deputy head teacher/principal enabling the researcher to fully understand how the school functioned administratively as well as how problems were dealt with by staff. The researcher was granted permission to shadow the deputy head teacher/principal for one day. This proved to be an effective method as it provided the opportunity to directly access the head teachers and members of staff, allowing the researcher to pose questions on specific areas and issues that may have arisen during the walk-through and observations.

4.3.2 Building Observation:

In this method, data is collected by direct contact with real life situations. The observer records ongoing events and records all the activities taking place within that context (Sanoff 2001). The building observation phase allowed the researcher to observe and collect data on all aspects of the school such as traffic flow, acoustic problems, distances to toilets, disturbances caused by inappropriate adjacencies such as music rooms located near shared learning areas, exit and entry issues, locations and layout problems, lunch time rush congestion, class management, storage of books and bags in classes, congestion and overcrowding during certain periods of the day, and distances needed to travel between areas.

The duration of this process lasted 7 days to allow the researcher to fully understand the operations within the building at all times of the day. The results of the researcher's observations will be discussed in chapter 7 Discussions.

4.3.3 Sanoff's Initial Building Observation

To assist in quantifying the observation phase, the researcher used Sanoff's Initial School Building Observation form developed for National Clearinghouse publications for Educational facilities (See Appendix A1 for results). This consists of a set of statements that represent a brief introduction to the school environment. It provides the visitor with an overall first impression of the existing facilities (Sanoff 2001). There are 15 questions about the overall impression of the facility with a series of yes and no responses. This was used by the researcher on the first visit to the site.

Table 4.3 clearly demonstrates the overall observations of the primary schools. From the checklist BISJ did not fulfil 4 of the 15 criterion relating to outdoor spaces for science projects, quiet areas and privacy in changing rooms. However AISJ and MJIS also achieved low scores clearly revealing poor conditions across the schools.

Table 4.3 – Sanoff's Building Observation Form: By Campus,

INITIAL BUILDING OBSERVATION	BISJ	AISJ	MJIS
Building is in good condition	YES	NO	NO
Neat and clean	YES	YES	YES
Work displayed on Bulletins, Walls	YES	YES	NO
Pictures display various ethnic groups	YES	NO	NO
Displays depict both boys and girls doing various activities, doctors, nurses etc	YES	NO	NO
Announcements of activities	YES	NO	NO
Building is flexible including large open spaces, small multi-functional spaces	YES	NO	NO
Moveable furniture throughout school	YES	YES	YES
Quiet places for individual, group to withdraw/relax e.g. lounges	NO	NO	NO
Identified places where students can be noisy and do	YES	NO	NO

physical activity			
Plenty of room in corridors/classrooms to move from one to the other	YES	NO	NO
Outdoor space for science projects etc	NO	NO	NO
Students responsible for upkeep and appearance of their school, e.g. displays, trash etc	NO	NO	NO
Privacy in bathrooms through doors	YES	YES	YES
Privacy in changing rooms through curtains	NO	N/A	N/A
TOTAL	12/15	4/15	3/15

☐ negative results from the checklist.

4.4 DATA COLLECTION: Assessment tools

4.4.1 Design Assessment Scale of Elementary schools (DASE)

DASE was developed by Kenneth Tanner and validated by the University of Georgia's School Design and Planning Laboratory. It was developed to assist educators and architects in planning and designing appropriate learning environments for primary schools and was intended to measure various aspects of best practices and design patterns existing in schoolhouses (Tanner 1999) (See Appendix B2 for results). The instrument contains 51 items distributed amongst six sections relating to functionality, safety, adequacy, quality, presence and overall impression. The components are measured with a 10-point Likert Scale, where 10=100%, 1=10% and not present or very weak = no response. Higher scores denote higher quality. A score between 60 to 100% denotes an effective degree of functionality.

Table 4.4 DASE Score sheet sample

DEGREE OF FUNCTIONALITY		BISJ School		AISJ School		MJIS School	
		Score 1	Score 2	Score 1	Score 2	Score 1	Score 2
1	Promenade - Walkways linking main outside area ideally placing major activity centres at the extremes	8	8.5	2	2.5	Not present	Not present
2	Green Areas - trees, grass and gardens	5	5.5	5	6	Not present	Not present
3	Quiet areas - Quiet areas to refresh themselves	7	7	Not present	0	Not present	Not present

The researcher assigned a grade score to each variable out of 10 within each section. The assessment was repeated after duration of 2 weeks to ensure that the results were unbiased. The average of the two scores was taken as the final score. Table 4.4 is a sample of the scoring system for each school in order to measure items such as quiet areas and green areas. The complete set of DASE results can be found in Appendix B2.

4.4.2 CEFPI Educational Adequacy Assessment

This instrument was developed by the CEFPI School Building Association to assess the educational adequacy of school buildings. Educational adequacy is defined as the degree to which a school's facilities can adequately support the instructional methods (Donald 2003). It is divided into 12 main categories related to teaching and learning support. The survey assesses whether all the functions within the school are adequate and cater to the needs of all the students. The components are measured with a scoring system of 0=Not present, 1= Below standard, 2=Meets standard, 3=Exceed standard. These scores are than added separately for each category. High scoring denotes high adequacy. The assessment was carried out independently for each school (See Appendix C3). Percentages were then calculated for each space.

Results were organized in two ways. Firstly each of the results from the three schools were maintained as separate set of data results so that the schools could be studied individually and recommendations made accordingly. Secondly, results were pooled together and averaged to give the researcher one final adequacy result for support spaces, academic learning, specialized learning and building features to allow

general recommendations to be made for schools in Jeddah. Table 4.5 shows an example of how the scoring was achieved.

As one of the research aims was to consider how this approach could be used to provide insight into the overall conditions of schools in Jeddah to the Ministry of Education pooling or averaging results might reveal trends across the schools. Table 4.5 indicates that the average adequacy of classrooms for these schools was 37.8%, 51.1% for classrooms, and 42.2% for the music rooms. Individual CEFPI Adequacy Assessment scores can be found in Appendices B3, B4, and B5.

Table 4.5 Example of CEFPI instrument score sheet.

	MJIS	BISJ	AISJ	Average
Library	0	46.7	66.7	37.8
Classes 1-6	40	80	33.3	51.1
Music Room	0	86.7	40	42.2

4.4.3 Nair's 28 Design Patterns

The 28-item school design patterns in Fielding and Nair's (2005) checklist represents the design principles that define best practice in the field of educational environments.

Each school was assessed by verifying which of the 28 design patterns were present. The results were tabulated (results can be found in Appendix B6) to provide the researcher with a clear understanding of where the major concerns lay. As an example, Table 4.6 shows the results for traditional classrooms. This indicates that MJIS School had the least amount of design patterns with 4 out of 5 patterns being absent. BISJ School on the other hand, had three design patterns present not including the learning suites and studios.

Table 4.6 E.g. of Fielding and Nair's 28 Design Pattern checklist

Describes specific functional areas			
	BISJ School	**AISJ School**	**MJIS School**
Traditional Classroom			
a. Learning Studio	No	No	No
b. Learning Suite	No	No	No
c. Learning studio-based small learning community.	Yes	Yes	Yes
d. Small Learning Community	Yes	Somewhat	No
e. Advisory based small learning community	Yes	Yes	No

4.4.4 Learning Modalities for classroom

A successful learning environment should support 18 learning modalities. Such environments allow students with different learning styles, and intellectual profiles to function with ease. This instrument functions as a checklist of items to measure the effectiveness of classrooms in relation to the support they provide for multiple intelligences. For example, it focuses on whether the classroom can accommodate independent study or collaborative group work, integrated technology or cater to various styles of learning and strengths. The Learning Modalities Checklist allows the assessor to recognize where facilities and organization may be lacking within the classroom and to focus on addressing specific concerns that will enhance learning and teaching. Results can found in (Appendix B7)

4.5 DATA COLLECTION: Interviews

Interviewing is a common tool for assessing people's reactions to the physical environment. Interviews may be structured or unstructured. In structured interviews the type and order of questions are decided in advance, when they are unstructured the interviewer asks questions that are relevant to a specific context (Sanoff 2001). Totally unstructured interviews may give rise to problems in pooling data across the respondents, so a semi structured interview is preferred which can allow for detailed exploration of issues and fine insights based on a loose agenda that allows free discussion to pick up issues that may not be obvious (HEFCE 2006). The one-to-one interviews were based on the extent to which the built environment supported the

learning environment and if it allowed the teachers to function as professionals. With the permission of the principal, random spots were allowed for interviewing teachers. The teachers were informed that all data would remain anonymous and that they were allowed to freely describe their concerns of their built environment. They were also encouraged to make recommendations that would enhance the learning environment.

Table 4.7 illustrates the total number of interviewees and their genders. 39 interviews were conducted, 81% of the respondents were female. BISJ and AISJ had an almost equal number of participants for interviews at 15 and 16 whilst MJIS had the least participants resulting in only 8. The researcher observed that there was a general lack of enthusiasm and willingness to participate in the study from the MJIS School.

Table 4.7: Interview Participation Description: By time-frame, total subjects, gender and participation

School	TEACHERS						
	TIME FRAME	MALE	%	FEMALE	%	TOTAL SUBJECTS	%
BISJ	February 6th-11th 2010	5	33%	10	66.66%	15	38%
AISJ	Feb 28th –March 7th 2010	2	12.5%	14	87.5%	16	41%
MJIS	March 21st – 28th 2010	0	0%	100	100%	8	21%
Total		7	18%	31	81.5%	39	100%

The interviewees were selected departmentally to allow for a broad range of perspectives and variety of responses. Table 4.8 depicts the interviewee's role and designation within their schools and the total amount of interviewees. The table illustrates that MJIS had the least amount of facilities (confirmed from other checklists) and specialised teaching staff. There was no library, science labs, music room or learning support at that school.

Overall the highest participation came from class teachers with 23 participants and learning support with 6 participants. The specialized teaching staff from the library, science labs were the least represented.

Table 4.8: Interview Participation Description: By Designation.

School	TEACHERS DESIGNATION								
	ICT	CLINIC	LIBRARIAN	ART	MUSIC	CLASS TEACHER	SCIENCE PREP	LEARNING SUPPORT	TOTAL
BISJ	1	1	1	1	1	8	1	2	**15**
AISJ	1	0	0	1	1	9	0	4	**16**
MJIS	1	0	0	1	0	6	0	0	**8**
Total Participants	3	1	1	3	2	23	1	6	**39**

▢ Facility is not present on campus

4.6 RESULTS

In the results outlined below, which achieve 6/10 (60%) or higher denote effective, functional or adequate spaces. In all cases the higher the score the better the facility. The results from all four checklists have been pooled to provide an overview of the extent to which

- The required elements and areas deemed necessary for an effective learning environment are present
- Those elements that are present are functional and adequate
- The facility is considered to be satisfactory

The following section provides an overview of the results only. For more detailed results for each school and for each checklist please refer to the relevant Appendix.

4.6.2 Results for Academic Learning Spaces:

These spaces are where the majority of formal teaching and learning takes place. Academic spaces must accommodate multiple intelligences, individual and multiple learning styles. These areas can be indoors or outdoors, such as learning studios, classrooms, shared areas, sports areas, quiet reading areas or learning communities.

The schools examined failed to provide the levels of support for teaching and learning that were expected, although BISJ School was rated higher in many of the scales than the other schools.

There was a large variation in the number of (Fielding and Nair) design patterns present. MJIS had none, AISJ having 6 and BISJ 8. This means that MJIS School did not have any of the functional areas such as learning studios or suites or 'brain-based spaces' such as shared learning areas, physical fitness or activity niches.

The results achieved in the DASE checklist, clearly showed the same levels of variation. However, none of the schools provided outdoor learning spaces, and the provision of instructional neighbourhoods (quiet private or small group areas) was universally poor (averaging between 25 and 37%, whereas an adequacy score would have been 60%)

Only BISJ School provided adequate instructional neighbourhoods (scoring 75%). Observations revealed that the classroom were only appropriately scaled for the size of the children at BISJ School, and did not provide a comfortable stress-free atmosphere. The CEFPI adequacy assessment verified this with both AISJ and MJIS Schools being rated poorly (33.3% and 40% respectively) whereas BISJ School achieved a score of 80% (See Appendix B3).

Looking at the ergonomics of the classroom environments, observations revealed

- High levels of noise which caused distraction, stress and disturbance. This was confirmed in interviews with teachers, 54% of whom complained of poor acoustics and that sound insulation was needed.
- Dull artificial fluorescent lighting with no variety such as task lighting to focus on specific areas or ambient lighting to create a certain mood (See Appendix E1 and E2). None of the schools adopted the standard requirements of full-spectrum lighting. Almost 50% of the teachers, interviewed felt that this contributed to the dull and sterile atmosphere.
- Many windowless classrooms which was unacceptable and extremely dangerous in cases of fire. At AISJ School only 1 out of the 5 classes surveyed had a window (See appendix E3 for photos).
- Classes that did have openings provided limited light and most of the windows were covered to prevent harsh glare and reflection off the white board. 61% of

teachers interviewed felt that classrooms should have an abundance of natural light.

- The majority of the classrooms did not have clear views and none of them opened onto green areas or living views (wildlife or natural terrain).

- There was limited ventilation as windows remained closed throughout the day due to extreme harsh climatic conditions.

- None of the schools had individual temperature control. The temperatures noted were either too cold or too warm and 46% of the teachers during the interview complained of this.

- Storage facilities were inadequate (See Appendices E4 and E5 for photos) resulting in bags and student belongings remaining on the floor and blocking circulation. Minimum storage space was allowed for teaching resources (See Appendices E6 and E7 for photos).

- None of the classrooms had wireless networking or technology based learning.

Furthermore, Lackney's checklist of Learning Modalities such as project-based, group work, story-telling or wet areas was used to assess the effectiveness of the classrooms. There was great variation between the three schools. MJIS School only consisted of 1 out of 18 of the learning modalities where as BISJ had 11 out of 18 with 5 'somewhat' and only 2 Negatives (See Appendix B7 for results.

Lackney's checklist of Learning Modalities indicated that areas for group work, independent study, art-based, performance-based and project-based learning were limited; whereas areas for social, emotional, distance and naturalist learning were not catered for at all. This confirms the results obtained from the other checklists.

Other academic learning spaces which achieved low results in the degree of functionality were indoor and outdoor learning areas for physical education with limited indoor private quiet spaces for reading and individual work at MJIS and AISJ School. On the other hand, BISJ School scored well on both variety of outdoor and indoor learning zones at 85% and 80% (See Appendix E8 for photos) respectively but MJIS and AISJ School scored poorly indicating limited variety of indoor learning zones

at these two schools (See Appendix E9 for photos). It must be noted that MJIS School scored the lowest of 15% implying that no outdoor learning areas had been provided. The low scores achieved at this school was verified by the CEFPI adequacy assessment results, confirming no provision was made for any physical education, reading, or individual study areas, scoring 0 on all three factors (See Appendix B5 for results). On the other hand, BISJ School assessment scores for outdoor and indoor learning areas were verified by the CEFPI Adequacy assessment confirming that both areas were adequate (See Appendix B3 for results).

The quality of the academic learning spaces was also measured by looking at levels of student access to spaces such as activity pockets and personal spaces. Students should feel they have free access, personalize them as they choose and when needed. This develops a sense of ownership and enhances their creativity. Only BISJ School provided for small activity pockets but these were also used as shared and reading areas. As such none of the schools had adequate provision in these areas (scoring 33% for activity pockets, and 35% for personal spaces as seen in Figure 4.1) (See Appendix B2 for score sheet – See Appendix E10 for photos).

Figure 4.1 DASE results for academic learning spaces
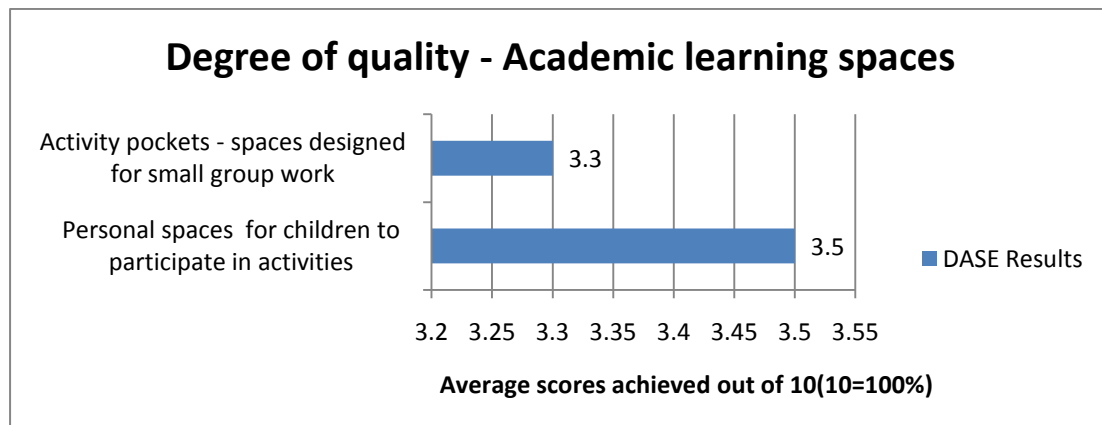
4.6.3 Support spaces:

These areas are defined as spaces that assist teachers to function as professionals and allow students to work in comfort and in a variety of ways; though the provision of easy access to internet facilities, staff lounges, storage areas and centralized

administration. Support spaces can also be regarded as non-academic areas; dining rooms, toilets, common rooms, or display spaces.

According to Fielding and Nair's checklist for design patterns 4 items must be present which were display areas, home-based and individual storage, casual eating and home-like bathrooms.

Only half the design patterns for support areas were present. MJIS School did not have any. There were no home-like bathrooms, home-based, individual-based storage; limited student display areas and dining areas. Figure 4.2 shows the DASE results for these areas, suggesting that the degree of functionality was poor on those design patterns that were present.

Figure 4.2 DASE results for support spaces
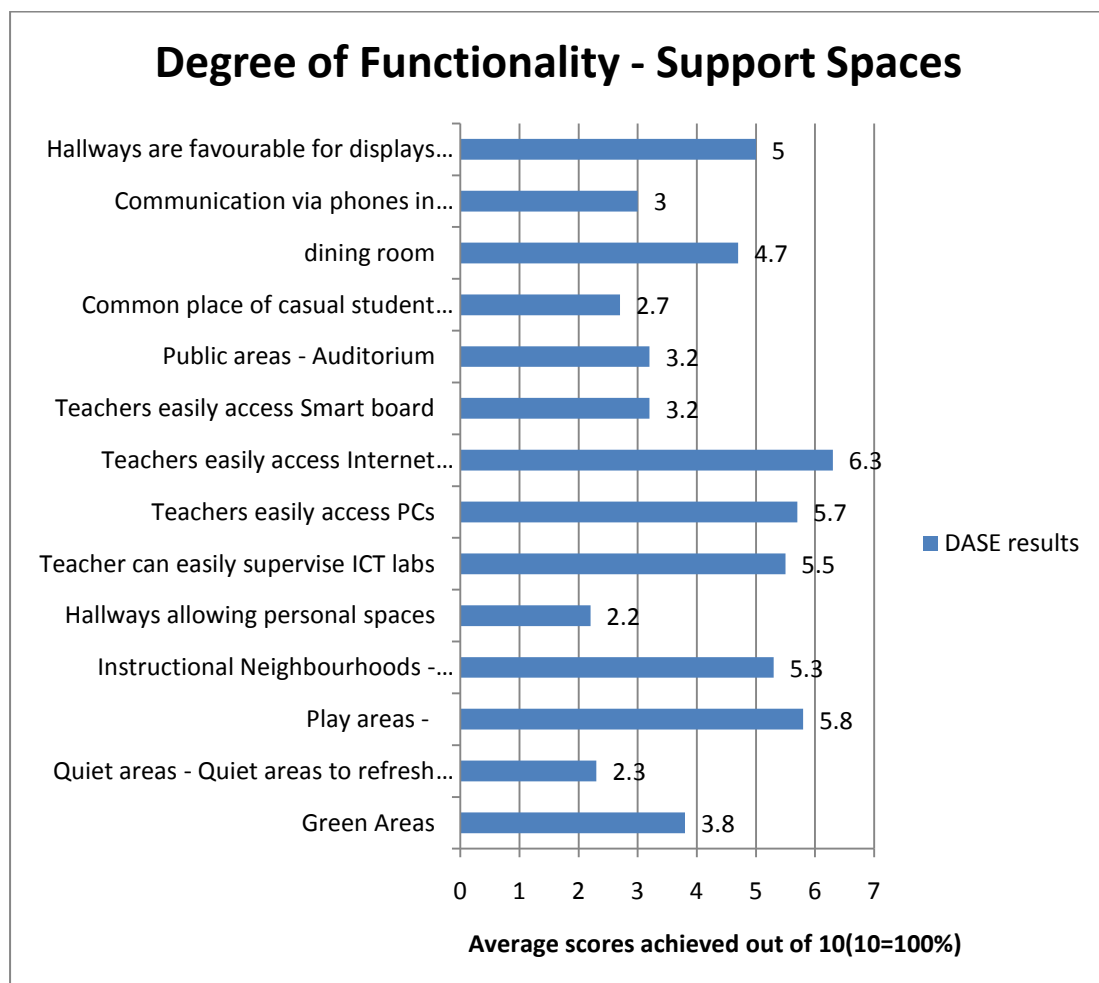
In the checklist, teachers' lounges and work areas are considered to be important spaces allowing them to function as professionals and catering for their teaching

methods and needs. The DASE checklist revealed problems with communication. There were no fax machines, phones or two way intercom systems for ease of communication between staff. Teachers did not have access to laptops or multi-media provisions and only one school (BISJ School) had access to smart boards. There was limited access to PCs and internet and at MJIS School it was not provided for at all. On the average schools scored 57% for PC use and 32% for internet smart board access (Figure 4.2)

Figure 4.3 DASE results for support spaces
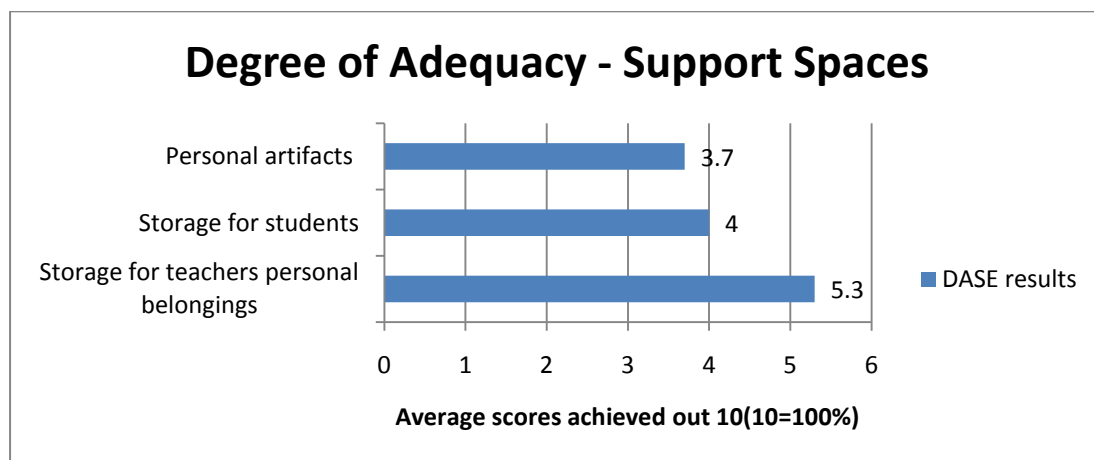
As Figure 4.3 suggests there was not enough storage space for teachers' belongings. Student storage and space for personal artefacts was limited.

The degree of functionality for the support spaces generally achieved low scores as seen earlier but the adequacy assessment revealed that the spaces that were the least adequate were the teachers' lounge and student dining (Figure 4.5). MJIS and AISJ scored poorly indicating that the teacher's lounges did not support teachers professionally. MJIS School did not provide the teachers with internet facilities, computers or flexible soft seating. Observations showed that the furniture was mostly damaged and poorly maintained. There was limited natural light and at AISJ School no windows were provided. The lounges only consisted of dull fluorescent lighting with no task or ambient lighting. It was also noted that teachers' lounges at AISJ School was used as storage areas for unwanted items (See appendix E12 for photos of AISJ School).

However BISJ School scored the highest at 85.2% which clearly suggests that the teachers' lounge was adequate with sufficient work surfaces, seating, PCs, storage, internet access and kitchenette (See appendix E11 for photos BISJ School). Only BISJ School provided for comfortable soft furnishings and variety of seating areas.

Observations made for student dining also support the adequacy assessment result as the conditions were extremely poor with inadequate lighting, glare, extremely high noise levels, limited ventilation and no control over temperature. The furniture did not cater to the age groups; there was neither variety in seating styles nor any kind of soft furnishings for more relaxed seating (See Appendix E13 for photos). Observations revealed that the dining rooms were unmaintained, aesthetically unpleasing and congested with no flexibility and variety achieving an average score of 45.6%. There were limited provisions for casual outdoor eating areas and none of the dining areas extended into outdoor spaces. The degree of functionality for the dining room was only 47% on the average and even lower for casual places for student meetings at only 27% (Figure 4.2). At MJIS School dining areas were not provided and observations revealed that students were forced to eat, sit, relax on the floor and play in the same area.

Other areas of concern within support spaces were public areas. DASE results suggest that public areas such as auditoria were not usually considered. Only BISJ School provided an auditorium which was also used as the assembly area scoring 95% (See Appendix B2). The quiet areas were minimal scoring 23%. Only BISJ provided personal spaces within hallways but these did not cater for the needs of the students. Figure 4.2 also shows that shaded and green areas for play and relaxation were not considered as a necessity and landscaping was not an integral part of any of the school layouts except for a few flower beds and scattered trees. MJIS School did not have any outdoor areas or landscaping.

Figure 4.4 DASE results for support spaces

Degree of Safety - Support Spaces
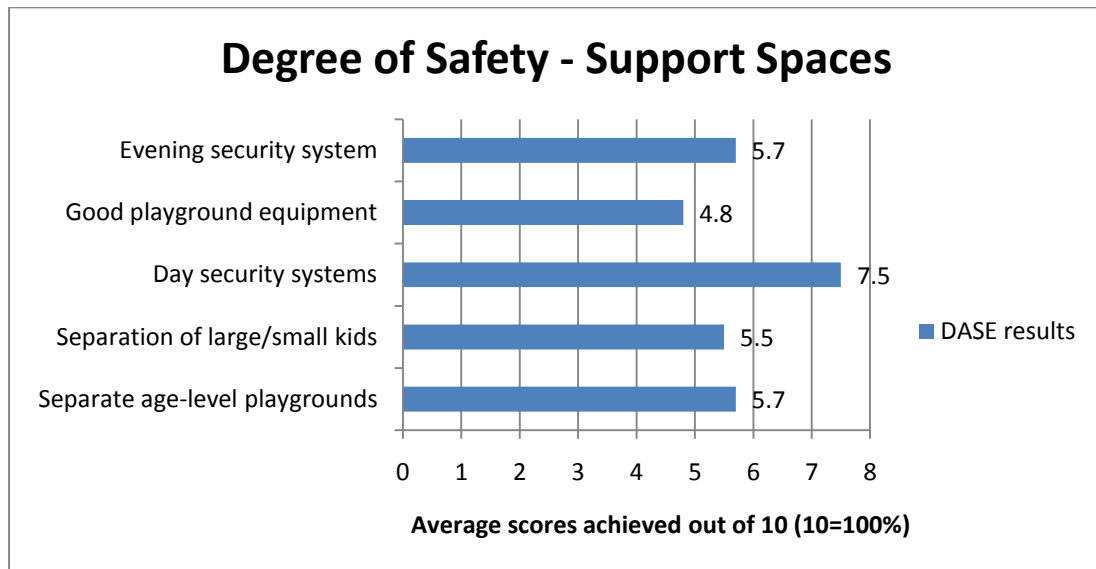
Play areas had limited playground equipment and DASE results revealed a low level of safety. (See Appendix D14 and D15 for photos). There was minimal separation of age-level playgrounds scoring 57% implying a compromise in safety standards (Figure 4.4) and according to the DASE results, the degree of safety needed for separation of small and large children was only 55% indicating that the play areas were not age appropriate (See Appendix B2 for results). It must be noted however that BJIS School did have separate age-level playgrounds and the separation of large and small children was considered (See Appendix B2 for results).

Figure 4.5 CEFPI results for support spaces

CEFPI Educational Adequacy Assessment - Support Spaces
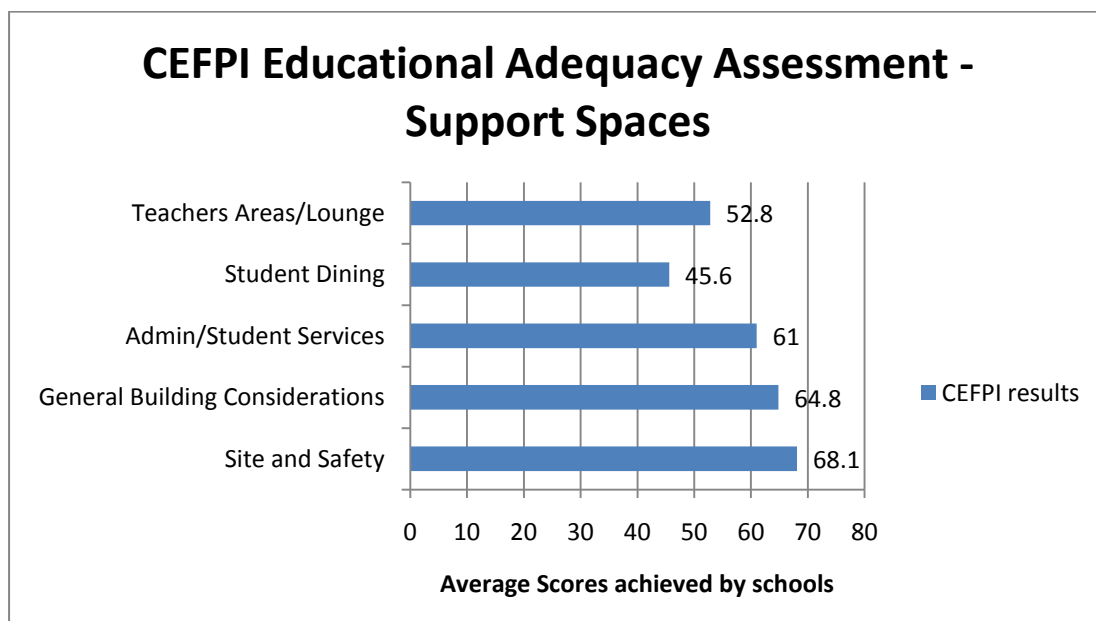
It was also noted that toilets were in poor conditions. AISJ School toilets were unhygienic, old and ill-maintained. They were also aesthetically unpleasing and teachers said that students avoided using them. Teachers also complained that there was only one toilet per floor for teachers and that this had to be shared by male and female teachers (See Appendix E16 and E17 for photos).

4.6.4 Specialized Learning Spaces

Specialized areas are spaces that directly support the curriculum and are designed specifically for that subject e.g. science labs, art room, ICT suite, music, special education and the library.
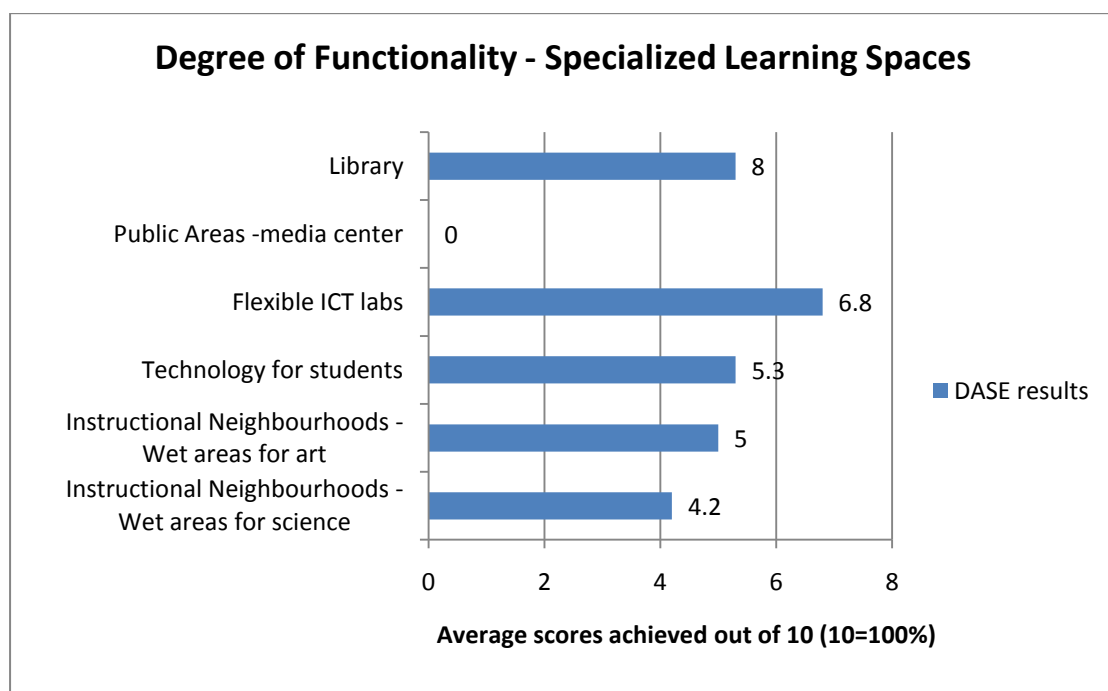
DASE results for the degree of functionality for specialized learning areas revealed that the lowest scores were from the science labs resulting in 42% (Figure 4.8). None of the schools provided for appropriate student science labs and only BISJ School provided a science preparation area. Unfortunately observations showed that this area could only accommodate the instructor. There was a limited preparation area and no teacher's station. There were no windows or ventilation system provided for

which is a matter of concern as toxic chemicals are prepared in this area and could prove to be a safety hazard. The lighting heavily relied on overhead dull fluorescent lighting creating shadows on the work surface. Storage was inaccessible by the lab technician due to high shelving units. However toxic chemicals were in easy reach for children which posed a safety hazard (See Appendix E18 for photos).

Art rooms at MJIS and AISJ scored low on both functionality and the adequacy assessment. Observations support these results as the lighting was generally poor with limited day light or windows which are necessary for art based studios. The furniture did not cater to the various age groups and students from both key stage 1 and 2 were required to use the same space and furniture suggesting that no ergonomic considerations were made. The overall impressions made of the art rooms were that they were unmaintained, old, damaged, aesthetically unpleasing and outdated (see Appendices E19 and E20 for photos). MJIS School in particular scored the lowest at 29% (see Appendix B5 for score sheet) where the room was over 20yrs old with no equipment or resources. The room was ideally designed for 15 students but was forced to accommodate 22-24. BISJ School however scored well at 85.2% which suggests that the degree of adequacy was more than sufficient (see appendix B3 for score sheet).

MJIS School did not have a library. The Library at BISJ School scored high in the DASE indicating that the degree of functionality was adequate (See Appendix B2) but scored low on the Adequacy assessment at only 46.7% clearly indicating that the area did not serve the students needs (See Appendix B3 for results). Observations showed the library did not function well as the layout and sizes were inadequate. The librarian's desk and book screening areas were at the entrance making it difficult to access the shelves behind. The integration of technology was limited with only 2 PCs for the librarians and no wireless facilities or PCs for students. The size of the library was also insufficient to deal with the number of students making it difficult to access during their free times. Classes were scheduled once a week for library access in order to avoid congestion as it was impossible to cater to free entry due to the size. There was limited variety of seating styles and soft furnishings. Individual and quiet reading areas were placed in corners and any available space with floor

cushions as the only type of seating. These quiet areas were poorly lit and usually dark (See Appendix E21 for photos).

On the other hand, AISJ School achieved a satisfactory result in both the DASE and CEFPI Adequacy assessment (See Appendices B2 and B4 for score sheet). Observations and photographs taken showed that the lighting was inadequate with heavy reliance on dull fluorescent lighting. AISJ School library had larger capacity, more variety of seating styles, centrally located librarian station, and easy to reach shelves for the young students. However, there were no windows or natural lighting (See appendix E22 for photos)

ICT labs scores were high which suggests successful functionality achieving 68% (Figure 4.8) however in the adequacy assessment it scored low at 48.1% (Figure 4.9). This score suggests that ICT did support the teaching methods and curriculum. The lighting conditions were poor with no full-spectrum lighting or task lighting. MJIS School did not have any internet facilities and had to share machines. Wireless networking was not present in any of the schools. There was limited space for demonstrations and lectures; students were forced to fit into small and congested floor areas. There was no space for writing or project work as the desks were small and none of the chairs were adjustable. It was noted that students from both key stage 1 and 2 were using the same lab with the same furniture suggesting that ergonomic considerations were neglected. Only BISJ School considered age-appropriate ICT labs maintaining it only for key stage 2. Storage and display was limited for student use and teachers. BISJ and MJIS School labs did not have windows and temperatures were reported to be uncomfortable and teachers complained of the same problem (See Appendix E23 for photos).

At AISJ School, temperatures were extremely hot and humid in the lab and pedestal fans were provided to compensate. The teachers generally complained that the temperatures were particularly uncomfortable around mid-day the room becomes stuffy, hot and humid. At this school, it was also observed that wires, electrical connections and sockets were left exposed and were using old and outdated electrical systems which are a safety hazard (See Appendix E4).

Special educational needs were not usually accommodated. MJIS and BISJ School did not provide for this either. This was only formally supported in AISJ School where low scores were given in both functionality and adequacy. MJIS School did not provide for either learning support or special education. Although only AISJ School considered special education but scored 53% in the adequacy assessment and 33% in learning support. This clearly suggests that both were considered low priorities at this school. Observations made of special education at AISJ indicated that only one room was provided. This room did not have any windows, any Software or technological aids to assist the students' special needs, a lack of resources and materials, and lastly no variety of electric lighting which relied heavily on fluorescent lighting creating a dull ambience (See Appendix E25 for photos).

Learning support was not provided for at MJIS School. Learning support spaces at AISJ were below the size standards and children were forced to fit into congested and cramped areas. None of the learning support areas had windows and were mostly make-shift spaces or converted storage rooms. Observations showed there was poor ventilation forcing teachers to keep doors open to allow for fresh air. This created problems as activity in the hallways caused distraction and disturbances. This is especially problematic for students who suffer from attention deficit disorders or from dyslexia who easily get distracted. There was heavy reliance on dull fluorescent lighting and furniture was ergonomically incorrect as several learning support teachers complained that students from ages 7 to 12 were required to use the same support room and many students were unable to fit. They also mentioned that the learning support rooms were extremely small for a capacity of 8 children with no room for circulation. This proved to be a greater distraction for these children due to the close proximity. Children with attention deficit disorder became more distracted and at times even aggressive. Storage space was limited and did not allow for any extra resources due to the size. The overall observation was similar to other spaces; poorly maintained, cluttered, aesthetically unpleasing, poor layout and an unhealthy atmosphere (See Appendix E27 for photos).

BISJ School however scored high at 80% in learning support. Observations indicated ergonomically correct furniture, adequate lighting, storage and size (See Appendix E26 for photos)

4.6.5 Building features:

In this section building features refers to the general quality and ambient factors of the overall facility. In table 4.10 the checklist of design patterns required for spatial quality are low. Out of the 16 design patterns needed for high quality building features, BISJ School accommodated 5 of these items which were dispersed technology, welcoming entry, natural ventilation and a unified theme. MJIS School did not consist of any of the design patterns.

Figure 4.7 DASE results for exterior building features
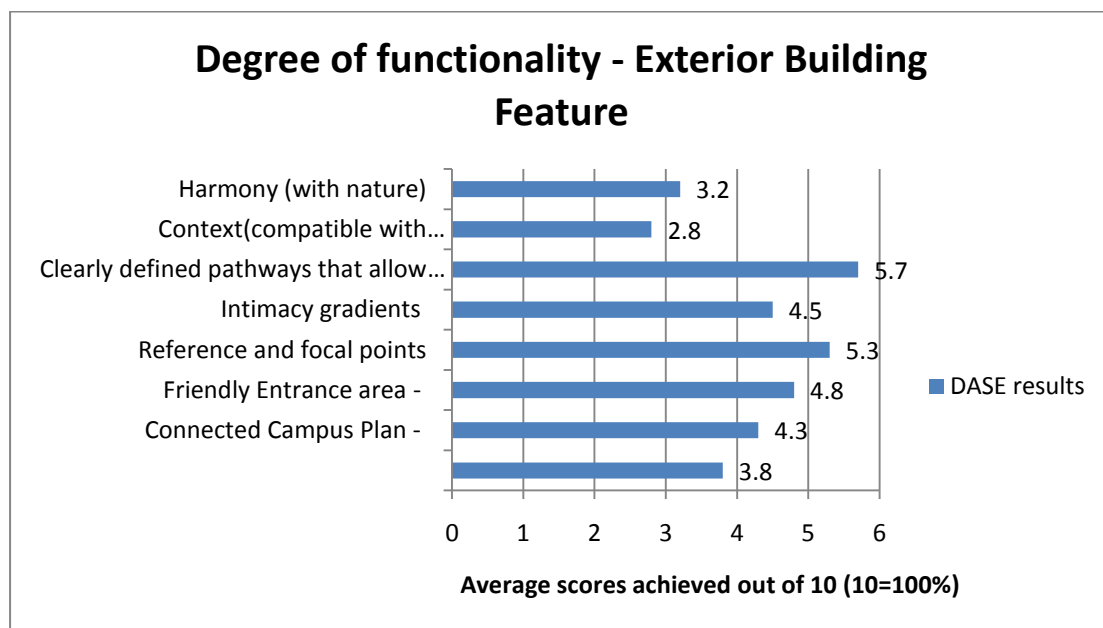
Figure 4.7 results suggest that the overall circulation patterns are weak and that pathways and promenades are poorly connected with few focal points in all three schools. The DASE scoring for a well connected campus plan was only 43% and was 38% for the promenades and walkways. However, the biggest areas of concern relating to the exterior building features, is the outdoor-indoor relationship and its compatibility with the surrounding context. The targeted schools were extremely introverted in plan (meaning it closed itself from the outdoors). A further investigation of the exterior building features confirmed the poor quality of the

views lack of natural landscaping (See Appendix E28 for photos) MJIS School did not have any landscaping as mentioned earlier.

Figure 4.8 shows the major items of concern affecting the degree of functionality for interior building features in all three schools. Lighting and windows achieved the lowest scores (See Appendix B2 for score sheet). The DASE results show that the windows did not allow for unrestricted views and that there was inadequate natural light in the building in all three schools. The other concerns affecting the functionality of the interior building features was the inappropriate scales for door handles, rails and light switches at 53%, 37% and 50% which were not considered as priorities.

Figure 4.8 DASE results for interior building features

Degree of funtionality - Interior building features

Feature	DASE results
Adequacy of natural light	3.4
Windows allowing unrestricted views	3.2
Windows allowing natural light	4.2
External noise control	5.2
Appropriate Ceiling heights	5.8
Doors/windows allowing views	3.5
Student scale for shortened steps	4
Student scale forhand rails	3.7
Student scale for door handles	5.3
Student scale for light switches	5

Average scores achieved out of 10 (10=100%)

4.7 Summary

The results from the DASE and CEFPI showed weakness in a number of areas. In summary the schools:

- Provided limited outdoor learning areas, no living views or landscape for imaginative play.
- Individual study areas or personal spaces to cater to multiple intelligences and needs were not provided for.
- The classrooms facility lacked variety and flexibility

2 out of 3 of the schools did not cater to children with special needs and when asked to elaborate, the school simply said that they could not cater for them. Only AISJ School provided elevators for wheelchair users and special instruction rooms for children with severe mental disabilities.

MJIS School scored the lowest in every category. In both the Design Pattern checklist, it only had 1 out of the 28 items present and in the Learning modalities checklist only 1 out of 18. In the Council of Educational Facility Planners International (CEPFI) Adequacy assessment the scores were alarmingly low. The average score at MJIS School for Academic learning areas was 22.3%, Specialized learning spaces was 11.3%, Support areas was 12.3% and building features was 45%. These results imply that the size, location, quality of furnishings and equipment, the ability to permit change and cater to the educational program were not met in any way. The DASE results revealed that out of 95 items required for an effective learning environment, MJIS School scored 0 on 45 different factors implying those items were not present such as dining area, library, playground, gym, auditorium, internet facilities, storage etc (See Appendix B2 for further details) and the average scores for the rest of the items was 44% which is well below the 60% bench mark.

On the other hand, BISJ School scores were higher on many of the assessment tool results. The average score for Academic Learning spaces was 88.9% which is significantly higher as classes were well equipped, well maintained, good furnishings, quality and adequate size. This school scored an average 78.4% for support areas

and scored a significantly high figure of 83.7% on building features as the building was well maintained with professional crew to ensure the up keep of the facility. Its weakest area was the specialized learning areas in particular the library at 46.7% and ICT suite at 50%.

AISJ School's were low in every category of the CEFPI Adequacy assessment with the lowest scores for specialized learning areas and academic learning spaces. Within the specialized learning areas, results revealed that learning support, the music and art rooms were particularly weak all scoring 40% and under. Within the academic learning spaces results indicated that classrooms were the weakest area at this school scoring 33.3%. The Classroom Learning Modalities checklist confirmed this as only 4 out of the 18 modalities were present.

The data from the assessment were analysed thematically to uncover patterns within the data and emergent themes. This categorisation enabled the researcher to group pieces of data under specific topics which were then later compared to the results of the surveys to validate areas of concern. These results will be compared to the results of the POE in the chapter 6.

CHAPTER 5

Study 2 – Evaluation of the Schools using the POE toolkit

5.1 Introduction

The previous chapter dealt with the assessment process conducted by the researcher. This enabled a clear understanding to be formed of the strengths and weakness of the individual schools. However in order to make a complete assessment and make accurate recommendations, an evaluation must be conducted on how the occupants perceive their learning environment. This chapter provides details of the participants and the results for each of the learning areas; academic learning areas, specialized learning, support spaces and building features. Results were observed separately within each school and collectively to assist in providing recommendations for the city of Jeddah.

5.2 Methods of Data Collection

To recap, at this stage of the research two measurement instruments were used:

1. The POE for the teachers comprised a 117-item paper based survey adapted from Total Learning Environment Assessment (TLEA 1999), Council of Educational Facility Planners, International (CEFPI 2002) and Newman's POE toolkit to create a new POE toolkit for teachers. It was estimated that this would take teachers 20-30 min to complete. Teachers of Key stage 2 also participating in the POE were advised to complete their survey at the same time as the children in order to conserve time and fit in with the timetable agreed by the Head Teacher. Eight teachers requested electronic surveys to complete at home. However, despite repeated requests only one of these was completed. The paper based surveys were completed only if the researcher remained on campus and urged returns by the end of the day. Without periodic reminders, teachers became impassive which caused unnecessary delays.

2. The students were given the first part of the toolkit developed by Newman. Teachers were requested to supervise this activity to avoid students influencing each other's responses. If the children had any queries they could request assistance. Completion time was estimated at 45min.

5.3 POPUTLATION: Participants

5.3.1 Post-Occupancy Evaluation stage:

The participants who completed the Post Occupancy Evaluation surveys were teachers, students and parents in the three primary schools. This population consisted of 456 participants. **Tables 5.1** through **Table5.4** below describe participant population by percentages, gender, and experience.

Table 5.1 depicts the breakdown of school participants by number and percentage of the students, teachers and parents out of the total population. The highest numbers of responses were from students resulting in 334 (73% of the total respondent sample). Only 71 of the respondents were parents (15.5%). Teachers formed the remaining at 11% of the sample. The highest rate of return was achieved at the BISJ School resulting in 179 respondents out of the total participants.

Table 5.1: POE Population Description: Participants breakdown by campus, number and percentage

Schools	Teachers	%	Students	%	Parents/	%	Total
BISJ	18	10%	131	73%	30	16%	179
AISJ	18	14%	90	70%	21	16%	129
MJIS	15	10%	113	76%	20	13.5%	148
Total Participants	51	11%	334	73%	71	15.5%	456

Table5.2 displays the gender of the population in this study by school, frequency and percentage. As can be seen in this table, females make up the majority of respondents in each group. This is important as females view their physical environment differently from their male counterparts.

Table 5.2: POE Population Description: Participants breakdown by campus, gender, number and percentage

School	TEACHERS				STUDENTS				PARENTS			
	M	%	FM	%	M	%	FM	%	M	%	FM	%
BISJ	8	44%	10	55%	77	59%	54	41%	6	20%	24	80%
AISJ	2	11%	16	88%	43	47%	47	52%	4	19%	17	81%
MJIS	0	0%	15	100%	0	0%	113	100%	4	0%	18	100%
Total	10	19.6%	41	80%	120	36%	214	64%	14	36%	59	64%

Students were drawn from Key Stage 2 (ages 7-11). This stage was targeted due to the children's ability to communicate their thoughts and understand the survey with limited supervision. Key stage 2 students made up an average of 31% of the total population within each school. In order to achieve an even distribution and an unbiased set of results, two sections from each year group were selected. At the AISJ School, the researcher was permitted to conduct the survey in any class except for the section where the teachers requested permission not to participate. At MJIS School classes were selected according to teacher's schedules and day planners that would allow time for the survey to be taken. **Table 5.3** illustrates the classes that participated in the study revealing the number of classes able to participate from the total expected target group. BISJ had the highest participation of 7 classes where as the MJIS campus had the least resulting in 6 out of the 8 classes that were targeted.

Table 5.3: Classes Description and Participation in POE

Campus	Classes				TOTAL
	Year group 3	Year group 4	Year group 5	Year group 6	
BISJ	Y3-1,Y3-4	Y4-1	Y5-5, Y5-3	Y6-4, Y6-3	7/8
AISJ	3A	4A, 4B	5B, 5C	Not included	5/6
MJIS	3A, 3B	4C	5A, 5C	6A	6/8

5.4 RESULTS: Students perception

5.4.1 Academic learning spaces:

5.4.1.1 Classrooms

Accumulative POE results for class storage

Category	NO	YES
Enough space for bag	31.6	67
Special place for bag	38.1	60.5
Easy to find class	14.7	83.8

Number of student responses (percentages)
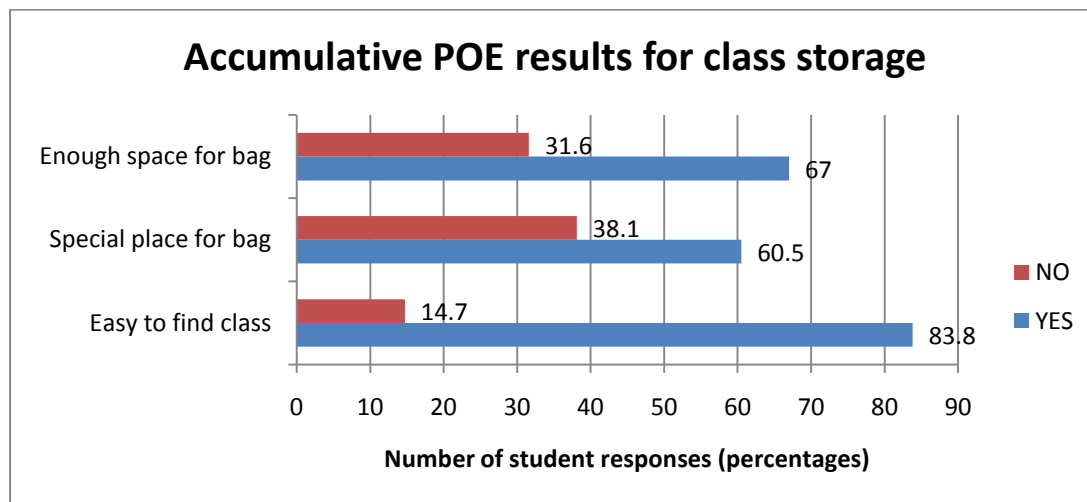
Figure 5.1 Class Storage results

Classrooms are the most important academic learning spaces as a majority of the learning and teaching activities take place within them. Newman's toolkit revealed that 83.8% could easily find their class (Figure 5.1). However almost 1/3 of the students did not feel that there was enough space for their bags and 38.1% felt that no storage provision had been made to store them.

BISJ School - Class Storage

Category	No	Yes
Enough space for bag	24	76
Special place for bag	18	82

Number of student responses (percentages)
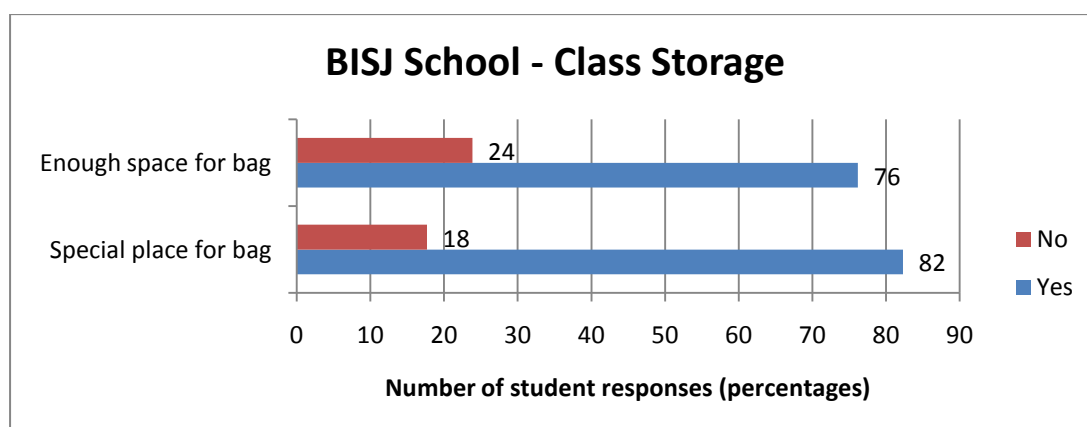
Figure 5.2a BISJ School Storage

However BISJ School scored high on both factors and suggested overall satisfaction with storage facilities (Figure 5.2a). Student satisfaction with storage in the other

two schools was inadequate but results show that the highest number of negative responses for both factors occurred at MJIS School where 39% said there was not enough bag space and 64% felt there was no designated area for their bags (Figure 5.2b). Mostly students placed them alongside their desks. At AISJ School, although cubby holes were provided, there were not enough and students had to share (See appendix E5 for photos).

POE results for class storage

	MJIS School	AISJ School
Enough space for bag	39	34
Special place for bag	64	37

Number of negative (no) student responses (percentages)
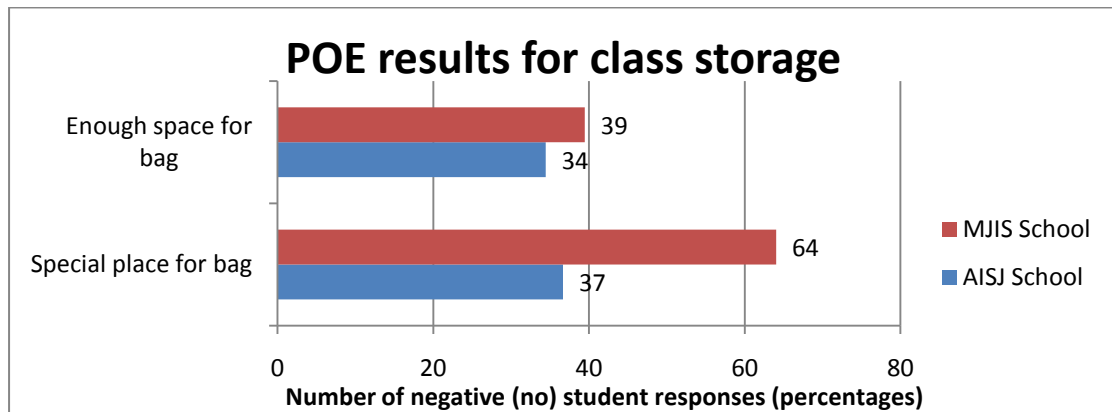
Figure 5.2b POE results for class storage

According to the literature review, temperature is considered a key component to enhance learning environments however the results revealed an average of 53% of the students from these schools felt their classroom got too hot. However individually, Figure 5.3 shows that highest number of students who agreed at 65% and 62% occurred at MJIS and AISJ School respectively. Only a minimal number of 15% students at BISJ School felt the same way.

Does class room get hot?

	MJIS School	AISJ School	BISJ School
Does class room get hot	65	62	15

Number of positve (yes) student responses (percentages)
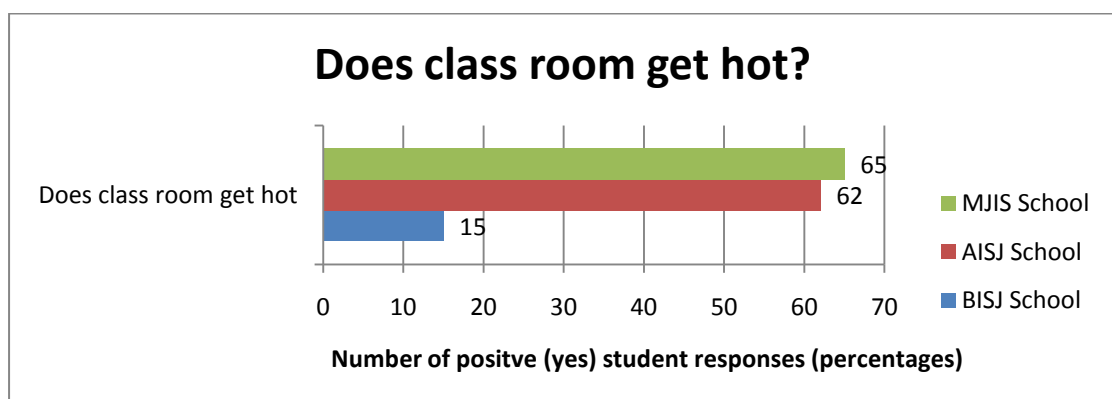
Figure 5.3 POE results for class temperature

POE results - Flexibity and variety

Anywhere to work quietly on your own: MJIS School 56, AISJ School 44, BISJ School 28

Is there a space to do group work: MJIS School 46, AISJ School 38, BISJ School 21

Is there enough space to sit comfortably: MJIS School 35, AISJ School 41, BISJ School 18

Legend: MJIS School, AISJ School, BISJ School

X-axis: Number of negative (no) student responses (0, 10, 20, 30, 40, 50, 60)

Figure 5.4 POE results for class flexibility and variety

Figure 5.4 shows that negative responses were quite high in relation to the variety of work spaces. This indicates that students at MJIS and AISJ School felt that classes could not accommodate individual study or group work and students felt that there was not enough space. BISJ School had the lowest number of negative responses on every factor. This may be due to the fact that teachers understood the need for students to be on their own and set aside smaller seating areas in far corners of the class and allowed for group work within the class. MJIS School was the least able to accommodate group work and quiet areas achieving the highest percentage of negative responses. 46% said there were no group work areas and 56% said there was nowhere to sit quietly. Almost 1/3 of the students from all three schools felt there was not enough space to sit comfortably. Results suggest that both MISJ and AISJ School have poor comfort levels and that the class could not accommodate flexibility and variety.

Good place to work and learn?

Can everyone see the whiteboard
- MJIS School: 25
- AISJ School: 30
- BISJ School: 11

Is there enough space ot show your work
- MJIS School: 17
- AISJ School: 41
- BISJ School: 7

Is the classroom a good place to work and learn
- MJIS School: 30
- AISJ School: 44
- BISJ School: 21

Number of negative (no) student responses (percentages)
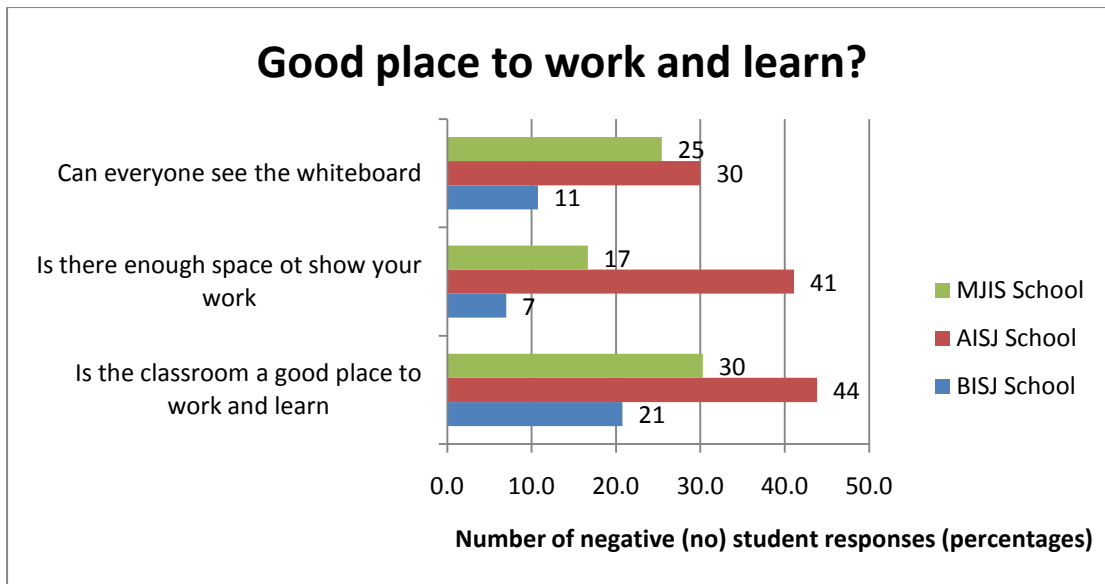
Figure 5.5 POE results for classrooms

Figure 5.5 shows that AISJ School received the highest number of negative responses on all three factors of visibility, display and good learning environment whereas results at BJIS School indicated overall student satisfaction and better conditions. 1/3 of the students at AISJ School complained that they could not see the whiteboard, 41% felt there was not enough space to show their work and 44% felt their class was not a good place to work and learn. Observations and assessment coincides with these finding. The school is almost 60 years old with poor maintenance of structure, interiors and furnishings. Resources were limited, with poor lighting and acoustics, no windows or ventilation, dull interiors and bad location of classrooms. All these contributed to a poor learning environment.

Does class room ever get disturbed?

Does class room ever get disturbed from another room outside
- MJIS School: 89
- AISJ School: 88
- BISJ School: 62

Number of positive (yes) student responses
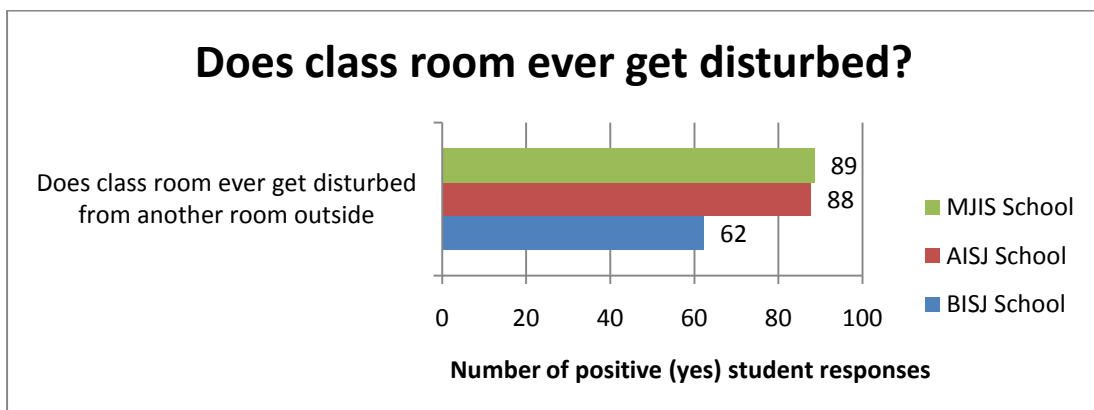
Figure 5.6 POE results for external noise

All three schools felt that class was disturbed by external noise with an average agreement of 78.1% across the schools. The high response rates on disturbance from external noise at MJIS School is due to the fact that majority of classrooms are located around an interior courtyard where sports and other activities take place, disturbing both teachers and students. At AISJ School, the majority of the classrooms have been constructed by temporary wall partitions with extremely poor sound insulation. Students complained of hearing neighbouring classes throughout the day. Many classrooms were also located near noisy areas such as art rooms, entrances, high traffic areas, nursery and crèche.

BISJ School received significantly higher positive responses for almost every factor mentioned above. Key concerns that arose were temperature, noise disturbances and group work areas. The results suggest that students were satisfied with their classroom as 82.2% felt there was enough space to sit comfortably, 80% felt the class accommodated group work and 93.1% felt there was enough space to show their work. These findings clearly suggest that BISJ can accommodate flexibility and variety, students could easily hear the teacher and see the whiteboard. Many of the classrooms in the other schools were generally rectangular in shape where the whiteboard was placed at the top end of the room, maximizing the distance between the students in the back and the teacher making it difficult to see.

BISJ School - Class Description

Number of student responses (percentages)

Description	Value
Bright	50
Safe	60
Boring	6
Easy	62
Quiet	12
Hard to Work In	22
unfriendly	3
Scary	6
noisy	53
Calm	35
Interesting	47
HAPPY	63
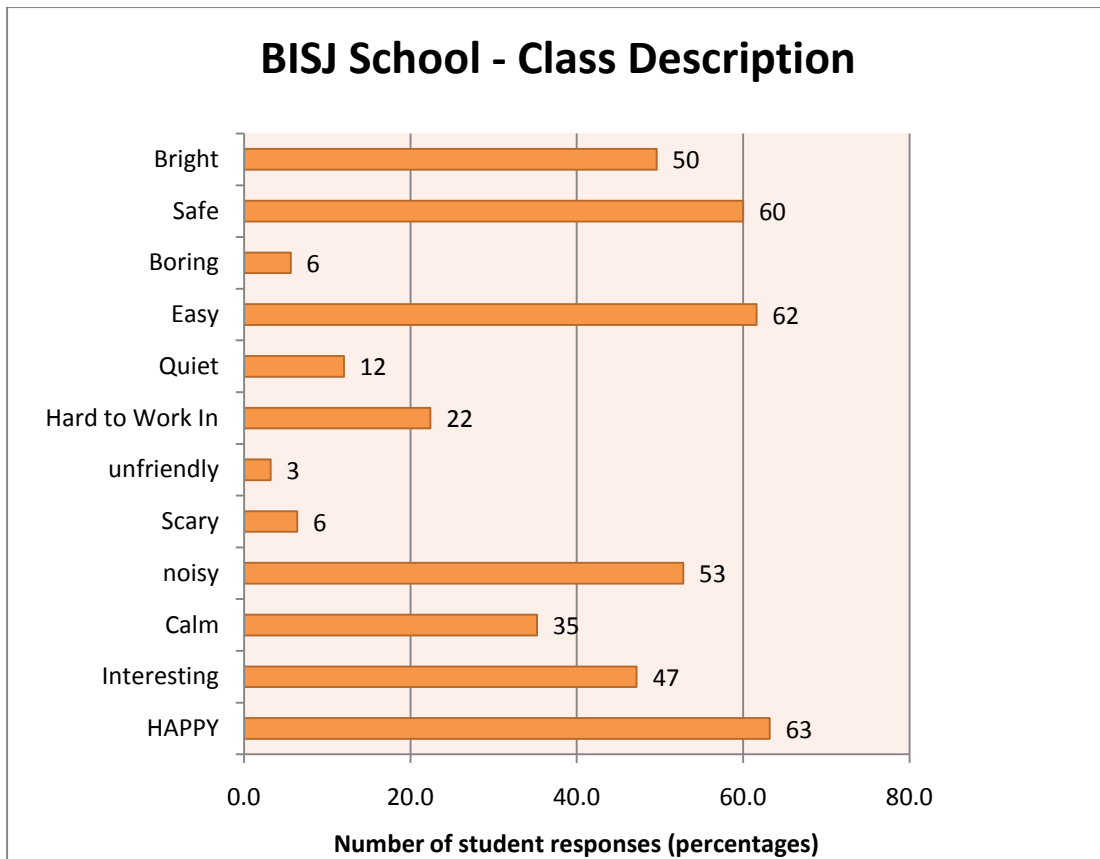
Figure 5.7 POE results for class description

The positive results at BISJ School can be further elaborated. Students from this school were asked to pick 4 words that best described their classrooms. Words that corresponded to the highest response rate were 'bright', 'safe' and 'easy to work in' but 'Happy' received the highest number of response of 63.2% as can be seen in Figure 5.7

However both AISJ and MJIS School students described their class more negatively with the highest response rate found with descriptions such 'boring' and 'hard to work in'.

AISJ School - Class Description

Description	Number of student responses (percentages)
Bright	22.2
Safe	31.1
Sad	1.1
Boring	43.3
Easy	28.9
Quiet	5.6
Hard to Work In	47.8
unfriendly	14.4
dark	6.7
Scary	7.8
noisy	71.1
Calm	13.3
Interesting	44.4
HAPPY	36.7
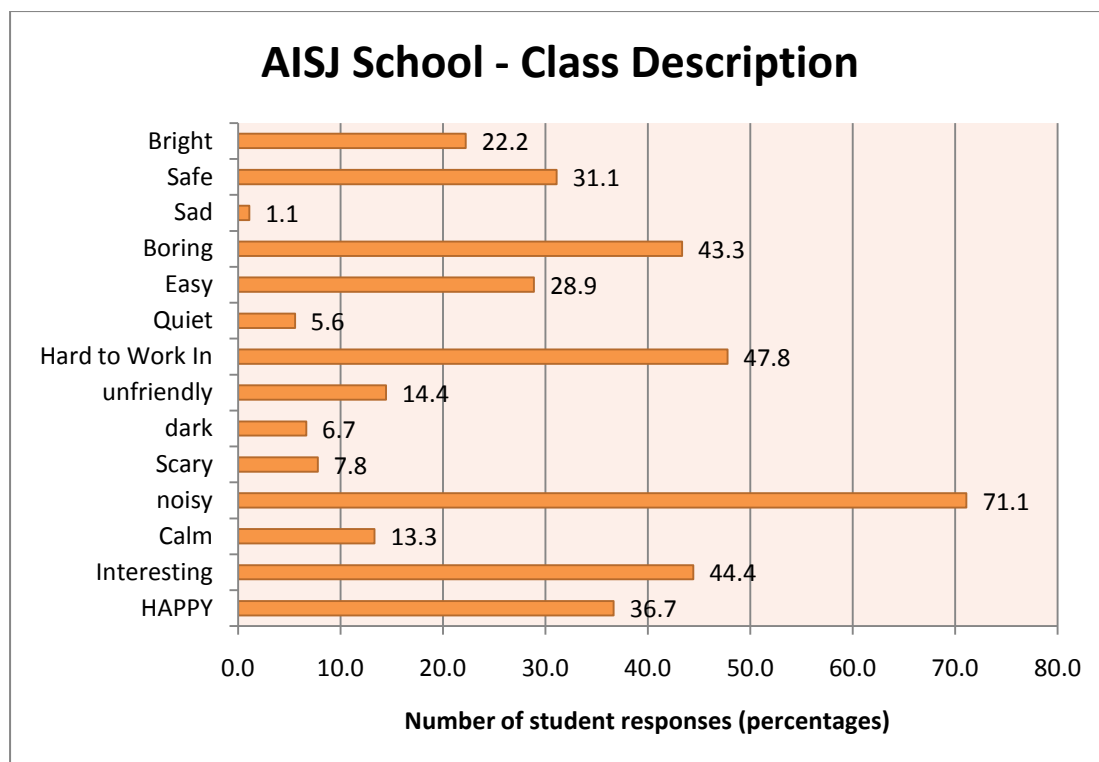
Figure 5.8 POE results for class description

All three groups of students described their class as 'interesting' (47.2% at BISJ School, 44.4% at AISJ and 39% at MJIS School).

All three groups of students described their class as 'noisy' with significantly high response rates; AISJ at 71%, MJIS at 66% and the lowest from BISJ School at 53% resulting in an average of 63% of students from these schools considered their class noisy. This is a clear indication that acoustics were poor in all three schools (Figure 5.7 and 5.8)

To further understand student concerns, students were requested to give reasons why they felt their class was a 'bad place to work and learn'. It must be noted that students at BISJ School refused to answer this question as they felt it was not a bad place to work. Results of the other two schools revealed shared concerns. AISJ School felt it was due to small and congested classrooms where as MJIS School ranked noise being the worst problem (Figure 5.9). They felt it was unmaintained; ill-equipped and had aesthetically unpleasing interiors. Others commented on aggressive behaviour, and thought the class was small and cramped. However noise was the main factor (Figure 5.9).

Why is Class a Bad Place to Work/Learn

Category	Value
Alot of Distraction from other classes	3.9
No Supplies	1
Dark/ No natural Light	2
No Fresh Air/ Stuffy	6.9
Ugly/Diryt/Brokenequipment/Notmainta…	16.7
HardtoWork/AggressiveBehaviour	15.7
Boring/Uninspiring/Dull	8.8
Small/Crowded/Cramped	18.6
Noisy	26.5

Number of student responses (percentages)
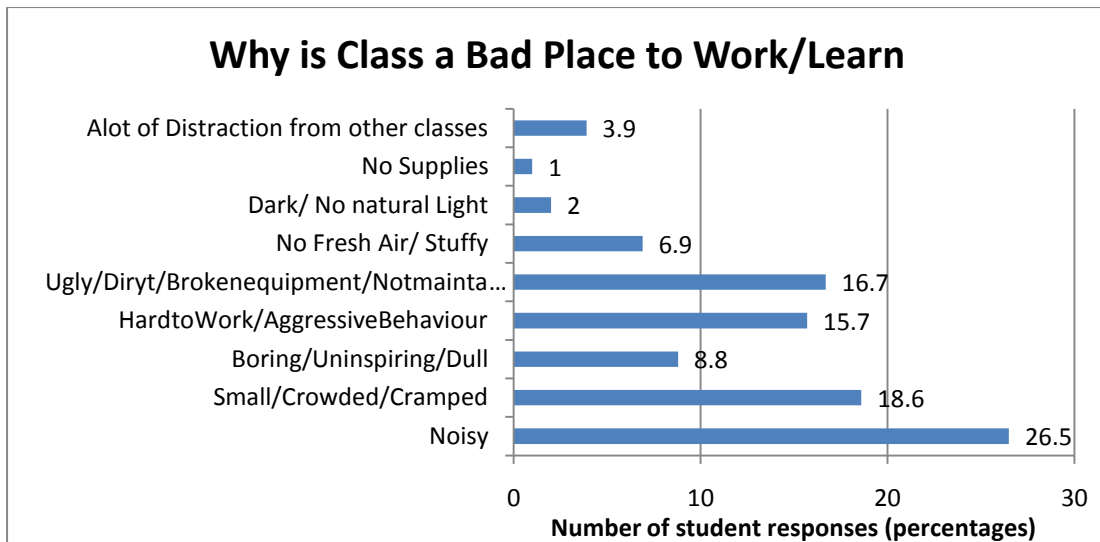
Figure 5.9 POE results on class rooms

When asked to give reasons as to why they felt their class was a good place to work and learn, the same concerns were noted throughout the schools. An interesting finding was that all three schools felt it was largely due to having a good teacher where the average response rate was 38.3% and secondly due to class being 'quiet and calm'. Other reasons were spacious and well organized class, friendly ambience, comfortable and safe but these occurred at minimum rates (Figure 5.10).

Why is Class a Good place to Work

Category	Value
NiceFacilities/Supplies/Display	9.3
Colorful/Bright/Clean	4.8
LotsofActivities	1.8
Comfy/Safe	7.9
Good Teacher	38.3
Quiet/Calm	19.4
SpaciousClass/Desks/Organized	10.1
Fun/Friendly/Support	8.4

Number of student responses (percentages)
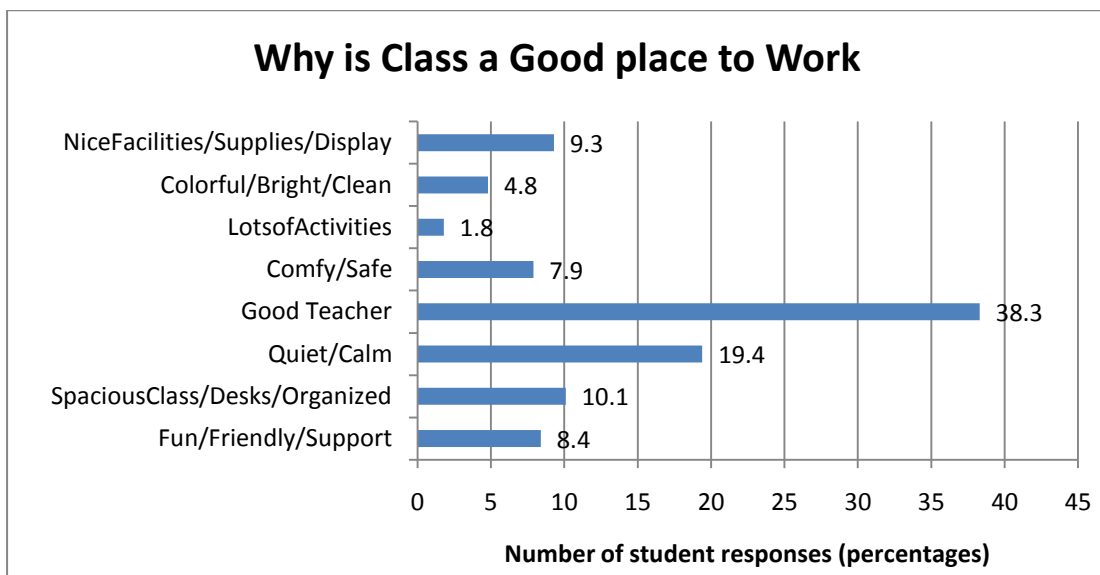
Figure 5.10 POE results on class rooms

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5.4.1.2 Quiet Rooms

BJIS School - POE results for quiet rooms

Is it big enough for you and friends: NO 16.2, YES 83.8

Is there a special room for this: NO 19.0, YES 81.0

Number of student responses (percentages)
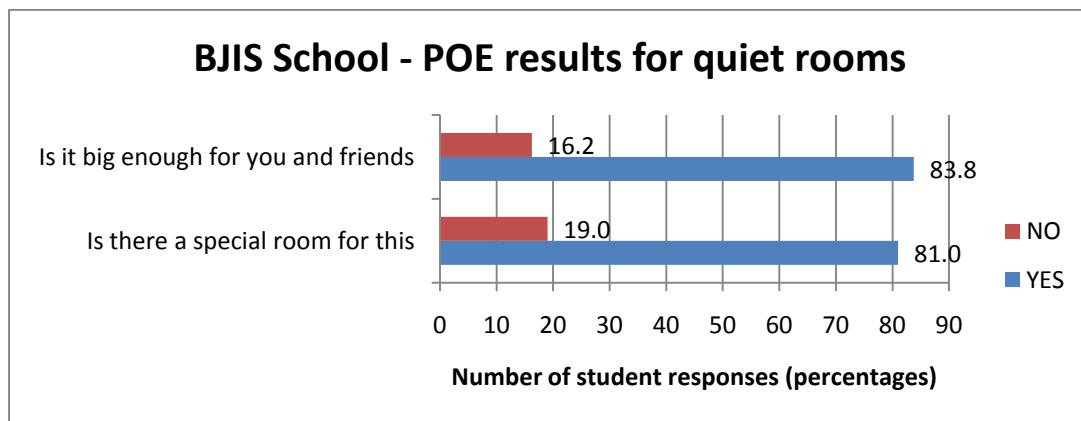
Figure 5.11 POE results for Quiet rooms

Quiet rooms allow student to work individually and to study, reflect, read and is considered an important design pattern that must be included. However on average almost half the students from these schools felt that quiet spaces were not present. Results show that majority of the students at MJIS disagreed but the majority at BJIS School said there was a quiet room and that it was big enough for their friends (Figure 5.11).

POE results for PE

Do you ever miss PE becuase there is no place to go: MJIS School 37.2, AISJ School 41.2, BISJ School 17.4

Number of postive (yes) student responses (percentages)
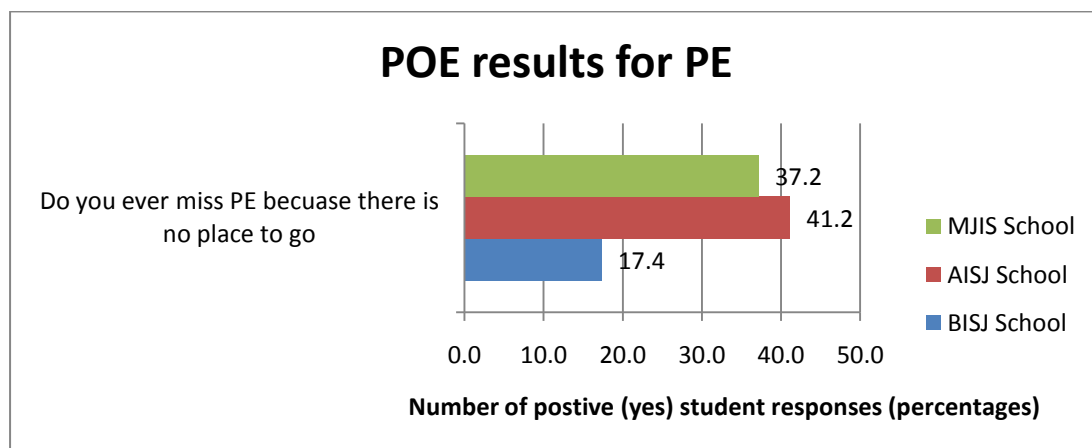
Figure 5.12 POE results on PE

5.4.1.3 Physical Education

Part of academic learning is physical education. However results show that MJIS and AISJ School have inadequate physical education facilities and equipment, they cannot reach equipment easily and students often miss PE because there is no place

to go. More than half of the students from MJIS and all the students from AISJ School complained they did not have a special place to change (Figure 5.12 and 5.13).

POE results for PE

Can you reach equipment easily	29 (MJIS) 36 (AISJ) 15 (BISJ)
Is there a special place to change	54.3 (MJIS) 71.3 (AISJ) 0 (BISJ)

Number of negative (no) student responses (percentages)

Legend: MJIS School, AISJ School, BISJ School
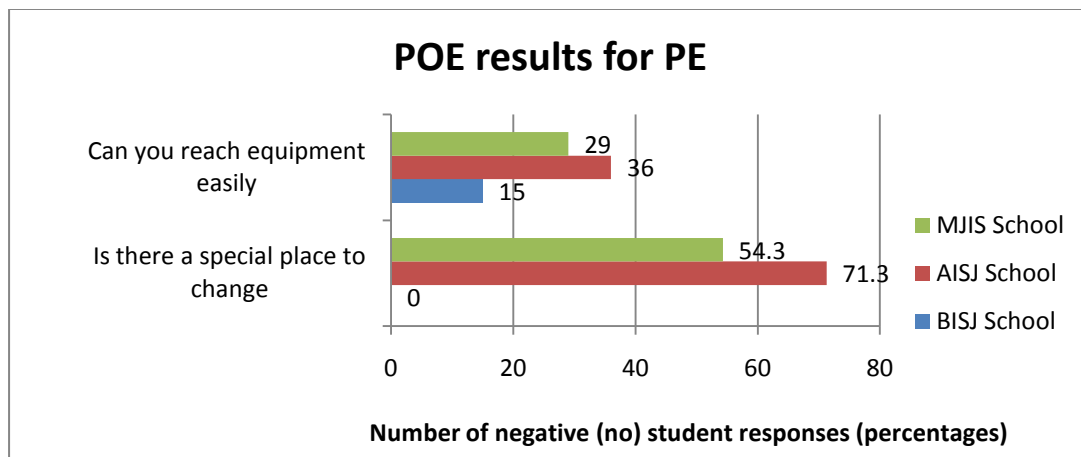
Figure 5.13 POE results on PE

However, BISJ School had a positive result as compared to the other two schools. Figure 5.13 shows students could easily reach equipment, had access to changing rooms and never missed PE because of lack of space (Figure 5.14). The assessment results of this school coincide with these findings and revealed that sport facilities were well-equipped, with a variety of age-appropriate indoor and outdoor sports areas such as gymnasium, basket ball court, squash court and a football field were all provided for.

BISJ School - POE results for PE

	NO	YES
Do you ever miss PE becuase there is no place to go	83	17.4
When you go inside during PE, is this place used for anything else	21	79.2
Can you reach equipment easily	15	84.6
Is there a special place to change	0	100.0

Number of student responses (percentages)
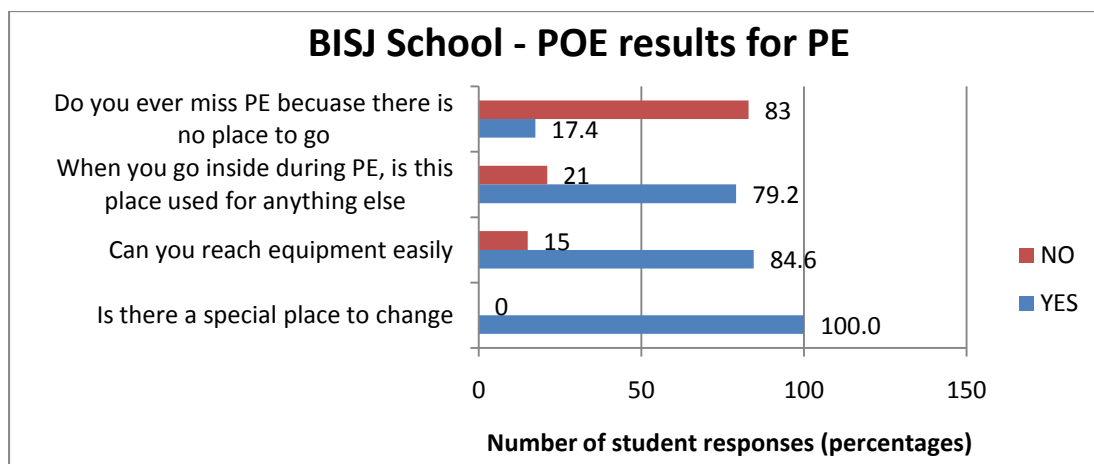
Figure 5.14 POE results for PE

5.4.2 Specialized Learning spaces

5.4.2.1 Science

Accumulative POE results for science class

- Can everyon hear the teacher clearly: NO 5.2, YES 94.8
- can everyone see the teacher clearly: NO 11.3, YES 88.7

Legend: NO, YES

The number of student responses (percentages)
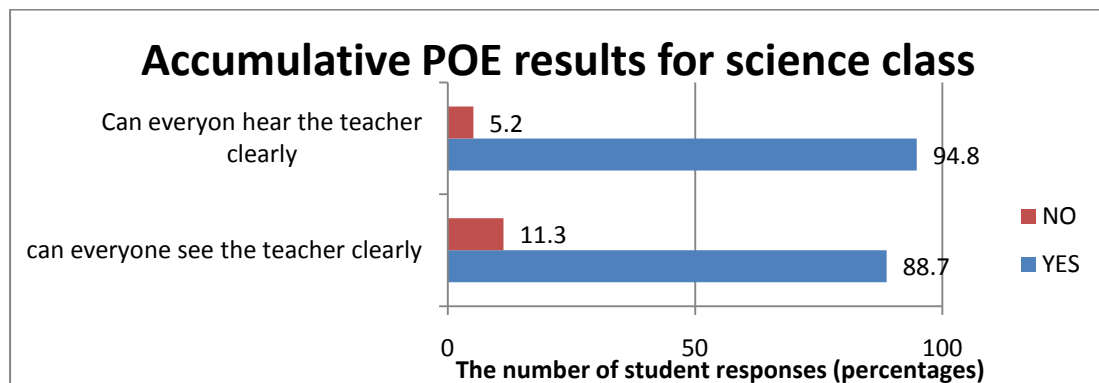
Figure 5.15 POE results for Science class

It was observed that none of the schools had science labs. All science experiments were conducted in class. Results show students in schools could easily see and hear the teacher during science class (Figure 5.15). However individually, students from MJIS and AISJ School felt that there was no special place to leave their experiments. Furthermore, majority of the students from all three schools said there was no sink (Figure 5.16). According to the assessment conducted and observations made, AISJ and MJIS schools did not provide for sinks in any of the classes but results indicate that more than half the students at MJIS felt they did. This maybe a result of students using sinks from nearby toilets.

POE results for Science

- Is there a special place to leave the experiment where it wont be…: MJIS 54, AISJ 39, BISJ 22
- Is there a sink: MJIS 51, AISJ 94, BISJ 57
- Can everyon hear the teacher clearly: MJIS 8, AISJ 8, BISJ 1
- can everyone see the teacher clearly: MJIS 20, AISJ 13, BISJ 2

Legend: MJIS School, AISJ School, BISJ School

Number of negative (no) student responses (percentages)
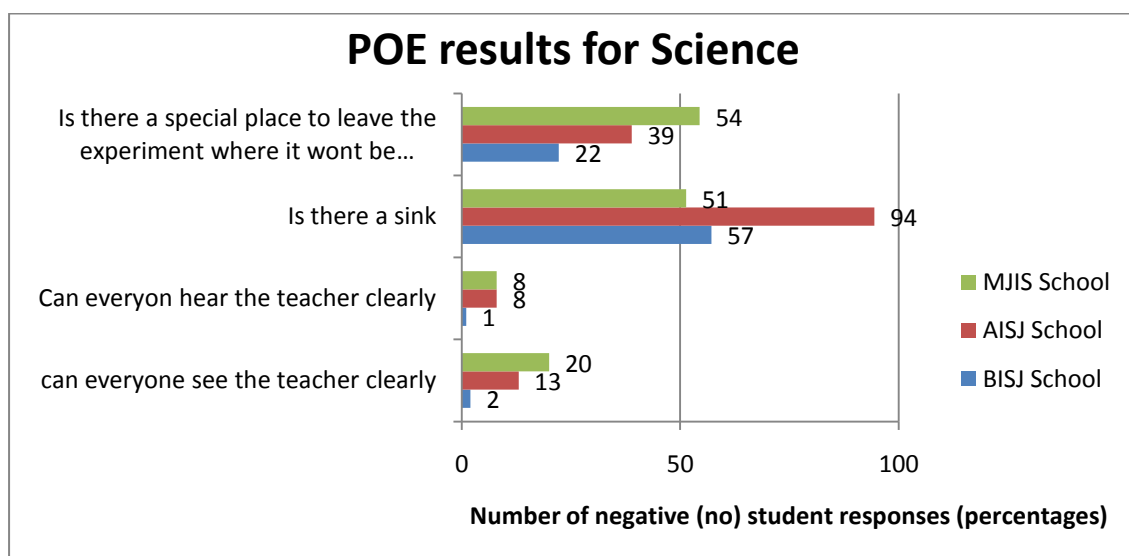
Figure 5.16 POE results on science facilities

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5.4.2.2 Music

AISJ School - POE results for music lessons

Do the lessons disturb other classes — 23 (NO), 77 (YES)

Is there a special room for music lessons — 2 (NO), 98 (YES)

Number of student responses (percentages)
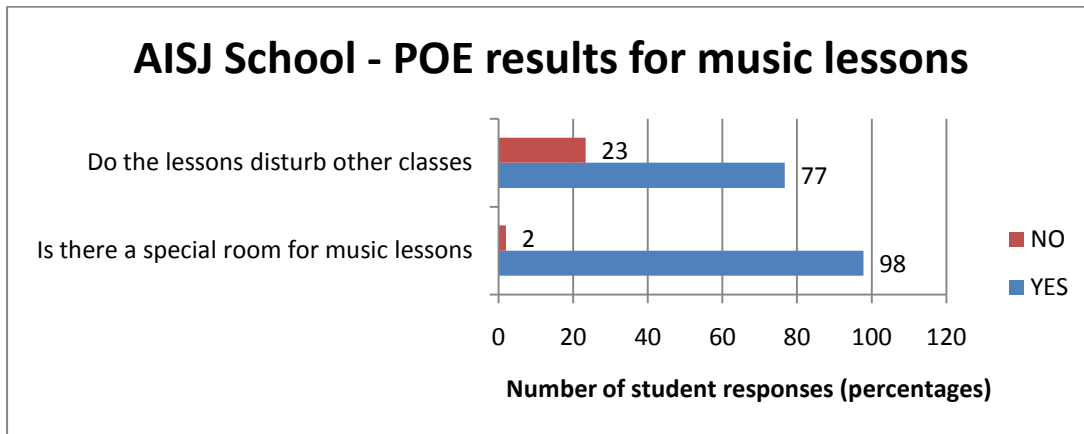
Figure 5.17 POE results on music rooms

MJIS School did not have a provision for music lessons in any capacity so students were unable to answer this question. AISJ School's POE result does indicate that 77% felt that the music lessons disturb other classes (Figure 5.17). This is largely due to poor location of the music room near learning areas and that the walls were temporary steel partitions with no sound insulation.

BISJ School - POE results for music lessons

Do the lessons disturb other classes — 80 (NO), 20 (YES)

Is there a special room for music lessons — 1 (NO), 99 (YES)

Number of student responses (percentages)
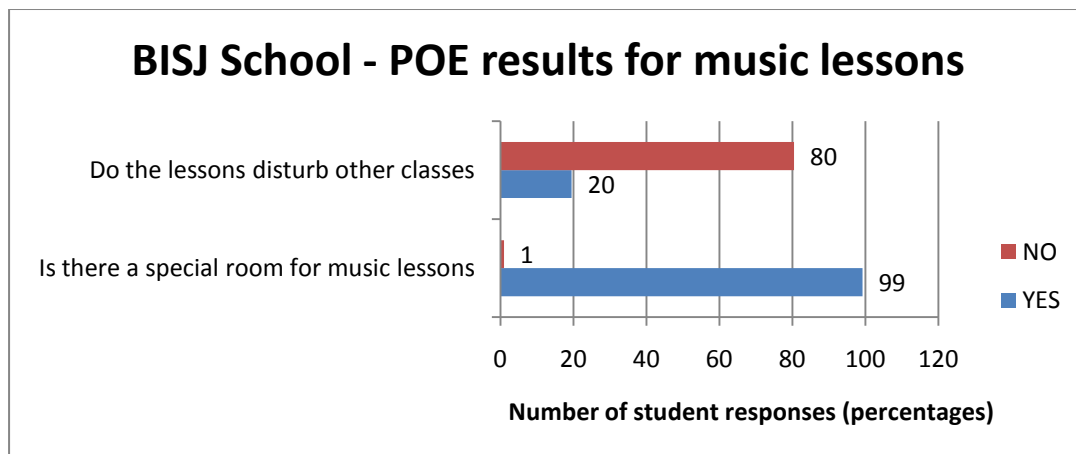
Figure 5.18 POE results for music rooms

BISJ School had high positive responses reflecting overall satisfaction by students. A significantly high response of 99% confirmed that there was provision for music lessons and 80% felt that these lessons did not disturb other classes (Figure 5.18). This can be explained by higher standards of sound insulation and because all music rooms were located away from all learning areas.

POE results for ICT labs

Are they enough — MJIS School: 1, AISJ School: 40, BISJ School: 43

Do the lessons ever get disturbed by people from other classes — MJIS School: 32, AISJ School: 34, BISJ School: 26

Is there enough space to sit comfortably — MJIS School: 34, AISJ School: 74, BISJ School: 88

Number of positive (yes) student responses (percentages)
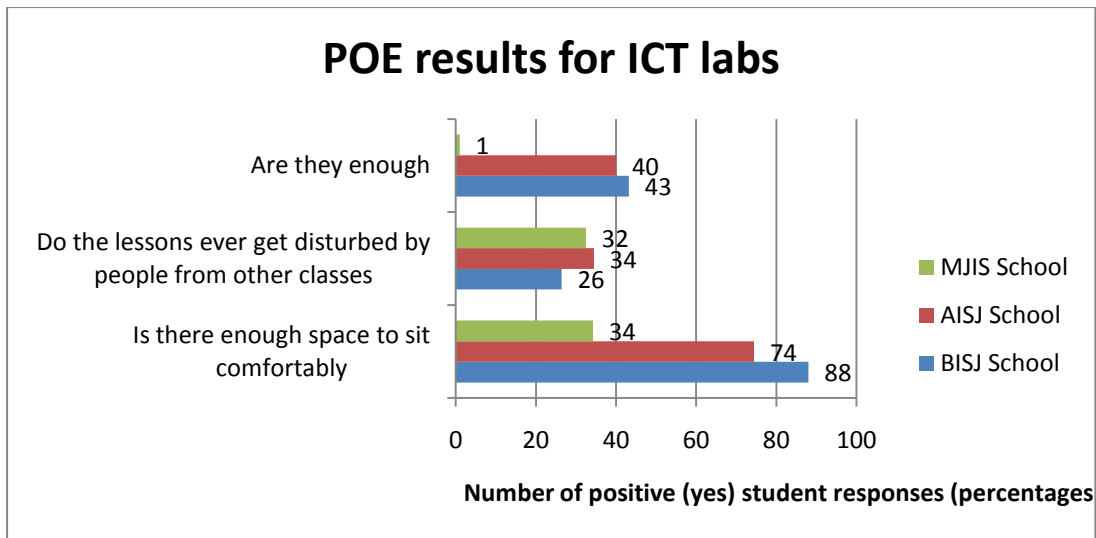
Figure 5.17 POE results on ICT labs

5.4.2.3 ICT labs

All schools assessed were provided with ICT labs, but these were considered to be inadequate in number. MJIS only provided one lab that is shared by the entire primary school. Furthermore, on the average 1/3 of the students from these schools felt that lessons were disturbed by people from other classes. The ICT lab in MJIS School was rated significantly lower with insufficient space to sit comfortably and computers which had to be shared between students (Figure 5.17).

POE results for ICT labs

Do some people have to share — MJIS School: 84, AISJ School: 12, BISJ School: 7

Are there enough computers for everyone — MJIS School: 24, AISJ School: 80, BISJ School: 96

Is there a special screen to show class wht to do — MJIS School: 88, AISJ School: 54, BISJ School: 98

Is the whole class able to see teacher — MJIS School: 73, AISJ School: 58, BISJ School: 96

Number of positve (yes) student responses (percentages)

Figure 5.18 POE results on ICT labs

However Figure 5.18 reveals that AISJ School also had weak areas in particular aspects as compared to the other two. Almost half the students felt they could not see the teacher and almost half felt that the lab did not have a screen to assist in demonstrations. On the other hand, BISJ School results were excellent on all accounts as 96% said they could see the teacher indicating that the lab had good sightlines, screens had been provided and there were enough computers for everyone (Figure 5.18).

5.4.2.4 Library

MJIS School did not have a library. The POE for the other schools indicated that students had a positive reaction to the library and were generally satisfied. They could sit down and read a book quietly, there were enough tables and chairs and that everyone could reach the shelves easily (Figure 5.19).
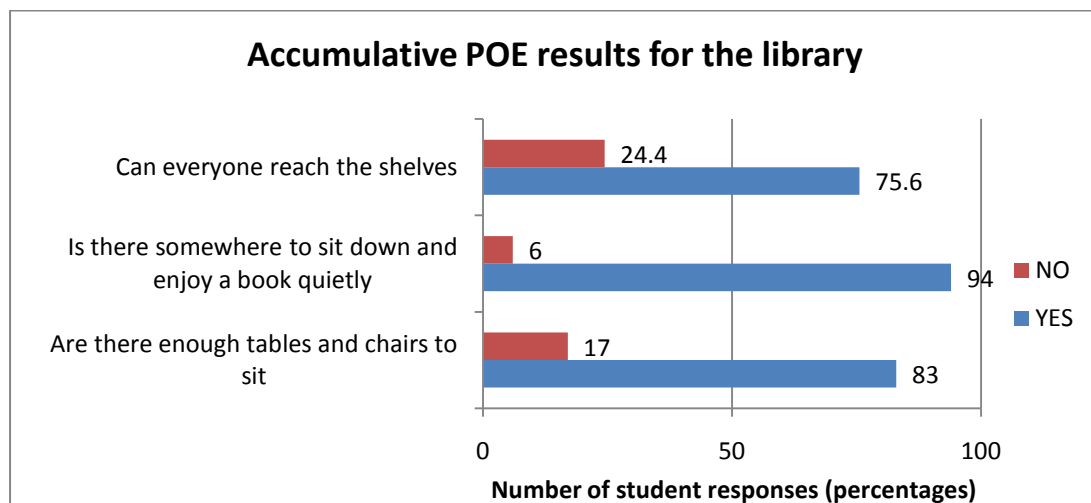
Figure 5.19 POE results for library

The POE survey required students to select from a set of words those that best described their library. Both schools had similar results. This exercise revealed that students felt it was a calm, peaceful place to go and was spacious, comfortable, quiet and special (Figure 5.20).
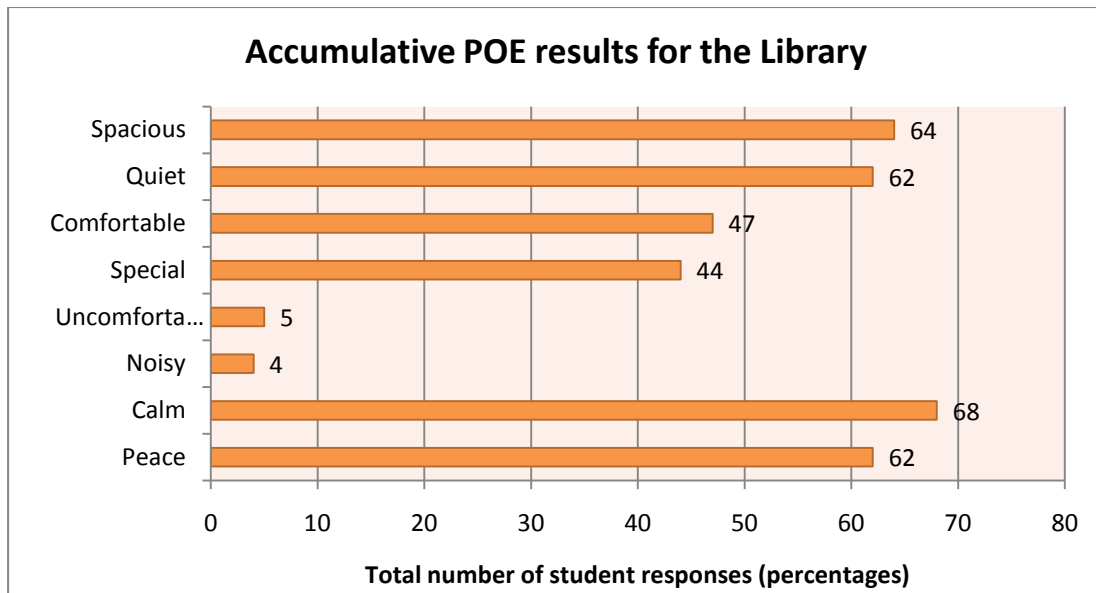
Figure 5.20 POE results for the library

5.4.2.5 Art room
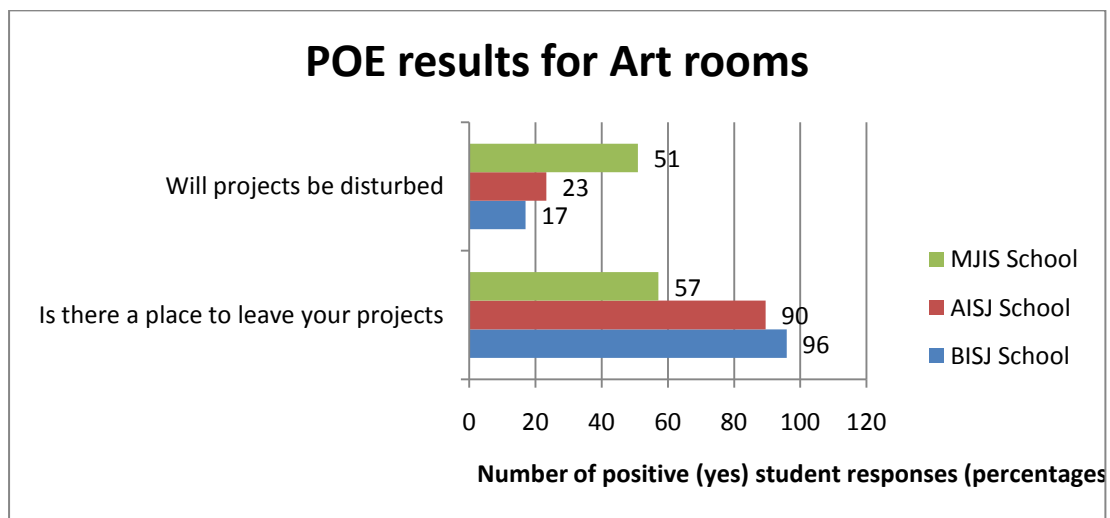
Figure 5.21 POE results for art rooms

The POE results showed the art rooms in BISJ and AISJ Schools accommodated areas where students could leave their projects without being disturbed but MJIS School rated poorly on this.

POE results for Artrooms

Number of negative (no) student responses (percentages)

Question	MJIS School	AISJ School	BISJ School
Can you reach equipment easily	33	57	36
Are all the things needed to paint nearby	46	33	20
Is there a room for everyone to paint at the same time	29	19	7
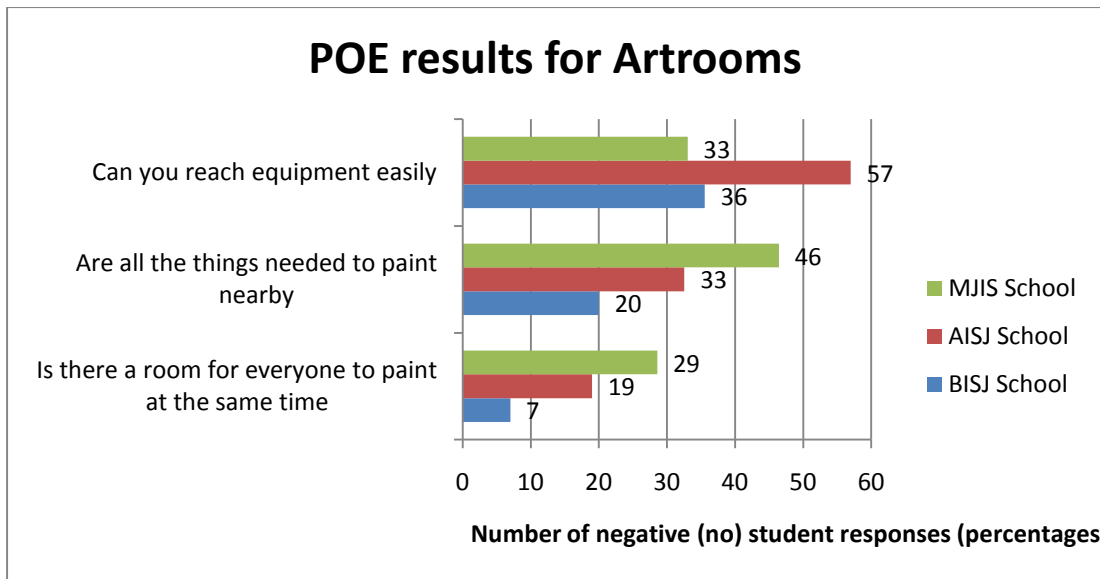
Figure 5.22 Poe results for art rooms

Results indicated that none of the schools especially considered the ergonomic requirements of the students in the art rooms (Figure 5.22). Observations made during the assessment phase may explain why AISJ School was rated lower than the others. All the classes ranging from 1st grade to 7th grade were required to use the same art room with no consideration for table, chair or shelf heights making it difficult for the smaller children to access equipment. The POE indicated that MJIS School was rated poorly and students felt equipment was not nearby and there was not enough room for all students to paint at the same time. This response is mainly due to the fact that there was only one art room for the entire school and it was almost half the size of the art rooms from the other two schools. This would imply congestion and little room for the students to paint. BJIS School art room was rated more highly.

5.4.3 Support Spaces

5.4.3.1 Assembly

In assembly halls a crucial requirement is easy access in and out of the area especially in case of an emergency. However on average more than half the students felt they could not do this. Figure 5.23 show that students at all three schools felt they were unable to get into and out of the hall quickly. Another concern was that students at these schools could not see pictures held up on stage. BISJ School had a

significantly lower number because a projector and screen had been installed for this purpose.

POE results for Assembly

can everyone get in and out of the hall quickly: MJIS School 66, AISJ School 56, BISJ School 38

Can everyone see pictures the people are holding up on the stage: MJIS School 79, AISJ School 67, BISJ School 43

Number of negative (no) student responses (percentages)
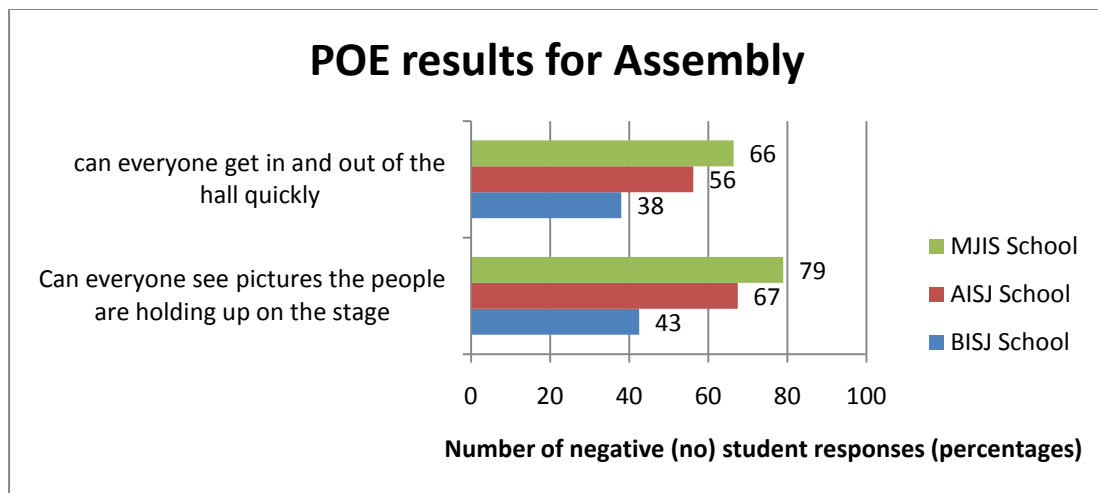
The POE results indicated that majority of the students from BISJ and AISJ could easily hear the speaker and that there was enough space to sit comfortably (Figure 5.24)
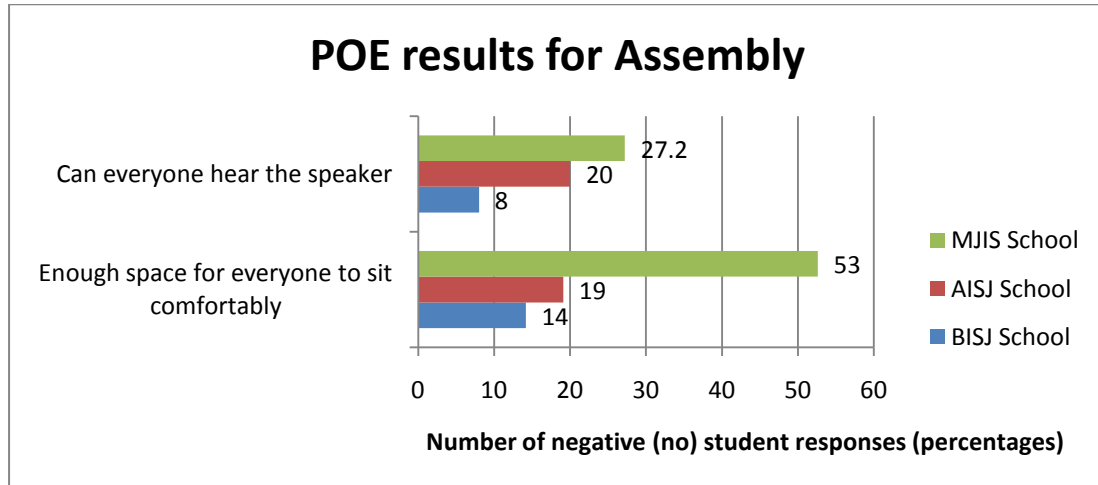
POE results for Assembly

Can everyone hear the speaker: MJIS School 27.2, AISJ School 20, BISJ School 8

Enough space for everyone to sit comfortably: MJIS School 53, AISJ School 19, BISJ School 14

Number of negative (no) student responses (percentages)

Results indicated that MJIS School's assembly hall least met the needs of the students as almost 1/3 could not hear the speaker and 53% felt there was not enough space for everyone (Figure 5.24). The assembly hall at this school was a shared courtyard area that was used for sports activities, gatherings, including assembly and other school functions. Due to the large size of this hall, sound

insulation was difficult to control due to echo and sound reverberation caused by hard- surface tiled flooring and 15m high ceilings.

5.4.3.2 Shared Areas

The majority of students at AISJ and MJIS said there were no shared areas in their school but 72% felt it was a good idea showing students acknowledgment that shared areas can contribute to their learning needs. As seen in Figure 5.25 only BISJ School had a high positive response of 73% who felt there was a shared area nearby. The school placed a few small shared areas near classrooms and off main corridors for easy access to be used by students as they pleased.
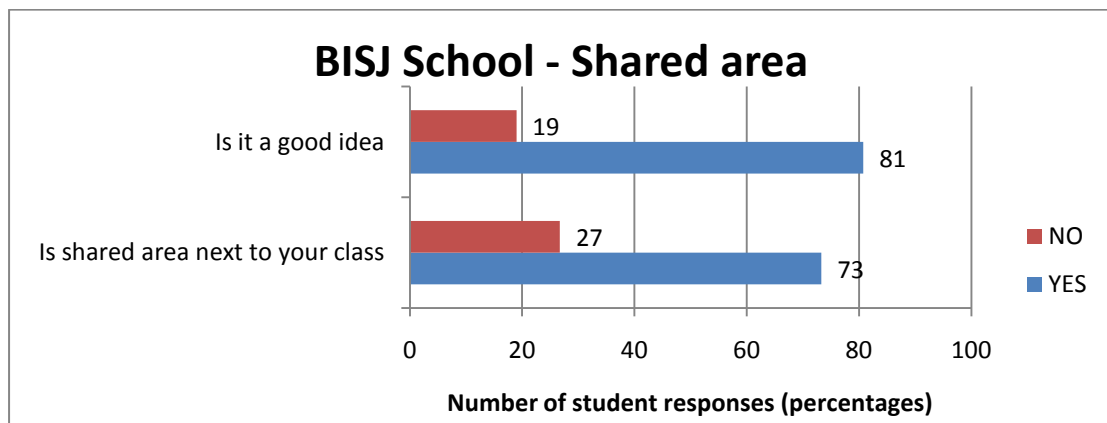
Figure 5.25 POE results for shared areas

5.4.3.3 Café
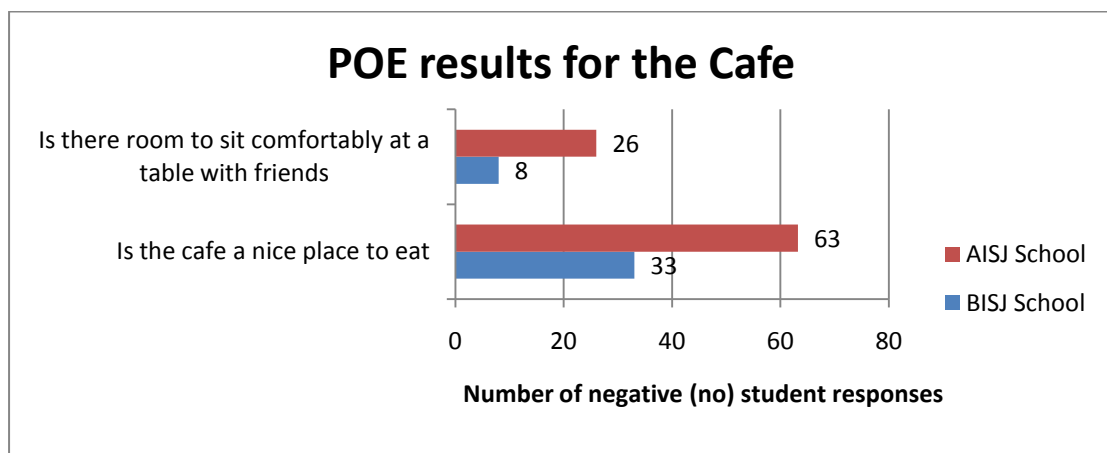
Figure 5.26 POE results for the café

Although a cafeteria is considered an important support area, MJIS School did not provide for one. The POE results for the other schools indicated that 33% of the students from BISJ and a significantly higher figure of 63% from AISJ School felt that the cafe was not a nice place to eat although the majority said there was enough room to sit comfortably at tables with their friends (Figure 5.26). Results indicate that majority of students at AISJ School were not satisfied. Figure 5.27 shows that majority of students from AISJ School described it as dirty and uncomfortable, horrible' and 'cramped'. BISJ School had much better results, students felt there was lots of space, it was clean, 'nice' and 'friendly'. However noise and poor acoustics was a problem in both schools.

AISJ School - POE Cafe Description results

Description	Percentage
Lots of Space	24.4
Comfortable	8.9
Friendly	8.9
Cramped	32.2
Dirty	68.9
Horrible	44.4
Nice	5.6
Uncomfort…	47.8
Scary	10.0
dark	11.1
bright	24.4
Noisy	87.8

Number of student responses (percentages)
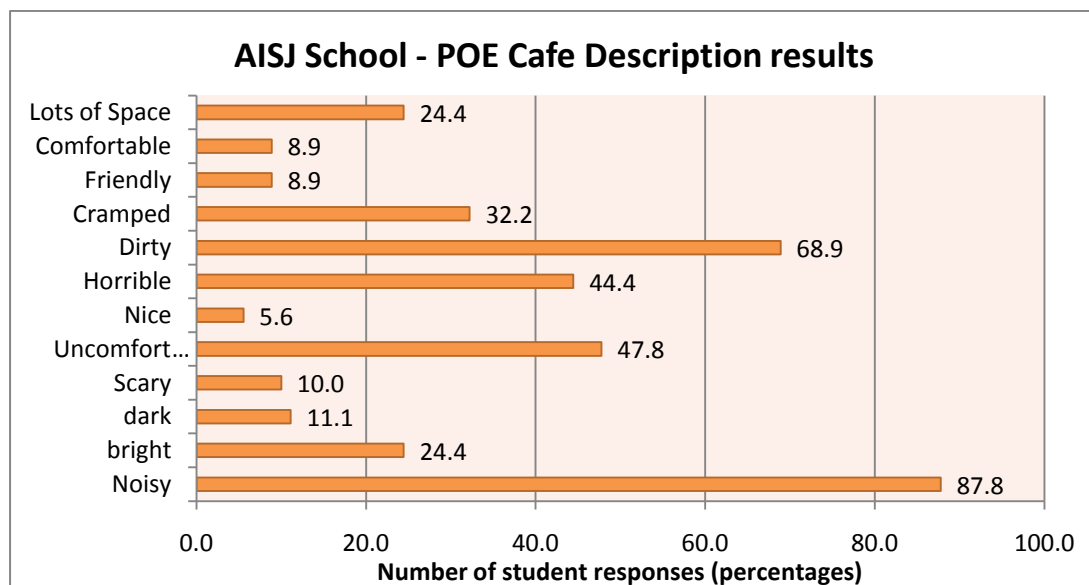
Figure 5.27 POE results for cafe description

This can also be further elaborated by the qualitative section of the POE where students were asked to give reasons why the felt their cafe was bad. Both schools had the same reasons. An average of 39.2% of the students from both Schools felt it was because of the unhygienic conditions of the cafe and another 31.7% felt it was due to the noisy, aggressive and chaotic ambience (Figure 5.28).

Why is the Cafe Bad (Percentages)

Category	Value
Uncomfortable	7.5
Ugly and unmaintainted	5.8
No place 2 Socialize	3.3
No other Options	0.8
Dirty Space/Tables	39.2
Crowded/Cramped	10
Uncomfortable/Cold	1.7
Noisy/Chaotic	31.7

Number of student responses (percentages)
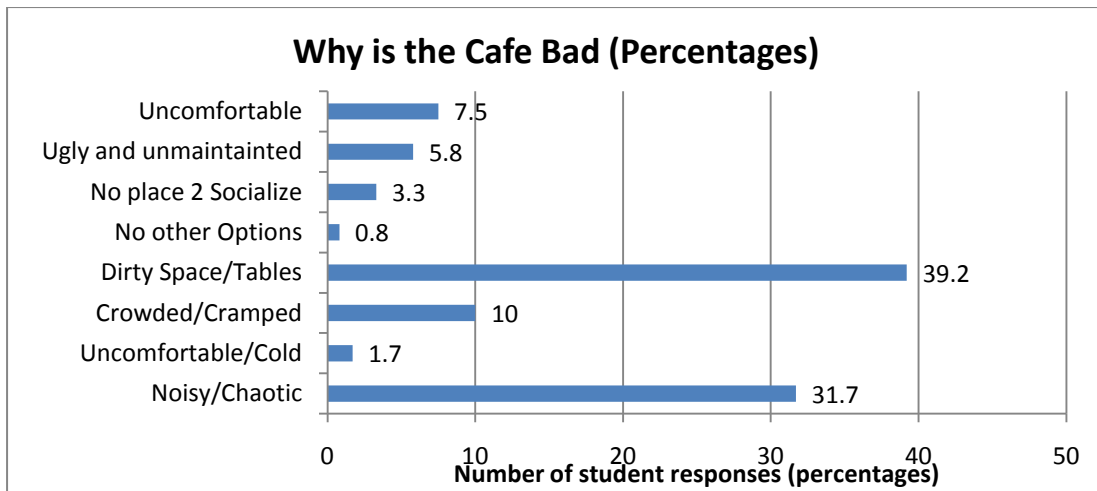
Figure 5.28 POE results for Café

5.4.3.4 Playtime

Along with the café, play areas are also important as students are free to play, imagine, socialize and be active. Providing variety of space and equipment enhances the play. Results indicated that BISJ and AISJ School had high positive responses suggesting that there were was a variety of options to choose from in the playground, enough shaded areas to sit and that there were dedicated areas in which children could play as seen in Figure 5.29

POE results for playtime

Question	MJIS School	AISJ School	BISJ School
Are there lots of different things to choose from in the playground	25	87	86
Is there enough you can sit with shade	35	91	100
Will you disturb other people	80	39	30
Is there somewhere you can play	32	98	100

Number of positive (yes) student responses (percentages)
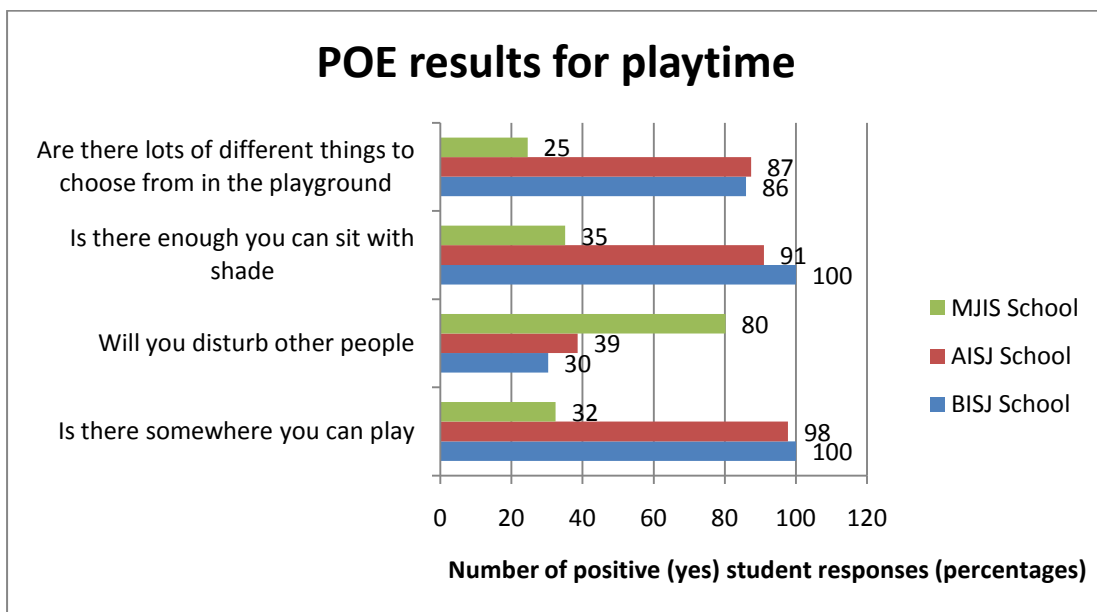
Figure 5.29 POE results for play areas

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However results indicated that students at MJIS School were not satisfied and that the playground was inadequate. As seen in Figure 5.29 majority of students from this school felt there was a lack of variety in equipment provided and nowhere to go during playtime. The assessment confirmed that lack of a dedicated playground, outdoor areas or play equipment. Students were required to remain indoors and spend their playtime in the assembly hall. Furthermore 80% of the students in this school felt their playtime would disturb others because most of the classrooms surrounded the assembly hall which was also used for playtime creating distraction for the students and disturbing teachers.

The poor conditions of the playground at MJIS School was further elaborated when students were asked to select 4 words that best described their play area, Figure 5.30 clearly shows extremely high rate for negative descriptions such 'sad', 'small', 'boring' and lastly more than half felt there was nowhere to sit quietly. Other concerns that are essential to effective play areas such as incorporating nature and quiet places to sit with friends were not considered as part of the school scheme.
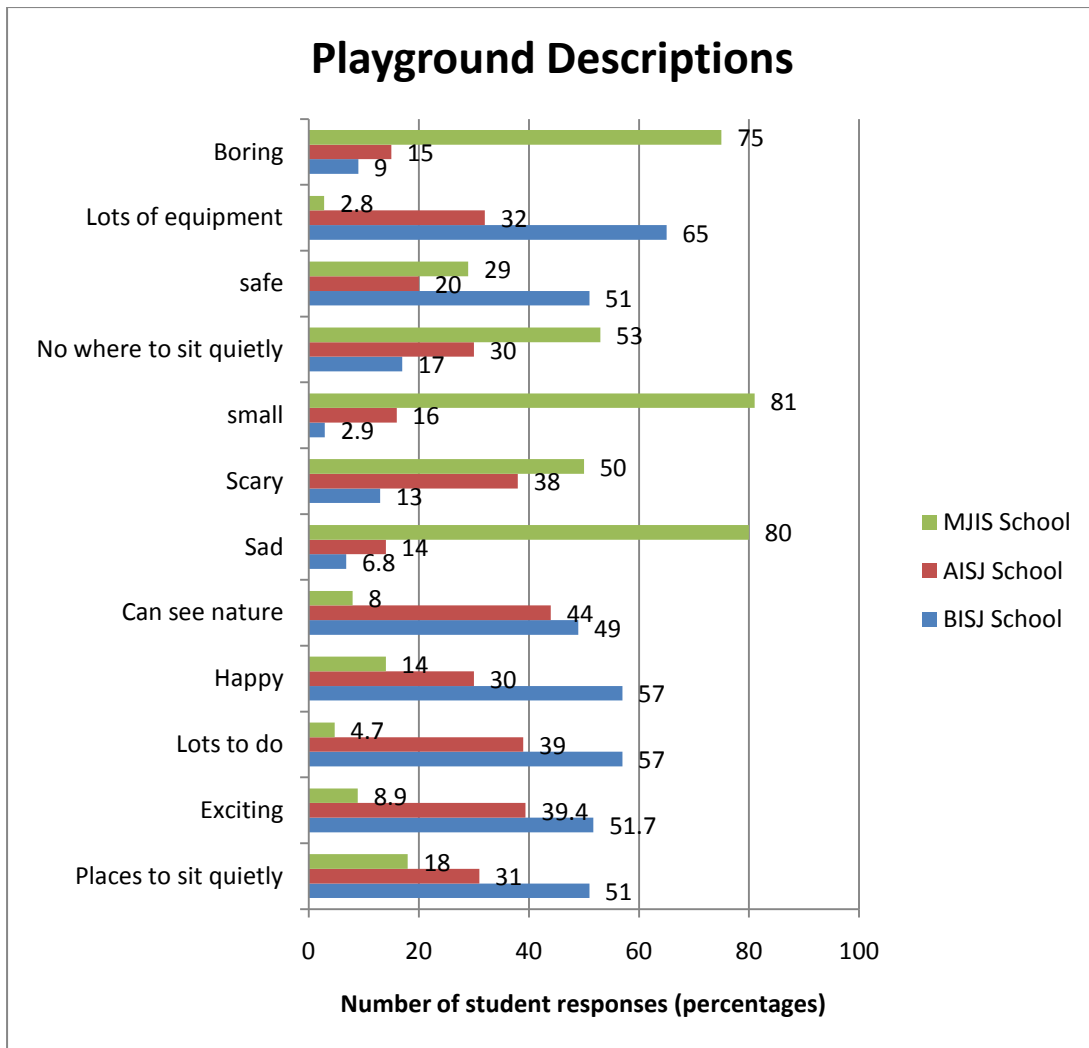
Figure 5.30 POE results for playground description

The POE results indicate that BISJ School playground was of a better quality and that students responded more positively to it. Majority felt there was lots of equipment to choose from and described it as 'happy'. More than half the students felt it was 'exciting', with lots to do, enough places to sit quietly and feel safe (Figure 5.30). This school was provided with a variety of outdoor activity areas such a shaded bench areas to enjoy their lunch with friends, hard-surface areas for active play, and age-appropriate play equipment such as slides and swings. AISJ School results indicated that there was room for improvement but the conditions of the playground were of higher standards than MJIS School.

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5.4.3.5 Toilets

POE results for toilets

Is it far from class
- MJIS School: 19
- AISJ School: 39
- BISJ School: 38

Number of positive (yes) student responses (percentages)
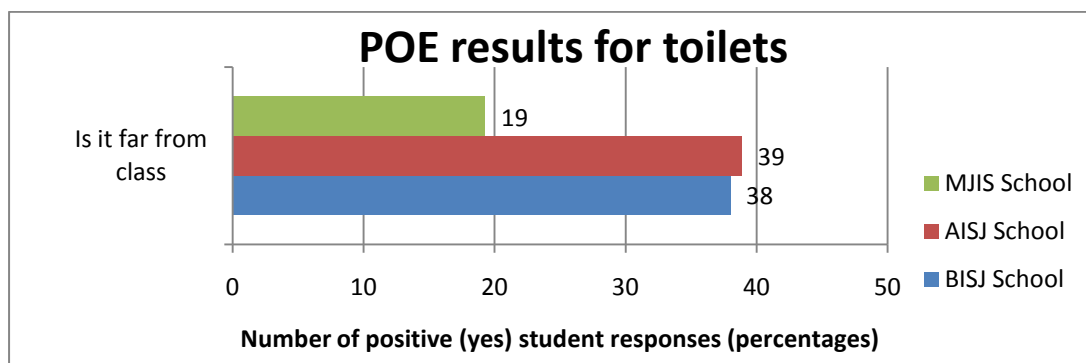
Figure 5.31 POE results for toilets

Convenient location of toilets for primary school children is an essential element. Toilets should be located near classes. However, students from AISJ and BISJ School felt the toilets were far from class. MJIS School achieved a better result because of toilet hubs located through the facility.

POE results for Toilets

Are they nice to use
- MJIS School: 80
- AISJ School: 87
- BISJ School: 36

Are there enough
- MJIS School: 61
- AISJ School: 61
- BISJ School: 7

Number of negative (no) student responses (percentages)
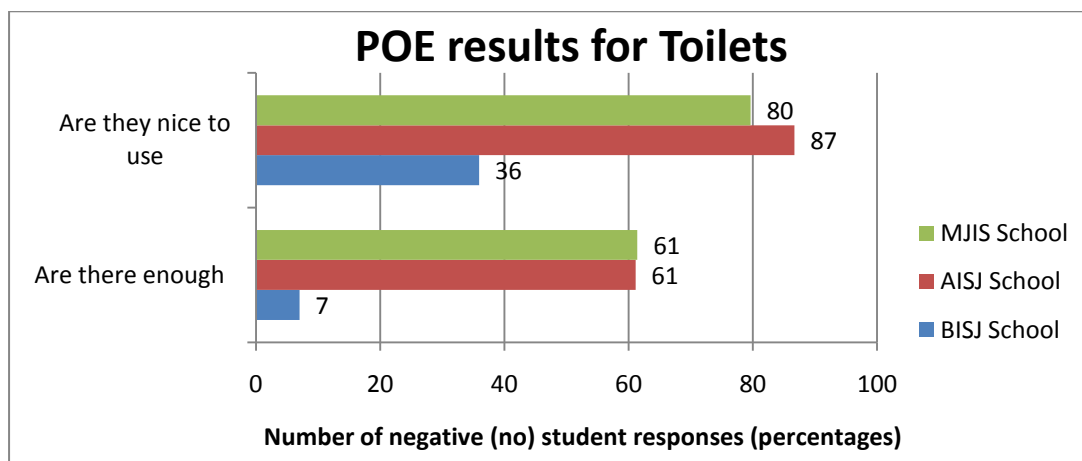
Figure 5.32 POE results for toilets

Figure 5.32 shows that a significantly high number of students from both MJIS and AISJ School did not feel the toilets were pleasant to use and over 60% at both schools felt there were not enough. During the observation and assessment phase, it was noted that the toilets in these two schools were unmaintained, old, aesthetically unpleasing and unhygienic. However in comparison, students from BISJ School rated the toilets with better results and only 7% felt there were not enough (Figure 5.32) indicating toilet facilities are of a higher standard and suit the needs of the children.

5.5 RESULTS: Teachers Perception

5.5.1 Academic Learning Spaces

5.5.1.1 Variety, Flexibility and Layout

Size of learning areas meets standards

	MJIS	BISJ	AISJ
Agree	33	28	39
Disagree	61	33	44
Neutral	6	39	17

Total number of teacher responses (Percentages)

Legend: School MJIS (green), School BISJ (red), School AISJ (blue)
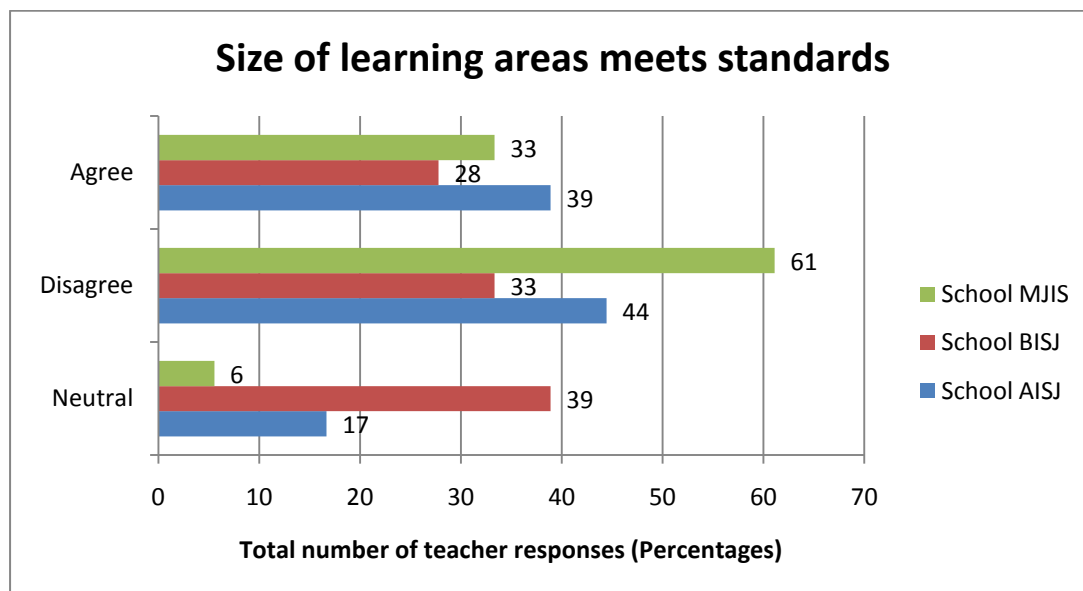
Figure 5.33

Results revealed that all three schools were concerned that the size of the learning areas did not meet standards. As shown in Figure 5.33 a considerably high response rate of 61% at MJIS, 44% at AISJ and the lowest response rate of 33% occurred at BISJ School.

When asked if the school facilities were adaptable to user needs 50% at MJIS and 39% at AISJ disagreed. This clearly suggests that MJIS School was the weakest of the three schools (Figure 5.34)

The school facilities are adaptable to users needs

Agree
- School MJIS: 11
- School BISJ: 44
- School AISJ: 28

Disagree
- School MJIS: 50
- School BISJ: 11
- School AISJ: 39

Neutral
- School MJIS: 39
- School BISJ: 44
- School AISJ: 33

Total number of teacher responses (Percentages)
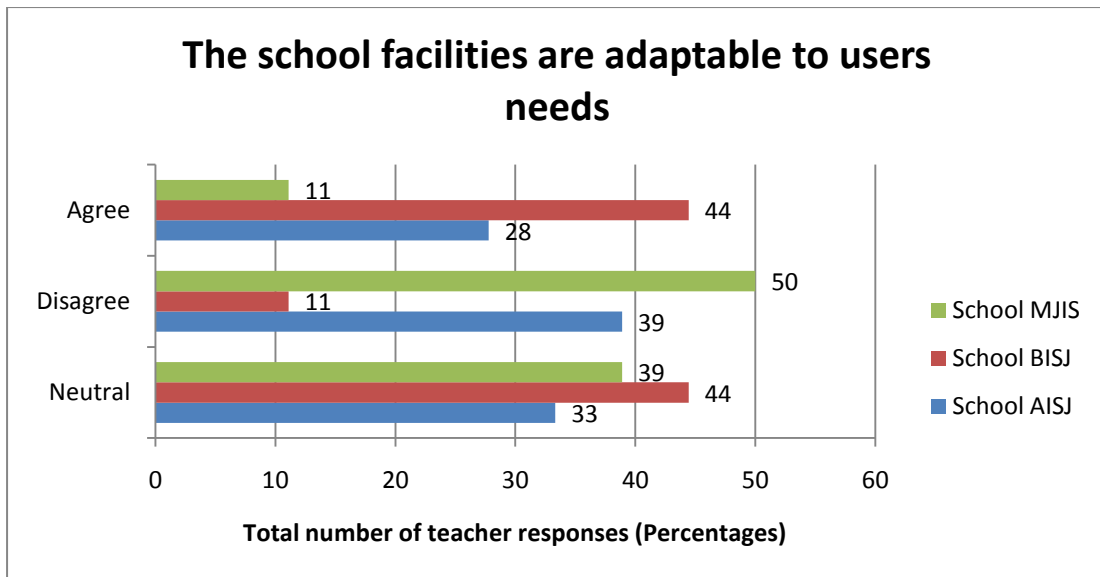
Figure 5.34

Results revealed that many teachers in all three schools felt that classrooms did not permit arrangements for small group activity (44% at MJIS, 39% at AISJ and 33% at BISJ School) (Figure 5.35).

Classroom space permits arrangement for small group activity

Agree
- School MJIS: 39
- School BISJ: 50
- School AISJ: 50

Disagree
- School MJIS: 44
- School BISJ: 33
- School AISJ: 39

Neutral
- School MJIS: 17
- School BISJ: 17
- School AISJ: 11

Total number of teacher responses (Percentages)

Figure 5.35

Large flexible spaces and/or workstations are available to accommodate student projects

Legend:
- School MJIS
- School BISJ
- School AISJ

Agree: 17, 22, 17
Disagree: 67, 56, 56
Neutral: 17, 22, 28

Total number of teacher responses (Percentages)

Figure 5.36

Moreover, high percentages of teachers at these schools felt that there were no large flexible spaces or workstations available to accommodate student projects (Figure 5.36) and that the classroom did not allow for flexibility in teaching styles (Figure 5.37). These results clearly suggest that classrooms in all three schools poorly accommodate variety, flexibility and individual study but teachers at the MJIS School were least satisfied.

The classroom allows for flexibility in teaching styles

Legend:
- School MJIS
- School BISJ
- School AISJ

Agree: 17, 50, 61
Disagree: 44, 33, 28
Neutral: 39, 17, 11

The Number of teacher responses (Total participants=18)
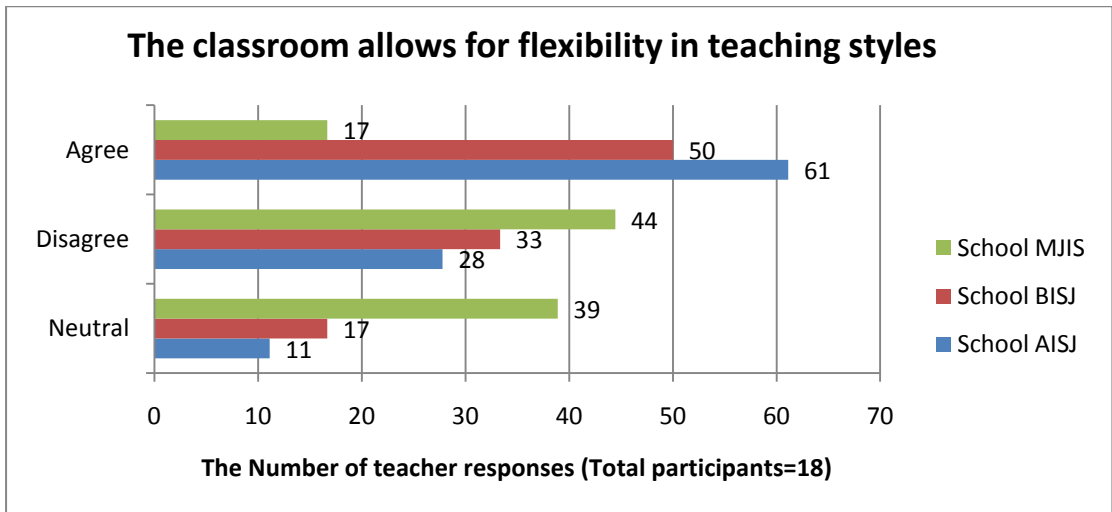
Figure 5.37

5.5.1.2 Storage

All three schools felt that student storage facilities were inadequate. Both MJIS and AISJ School felt that the storage for teachers was also inadequate (Figure 5.38).

Storage for teachers is adequate

	School MJIS	School BISJ	School AISJ
Agree	11	61	33
Disagree	39	22	39
Neutral	50	17	28

Total number of teacher responses (Percentages)
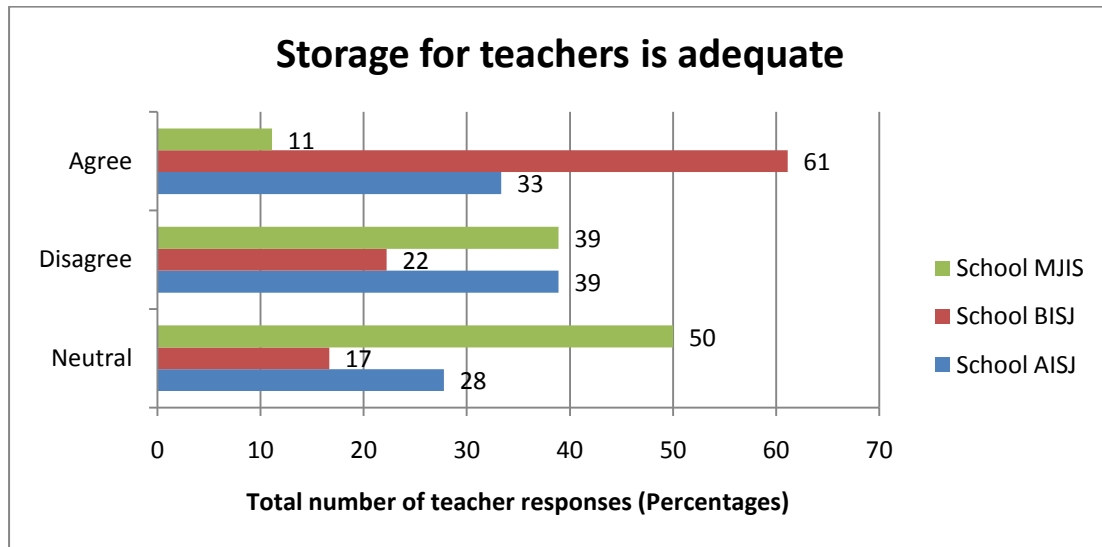
5.5.1.3 Technology and Communication

Classrooms have logical, well designed integrated technology

	School MJIS	School BISJ	School AISJ
Agree	22	67	0
Disagree	56	17	83
Neutral	22	17	17

Total number of teacher responses (Percentages)
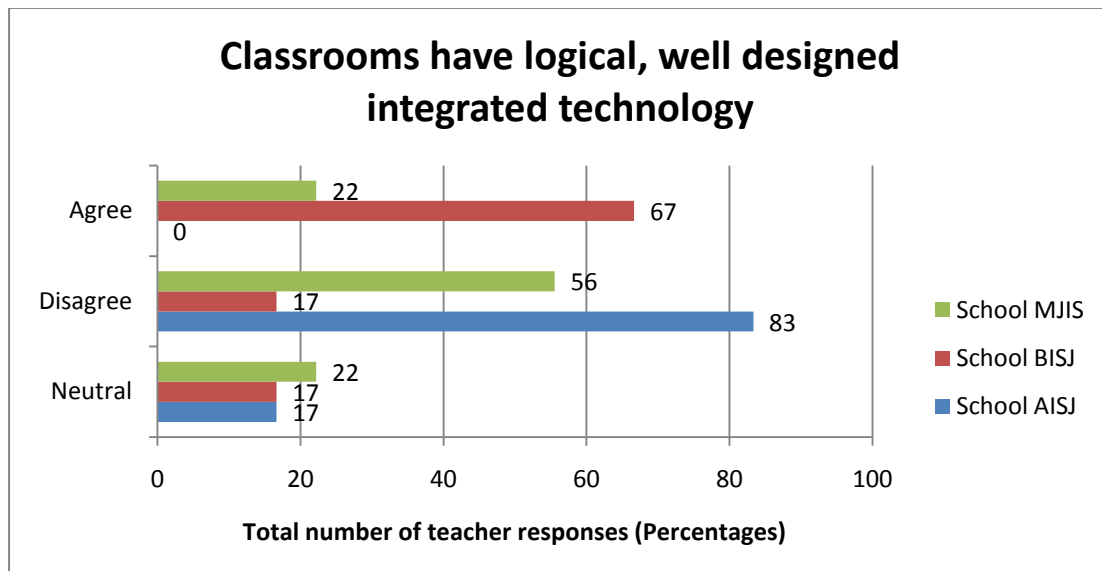
According to the literature, classrooms must have well designed and integrated technology. The results indicate that the provision of ICT was lower in AISJ and MJIS School (Figure 5.39). BISJ School had smart boards, computers and internet

connection where as at MJIS classrooms did not have computers or internet access (Figure 5.40).

Classrooms have computers that are networked for both the intranet and internet
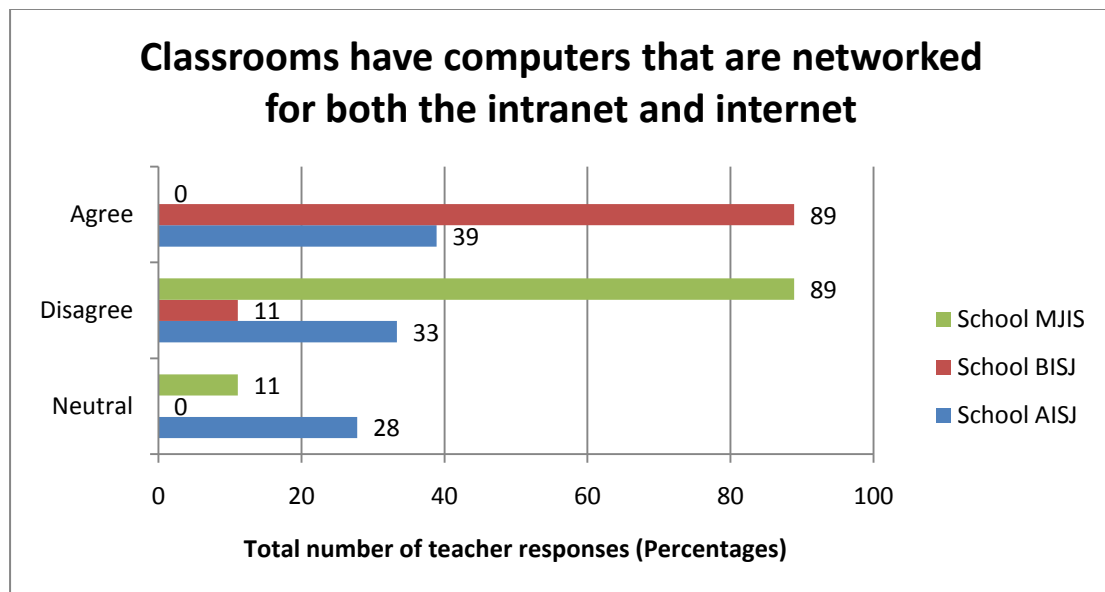
Figure 5.40

The majority of the teachers were unhappy with other communication such as telephones and fax machines.

5.5.1.4 Furnishings

The classroom furnishings are comfortable
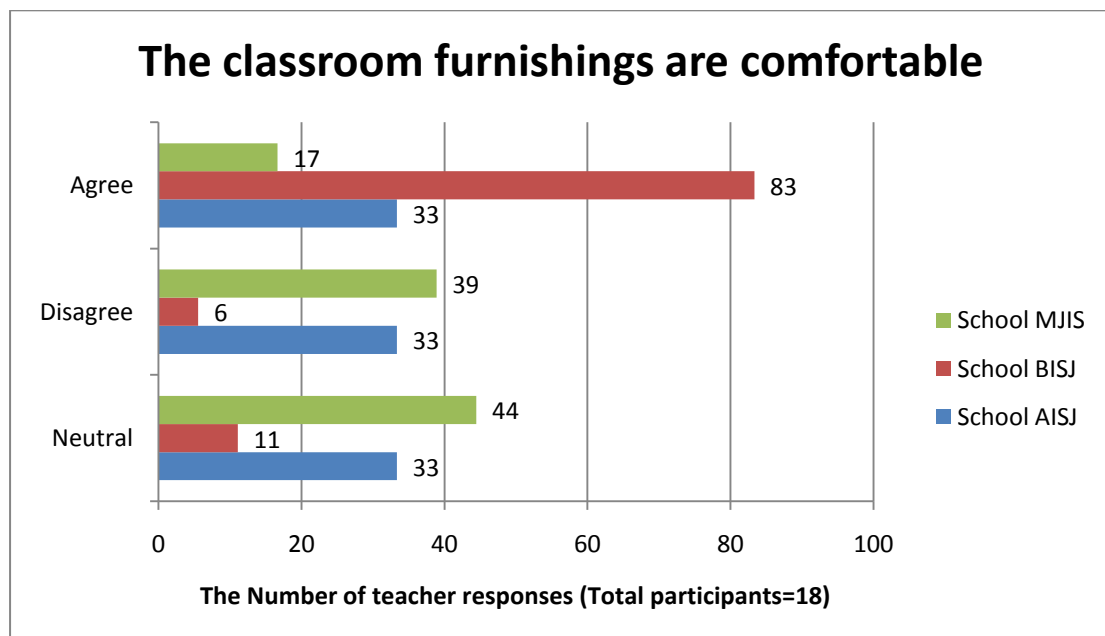
Figure 5.41

Ensuring that classrooms have comfortable furnishing is an essential factor in good learning environments. However 39% of the teachers at MJIS and 33% at AISJ School felt that the furniture was uncomfortable and the rest remained neutral (Figure 5.41. BJIS School was the only one where 83% of the teachers agreed that furnishings were comfortable, age-appropriate and well maintained. BISJ and MJIS both felt their furniture could easily be maintained and cleaned but almost 1/3 of the teachers at AISJ School disagreed as some of the furniture was over 10 years old.

Teachers at BISJ and AISJ were generally satisfied and felt there was enough room for students to display work and accomplishments. 61% of the teachers at MJIS felt that there was not enough display boards and the assessment verified this conclusion (Figure 5.42).
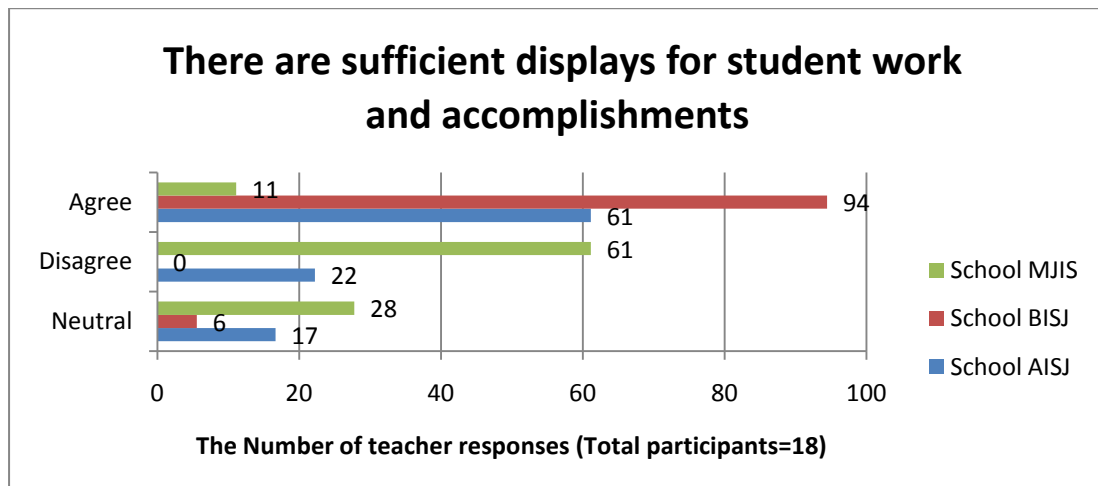
Figure 5.42

5.5.1.5 Ambient factors

The temperature in the classroom is comfortable

	School MJIS	School BISJ	School AISJ
Agree	50	28	17
Disagree	22	50	61
Neutral	28	22	22

The Number of teacher responses (Total participants=18)
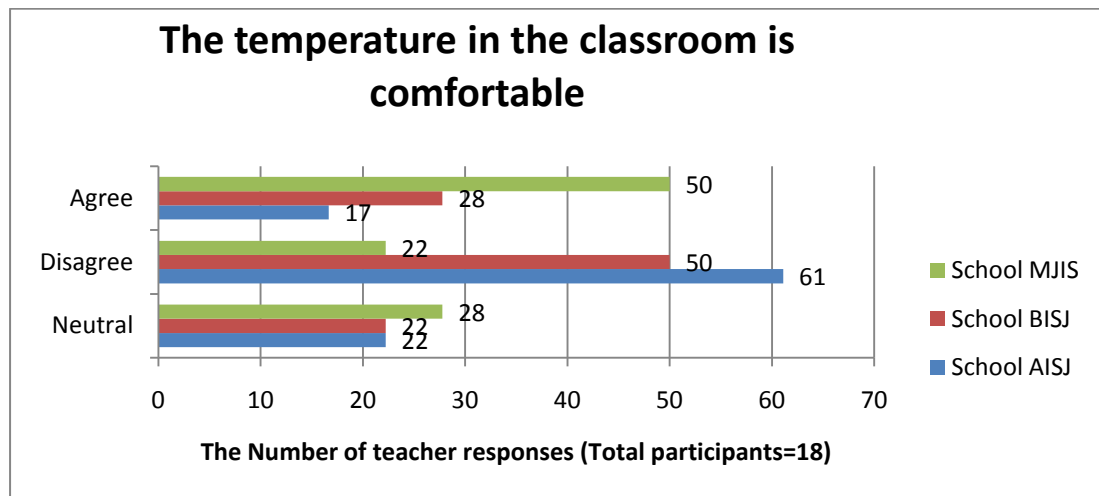
Figure 5.43

Temperature is considered one of the most important air quality parameters for effective learning environments however Figure 5.43 shows that there was some thermal discomfort. Only in MJIS School were classrooms provided with individual control of their AC units. POE results support this fact as 50% from this school agreed that temperature could be easily controlled where as the majority of the teachers from the other two schools disagreed (Figure 5.44).

The temperature in the classroom is easily controlled

	School MJIS	School BISJ	School AISJ
Agree	50	6	11
Disagree	22	83	89
Neutral	28	11	0

The Number of teacher responses (Total participants=18)
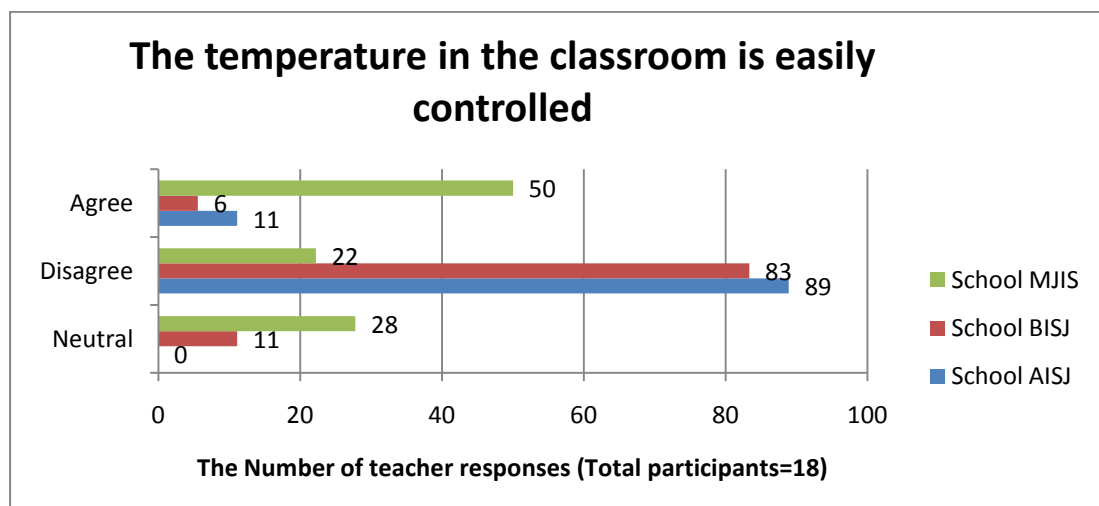
Figure 5.44

Heath and Mendell (2002), Lackney (1999), and Lyons (2002) stress the criticality of indoor quality as a key component of the learning environment. However as shown in Figure 5.45, 78% of the teachers at AISJ School disagreed that their classrooms had fresh and clean air, with no windows and outdated ventilation systems.

The air quality in the classroom is fresh and clean
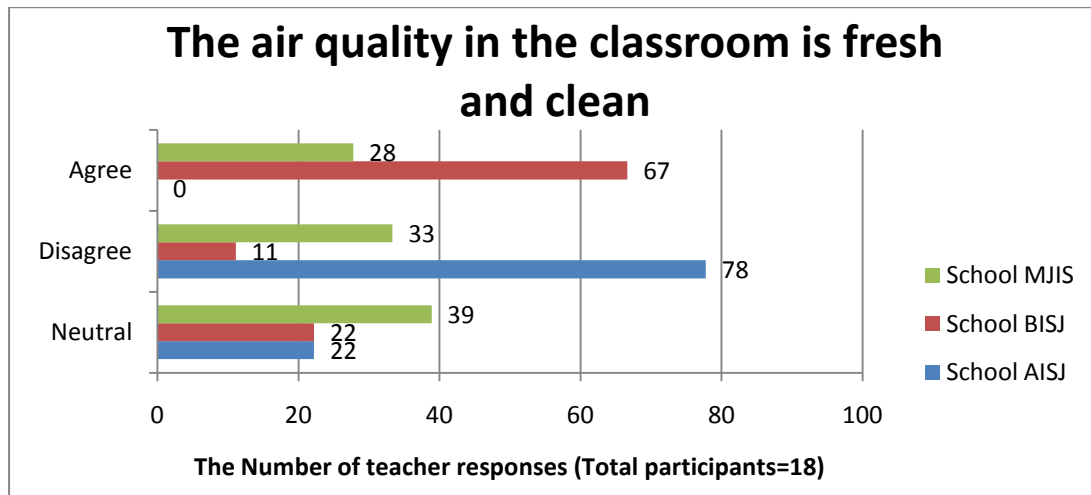
According to the literature review, students in classrooms with daylight progress faster than those in the least daylight rooms (Plympton, Conway, Epstein 2000; Jacobs 2009). The majority of classrooms, as mentioned earlier were without windows or views. Although BISJ School did have plenty of windows, 39% disagreed that there was enough sunlight as the orientation of many classrooms prevented direct sunlight. The overall results could be explained by their perception of daylight as a negative or harsh climatic feature that needs to be prevented (5.46).

There is plenty of daylight in the classroom
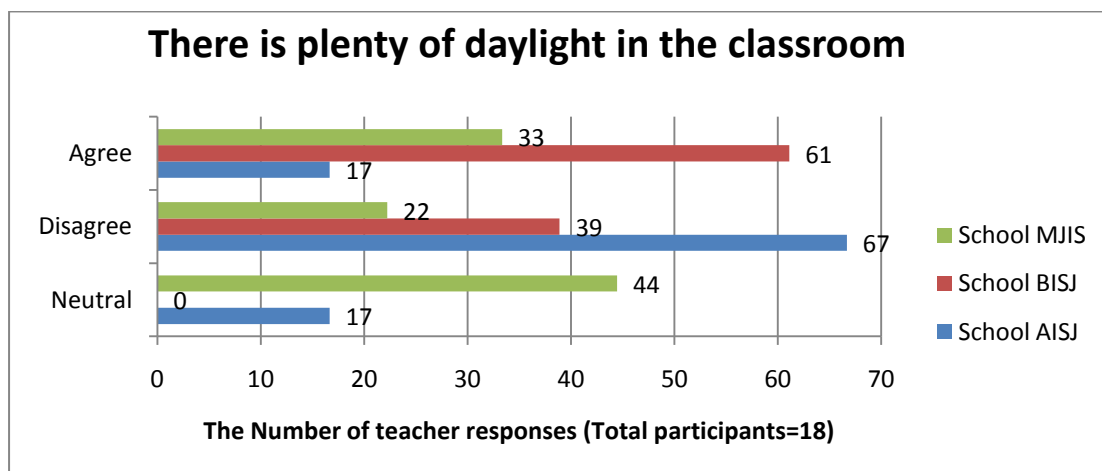
The majority of teachers BISJ and MJIS School agreed that there was enough electric light in the classrooms. However half the teachers at AISJ School disagreed with this statement. Furthermore teachers at BISJ and MISJ School felt that the lighting levels were visually comfortable but the majority at AISJ disagreed (Figure 5.47).

The lighting levels are visually comfortable

Agree — School MJIS: 56, School BISJ: 72, School AISJ: 33
Disagree — School MJIS: 0, School BISJ: 11, School AISJ: 39
Neutral — School MJIS: 44, School BISJ: 17, School AISJ: 28

The Number of teacher responses (Total participants=18)
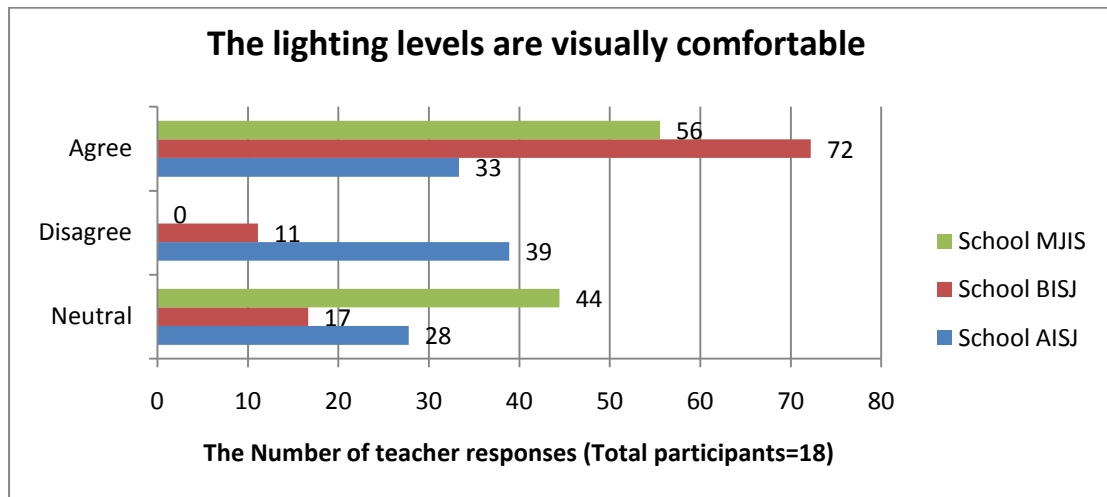
Figure 5.47

POE results indicate that teachers were generally dissatisfied with the lights and felt they could not adjust the lighting to suit the needs of the classrooms (Figure 5.48)

The light can be controlled and adjusted to suite the needs of the classroom

Agree — School MJIS: 28, School BISJ: 39, School AISJ: 11
Disagree — School MJIS: 44, School BISJ: 33, School AISJ: 78
Neutral — School MJIS: 28, School BISJ: 28, School AISJ: 11

The Number of teacher responses (Total participants=18)
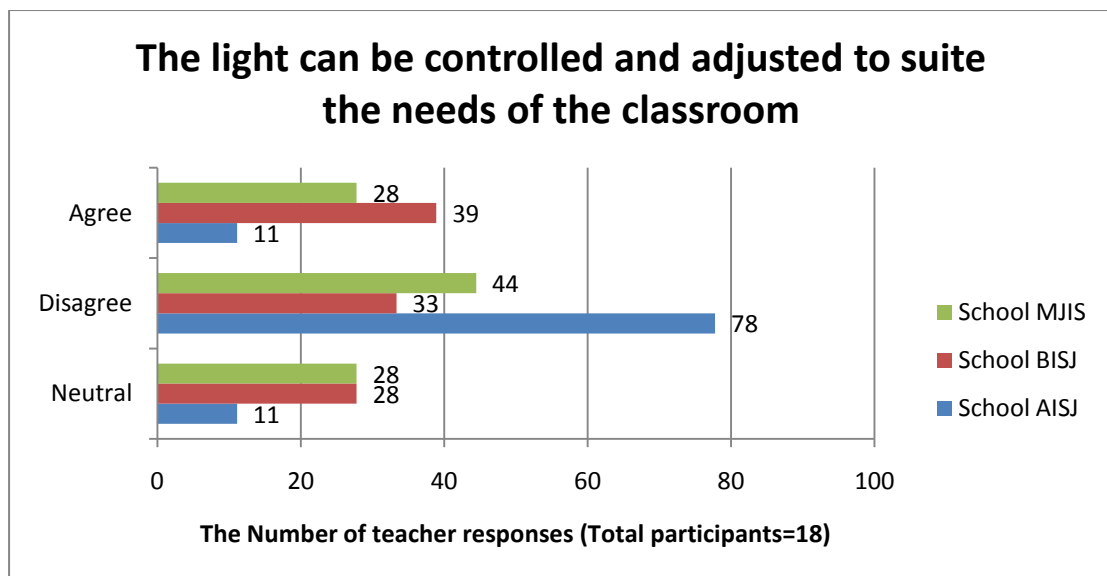
Figure 5.48

There was some evidence that the noise levels in class interfered with teaching and learning at AISJ and MJIS, with AISJ having the weakest sound insulation (Figure 5.49).

The noise levels in the classrooms are low and do not interfere with teaching and learning

- Agree: School MJIS 28, School BISJ 56, School AISJ 22
- Disagree: School MJIS 39, School BISJ 17, School AISJ 61
- Neutral: School MJIS 33, School BISJ 28, School AISJ 17

The Number of teacher responses (Total participants=18)
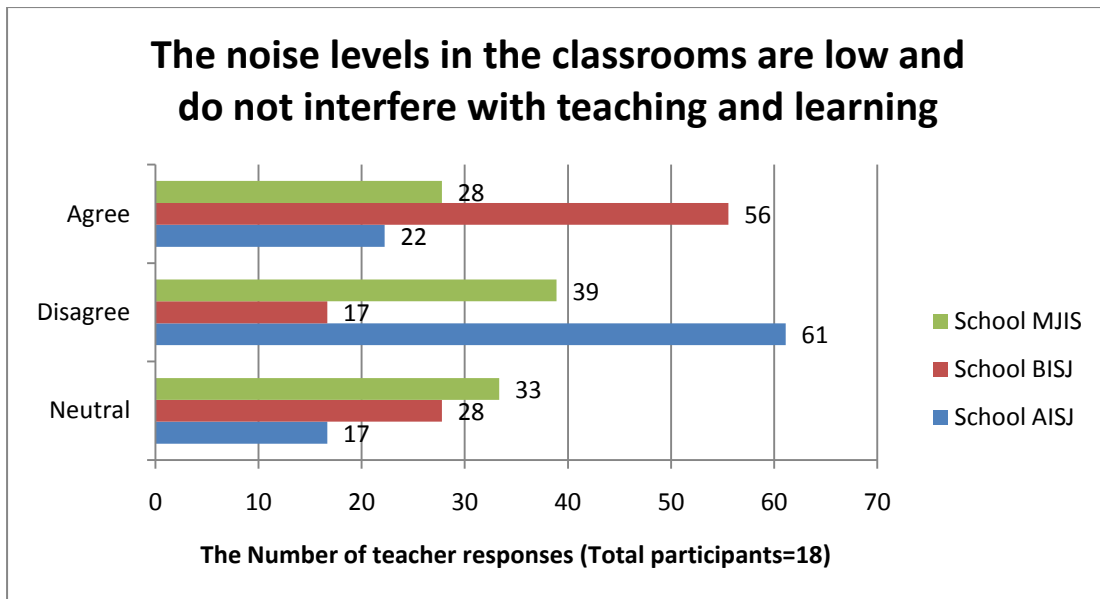
Figure 5.49

5.5.2 Specialized Learning Spaces

Size of specialized learning areas meet standards

- Agree: School MJIS 17, School BISJ 61, School AISJ 39
- Disagree: School MJIS 44, School BISJ 22, School AISJ 22
- Neutral: School MJIS 39, School BISJ 17, School AISJ 39

Total number of teacher responses (Percentages)
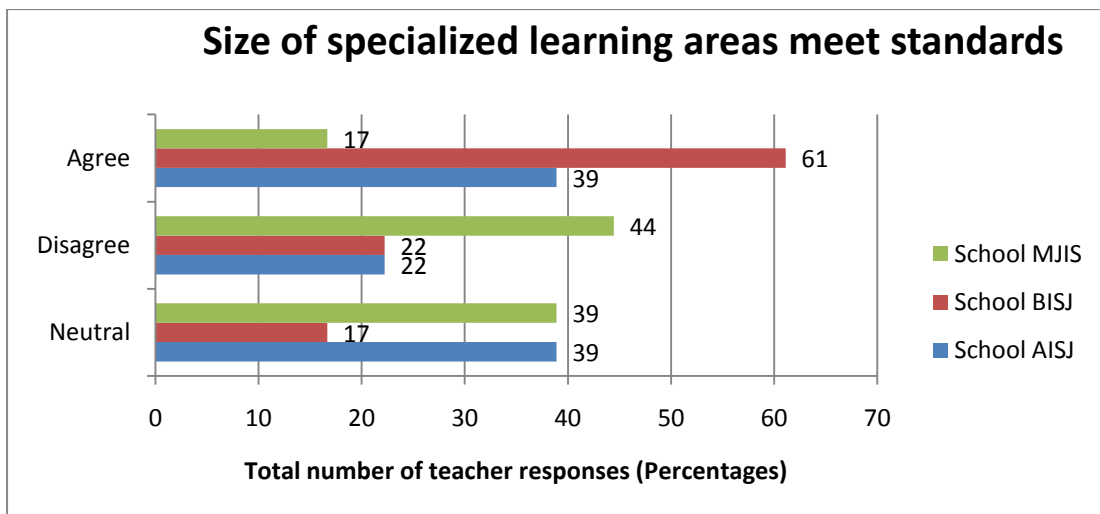
Figure 5.50

In terms of specialized learning space, the results from the teachers at BISJ School indicate that the rooms both met the required standards and were compatible with instructional needs (Figure 5.50 and Figure 5.51). It was observed that MJIS School did not provide for many of the specialized learning areas and that the ICT labs and art rooms did not reach the required standards.
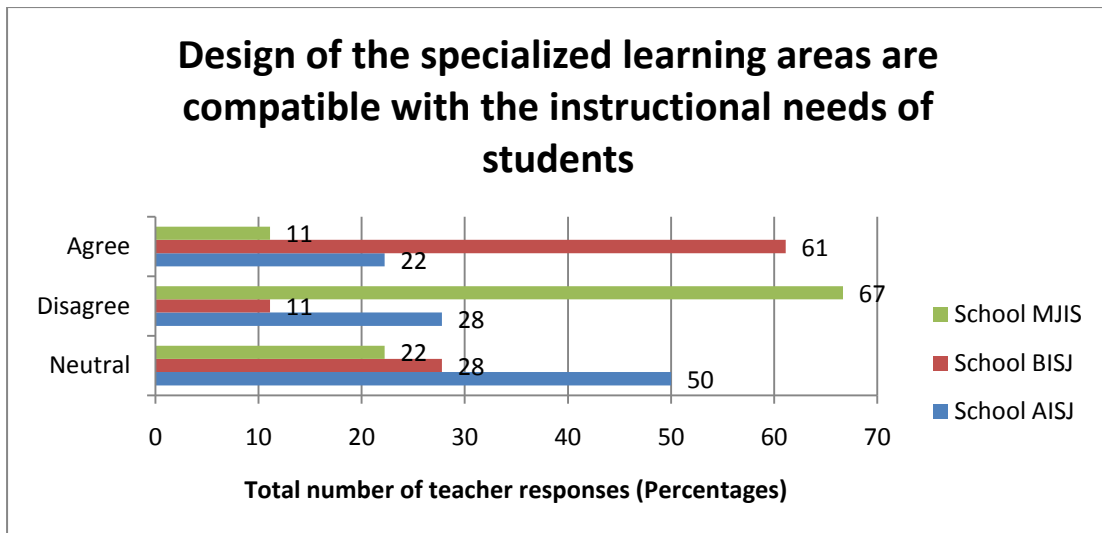
Figure 5.51

5.5.2.1 Art Room

Figure 5.52 shows that the art room at MJIS School was not adequately resourced. This is in sharp contrast with BISJ School where the art rooms was well equipped and was compatible with instructional needs.
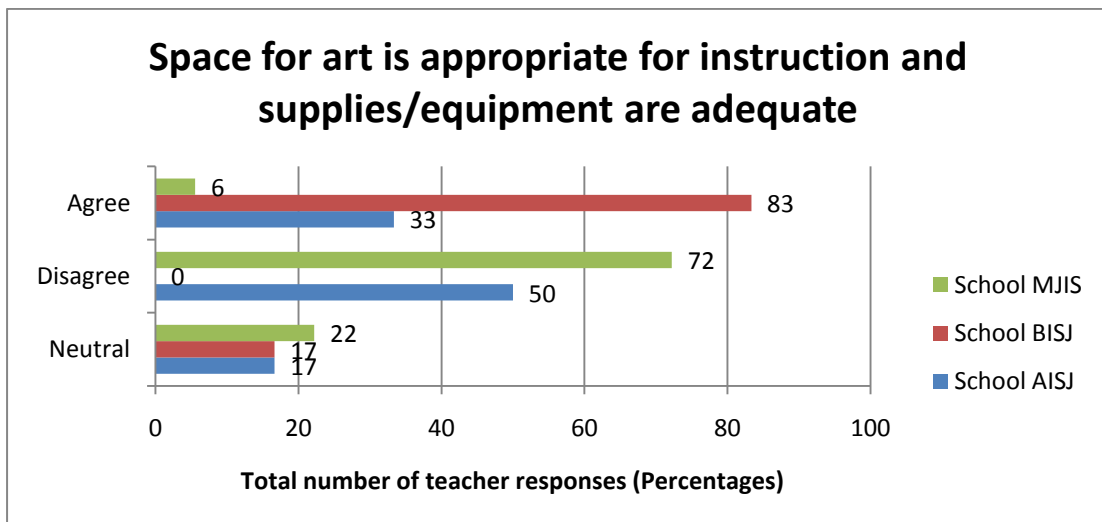
Figure 5.52

5.5.2.2 Music Room

MJIS School did not have of a Music room. The quality of this provision varied at the other schools, as can be seen in Figure 5.53.
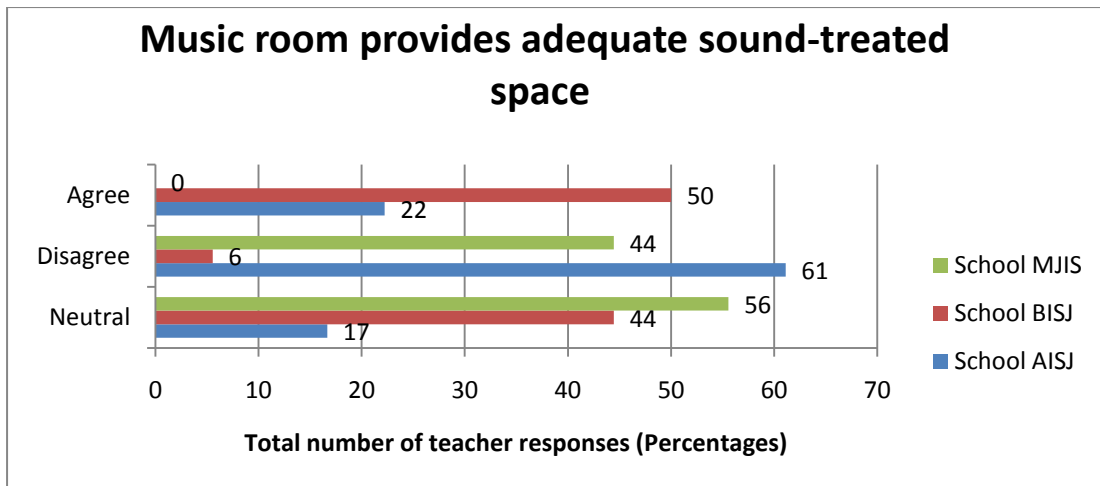
Figure 5.53

5.5.2.3 Library

MJIS School did not have a library. In the other schools the furniture was poorly rated. Majority of the teachers agreed that children easily find their way around, there were enough tables where they could work and they could easily access books.
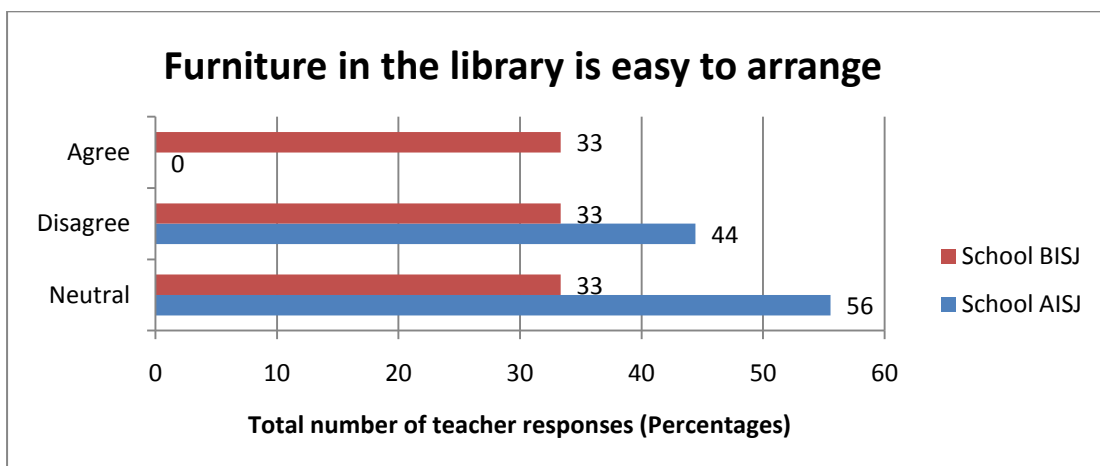
Figure 5.54

Results also showed many teachers felt that displays were not adequate and the teachers at AISJ disagreed that the library was easy to supervise (Figure 5.55).

113
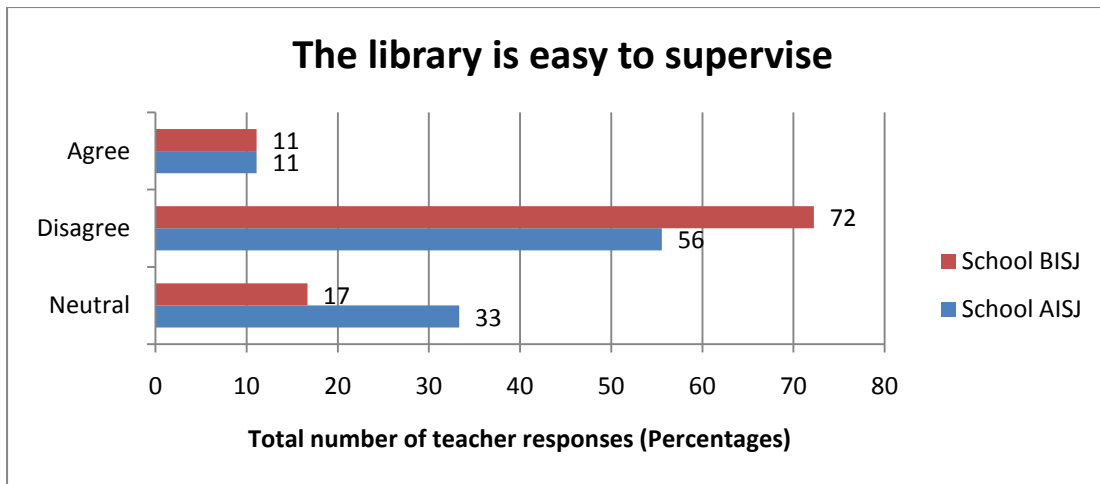
Figure 5.55

5.5.2.3 ICT labs

At MJIS School 72% of the teachers who disagreed that the pupils had easy access to networked ICT systems throughout the building. The ICT provision at the other schools was better (Figure 5.56).
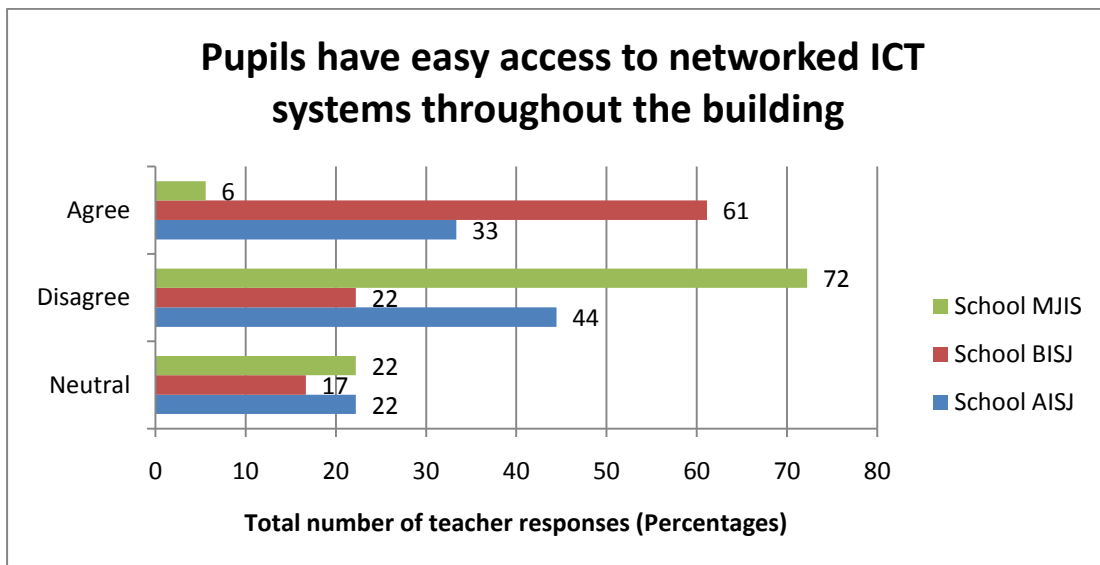
Figure 5.56

5.5.3 Support areas

5.5.3.1 Teachers lounges and workspaces

Teachers' lounges must be equipped and designed to allow teachers to function as professionals. However results showed that at AISJ and to a certain extent MJIS School lounges did not meet the required standards (Figure 5.57). When asked if they were provided with their own offices with access to telephones 83% of the teachers at AISJ and half the teachers at the other two schools disagreed clearly suggesting that communication was limited and teachers' facilities should be improved.

Teachers lounge and work areas support teachers as professionals

- Agree: School MJIS 22, School BISJ 44, School AISJ 6
- Disagree: School MJIS 39, School BISJ 28, School AISJ 67
- Neutral: School MJIS 39, School BISJ 28, School AISJ 28

Total number of teacher responses (Percentages)

School MJIS
School BISJ
School AISJ
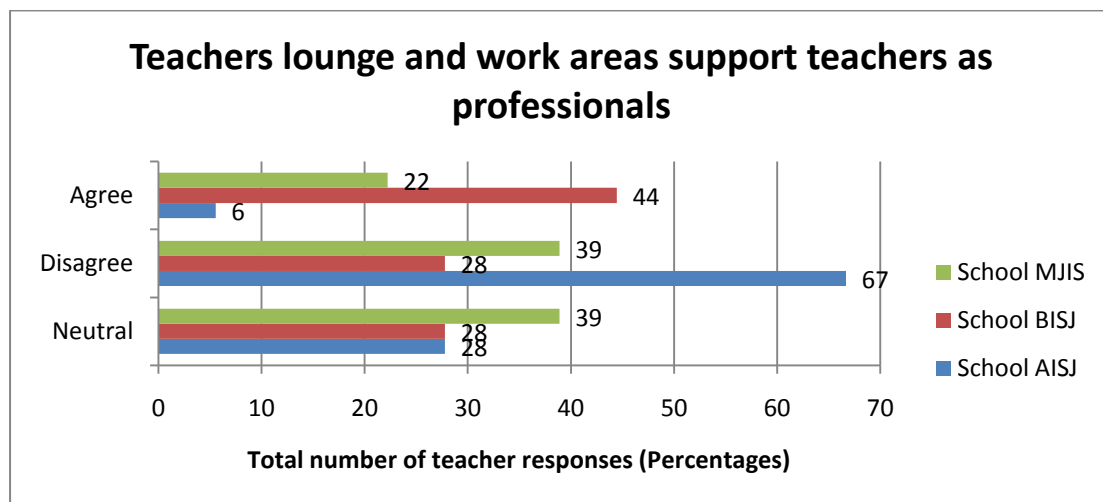
5.5.3.2 Cafeteria and common areas

The cafeteria is an important place for both teachers and students as it allows them to relax and socialize. Cafeterias should be well designed and aesthetically pleasing. However 50% of the teachers at AISJ and 39% at BISJ School disagreed that their cafeteria was pleasing (Figure 5.58).

A Cafeteria/kitchen is attractive with sufficient space

Total number of teacher responses (Percentages)

- School BISJ
- School AISJ
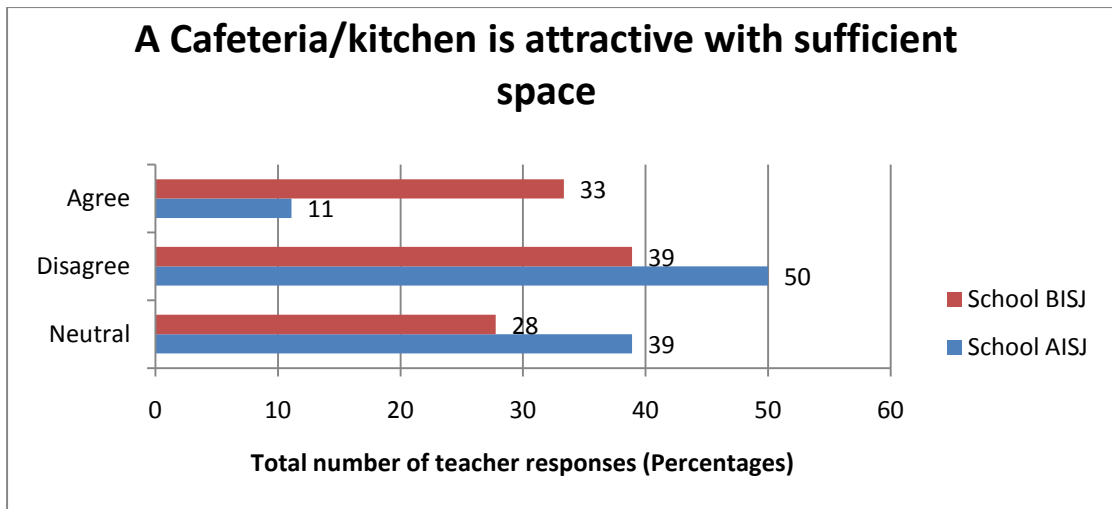
67% at MJIS School disagreed that there were student interaction and socialization areas available. This was because no common areas were provided at this school (Figure 5.59).

Areas for students to interact and socialize are available

Total number of teacher responses (Percentages)

- School MJIS
- School BISJ
- School AISJ
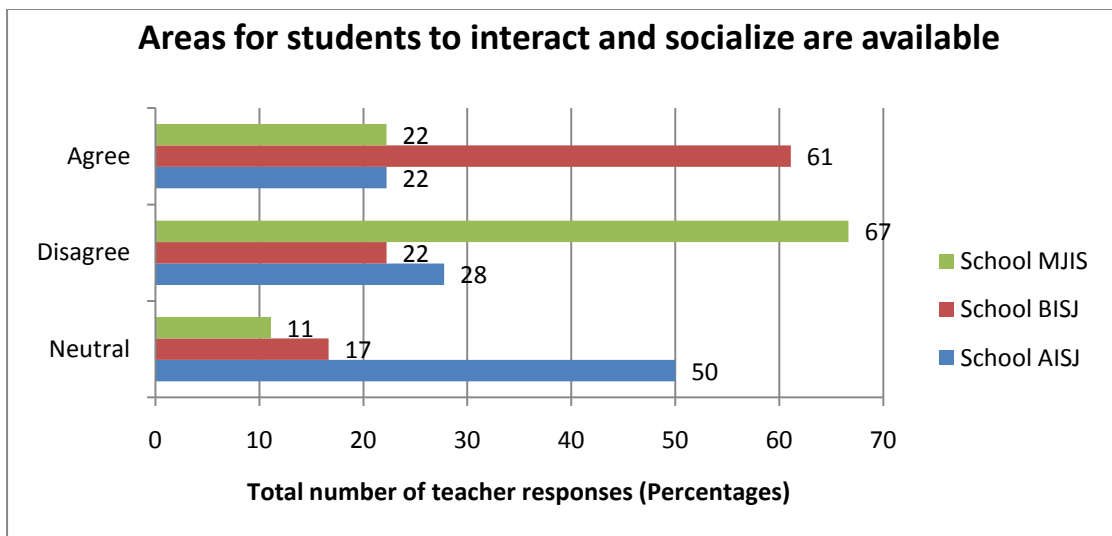
The results from all schools indicated a need for more small remedial instruction spaces next to the classrooms (Figure 5.60). From the assessment it was noted that BISJ School provided a single desk outside of each class and one group desk at the end of the corridor for the entire set of key stage 2 students which may explain the ratings for this school.

Space for small groups and remedial instruction is provided adjacent to the classrooms

The Number of teacher responses (Total participants=18)

Legend: School MJIS, School BISJ, School AISJ

Values:
- Agree: MJIS 6, BISJ 50, AISJ 22
- Disagree: MJIS 50, BISJ 39, AISJ 44
- Neutral: MJIS 44, BISJ 11, AISJ 33
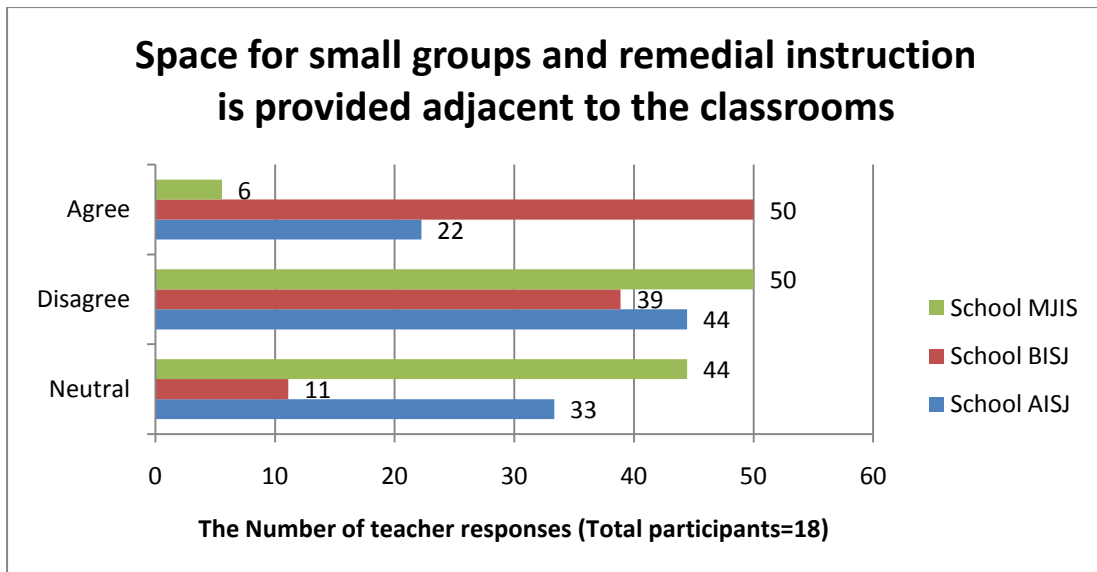
5.5.3.3 Toilets

The perception of the provision of toilet facilities varied. The dissatisfaction found at AISJ was reflected in the assessments where it was noted that only one bathroom hub was provided per floor for 250 students.

Number and size of restrooms is adequate throughout the building

Total number of teacher responses (Percentages)

Legend: School MJIS, School BISJ, School AISJ

Values:
- Agree: MJIS 44, BISJ 61, AISJ 11
- Disagree: MJIS 17, BISJ 22, AISJ 72
- Neutral: MJIS 39, BISJ 17, AISJ 17
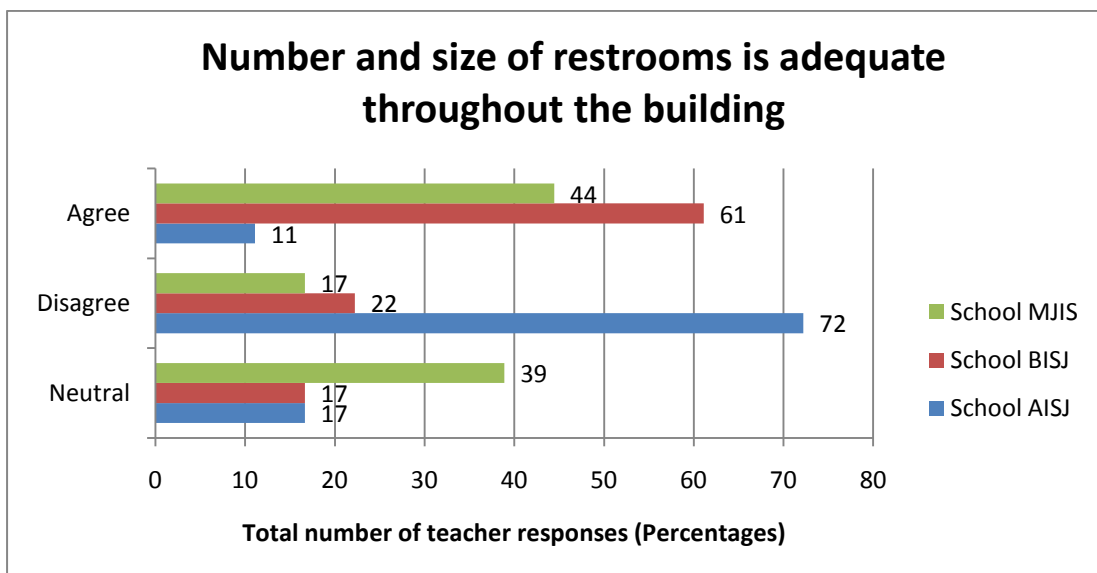
5.5.4 Building Features

5.5.4.1 Cleanliness and Maintenance

Results indicated that teachers from both MJIS and BISJ School agreed that the overall building was clean and well maintained. AISJ School was not rated highly (Figure 5.62). The POE also indicated that teachers at school agreed that cleanliness enhanced the performance of the building but 61% at AISJ School disagreed. The negative result indicated at AISJ School, is largely due to the age and poor maintenance of the building observed during the assessment.

The overall building is clean and maintained
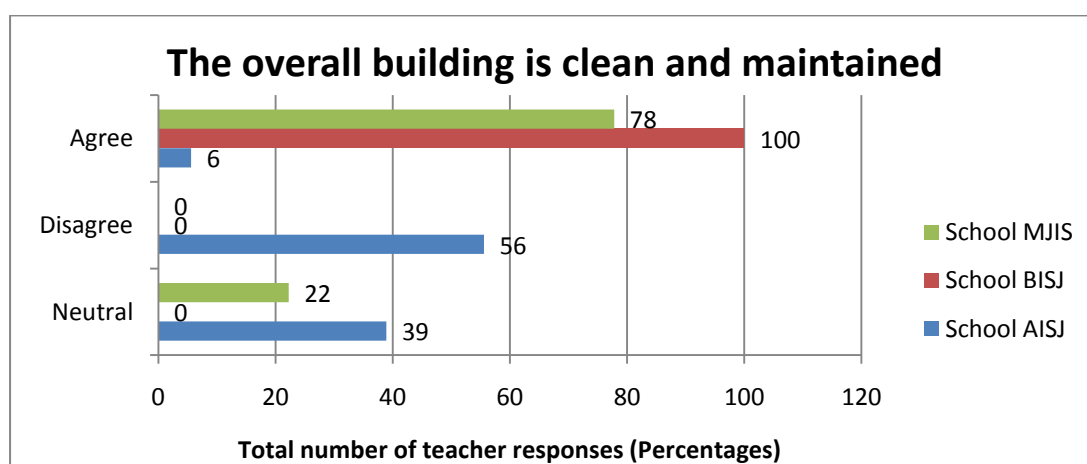
Figure 5.62

5.5.4.2 Aesthetics and Design

At BISJ School 67% agreed that the overall design was aesthetically pleasing and age appropriate but 50% disagreed at MJIS and 39% at AISJ School (Figure 5.63) clearly suggesting that MJIS and AISJ School did not feel the school was visually pleasing.

Overall design is aesthetically pleasing and appropriate for the age of the students
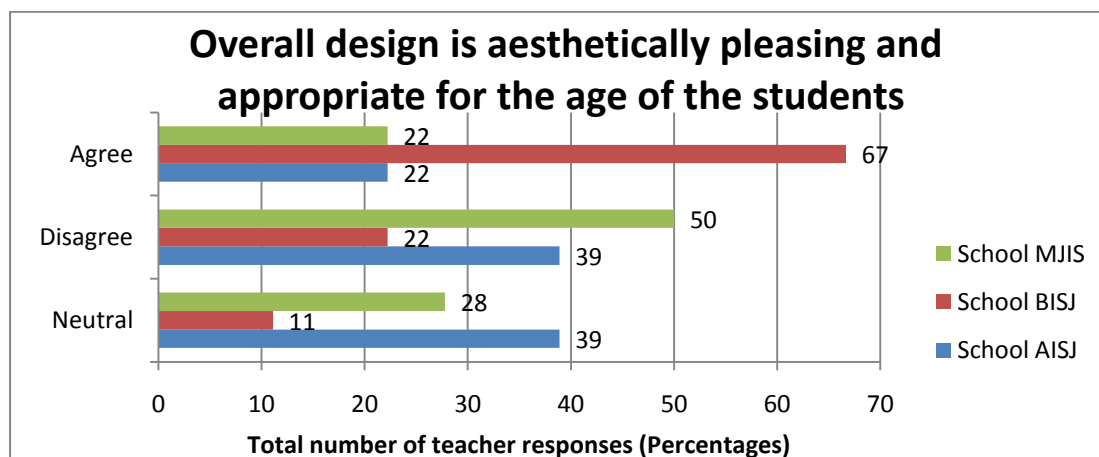
Figure 5.63

Furthermore, almost half the teachers at MJIS and BISJ School felt their school was spacious but 44% at AISJ School disagreed (Figure 5.64). This may be attributed to later developments constructed to meet increased needs where classes and offices were erected in any free space creating a congested layout.

The school feels spacious

Response	School MJIS	School BISJ	School AISJ
Agree	50	56	22
Disagree	6	17	44
Neutral	44	28	33

Total number of teacher responses (Percentages)
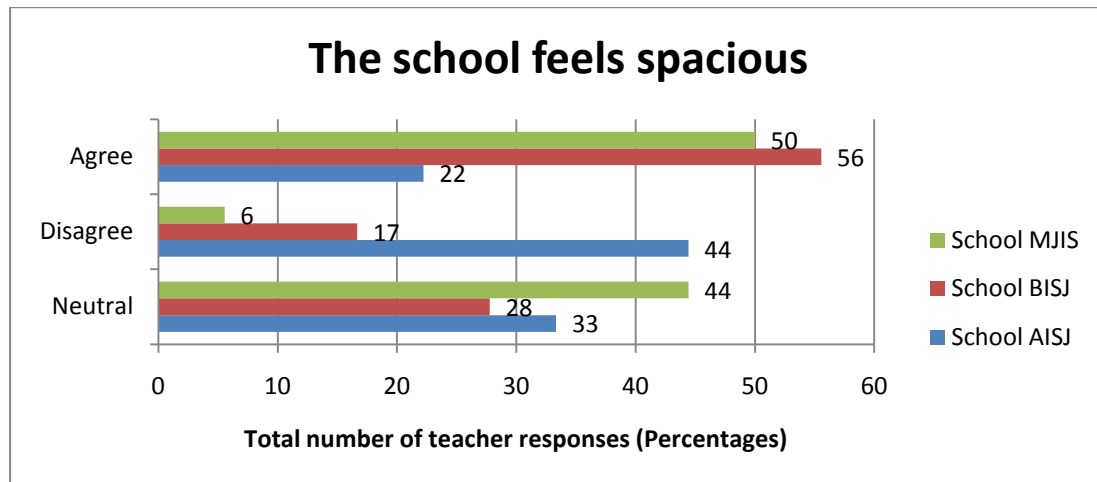
5.5.4.3 Ambient factors

Results from all three schools indicated that teachers were dissatisfied with the internal acoustics (Figure 5.65).

Acoustical treatment of ceilings, walls, and floors provide effective sound control

Response	School MJIS	School BISJ	School AISJ
Agree	22	33	6
Disagree	33	44	61
Neutral	44	22	33

Total number of teacher responses (Percentages)
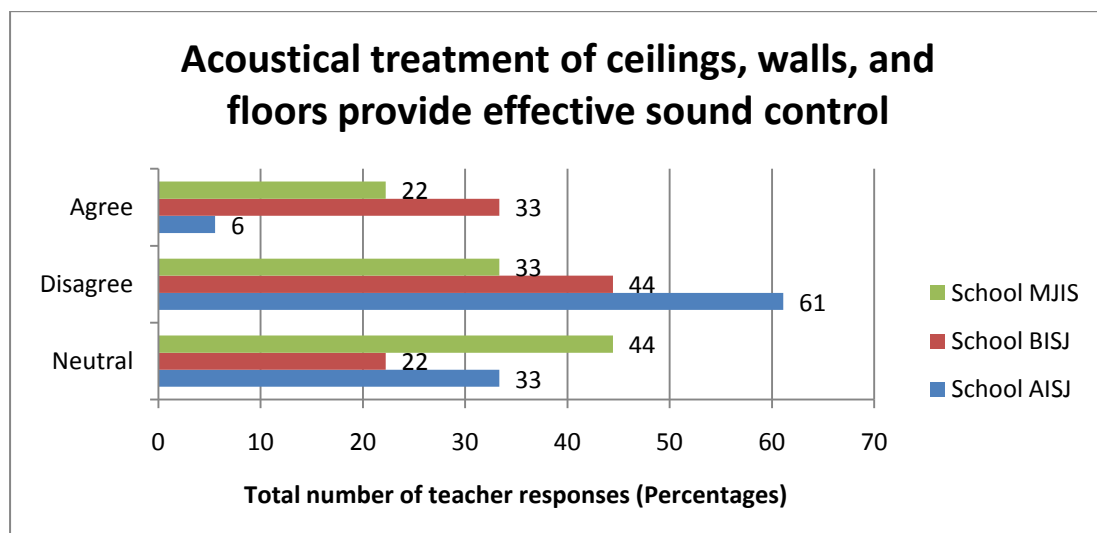
The POE results indicated the temperature was a problem within all three schools. AISJ School in particular with 83% disagreeing that a comfortable temperature was provided throughout the building (Figure 5.66).
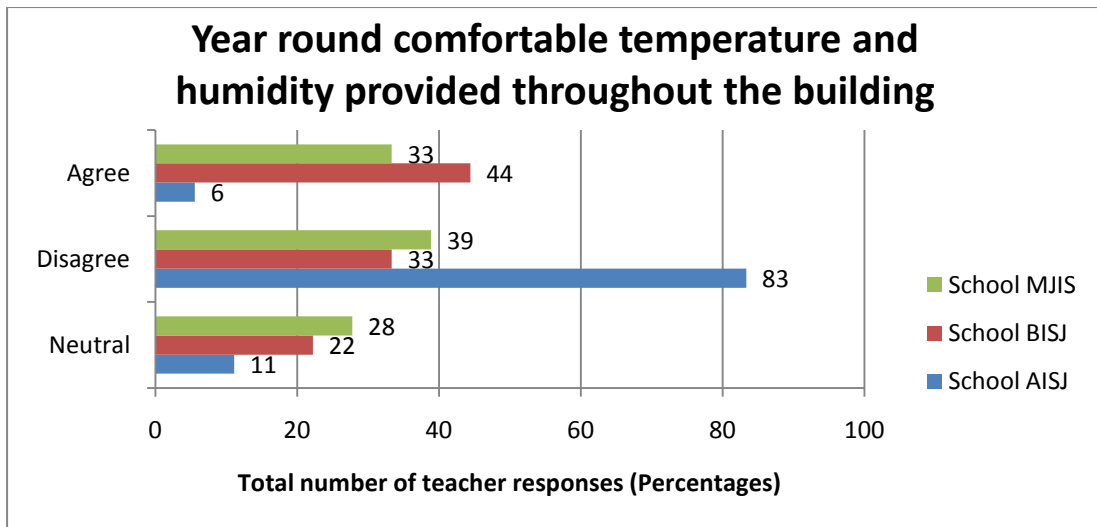
Figure 5.66

The results of both AISJ and BISJ School indicated that teachers were not satisfied with general lighting systems in the building as 44% from AISJ and almost 1/3 from BISJ disagreed that there was proper light intensity and diffusion. However, although a considerably low figure of 6% from MJIS School also disagreed, majority of the teachers at 61% took a neutral stand as seen in Figure 5.67. Furthermore day lighting was also considered weak as 83% from AISJ, 44% from MJIS and almost 1/3 from BISJ School disagreed that the quantity and quality of the windows contributed to a pleasant environment in the building.
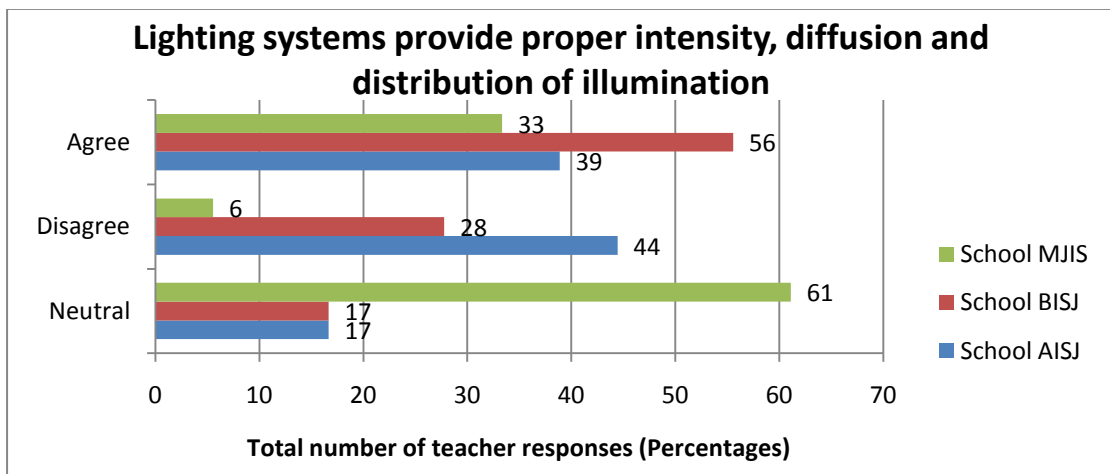
Figure 5.67

The POE results showed that a significantly high percentage at 83% of teachers at AISJ School disagreed that the ventilation system provided adequate quiet

circulation of clean air. Figure 5.68 clearly shows that there was a general dissatisfaction with the ventilation system at the other schools.

Ventilation system provides adequate quiet circulation of clean air

Agree: School MJIS 22, School BISJ 44, School AISJ 6
Disagree: School MJIS 33, School BISJ 28, School AISJ 83
Neutral: School MJIS 44, School BISJ 28, School AISJ 11

Total number of teacher responses (Percentages)
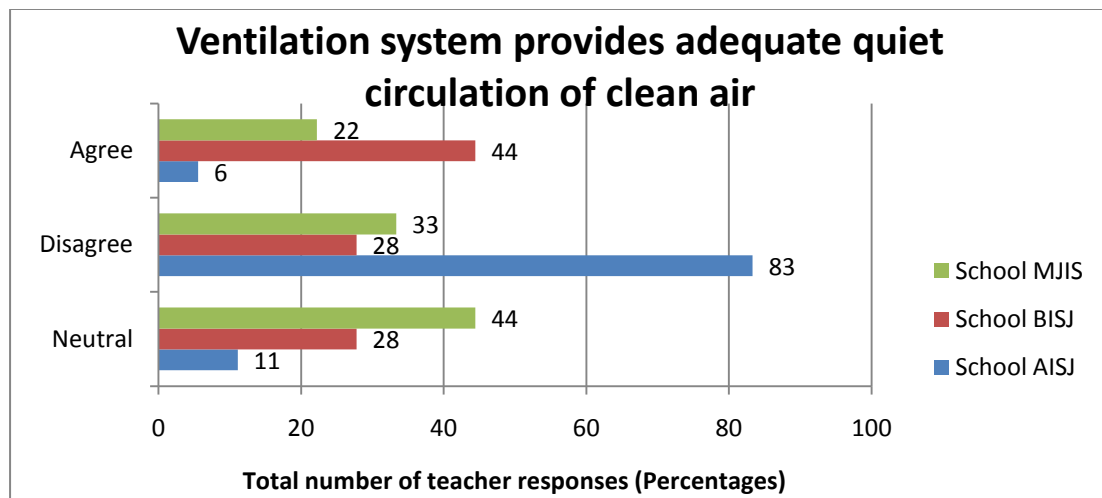
5.5.4.4 Circulation

Although POE results revealed that majority of the teachers agreed that corridor width was adequate for student movement many were dissatisfied with the foyers and halls aiding traffic flow. As seen in Figure 5.69, 72% from MJIS and 56% from AISJ School disagreed that there were appropriate foyers and corridors that aided traffic flow but 78% from BISJ School agreed with this statement. However, the majority of the teachers from all three schools agreed that the building corridors have good sightlines and are easy to supervise.

Appropriate foyers and corridors aid traffic flow

Agree: School MJIS 28, School BISJ 78, School AISJ 28
Disagree: School MJIS 72, School BISJ 11, School AISJ 56
Neutral: School MJIS 0, School BISJ 11, School AISJ 17

Total number of teacher responses (Percentages)
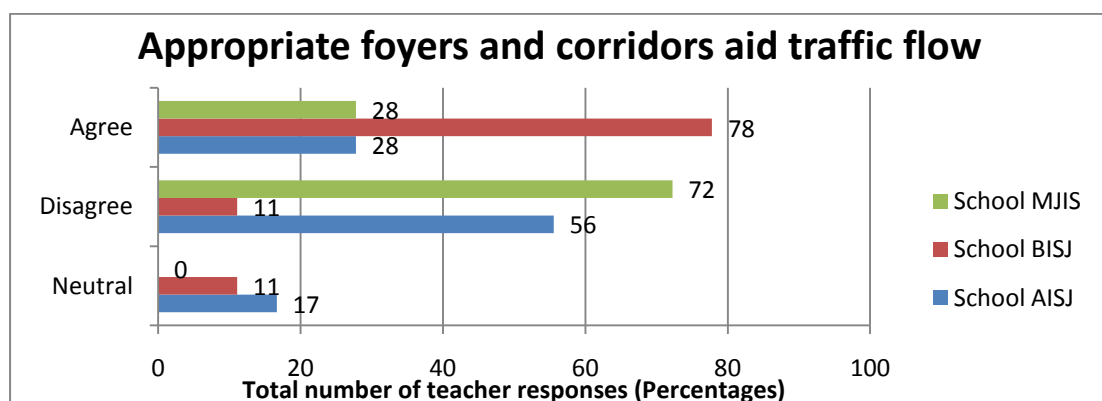
5.5.4.5 Signage and Display

Only BISJ School had high percentage of positive responses where 72% agreed that signage and information were clearly visible and easy to follow. The highest number of negative responses occurred at MJIS School (Figure 5.70).

Signage and information are clearly visible and easy to follow

Agree: School MJIS 33, School BISJ 72, School AISJ 33
Disagree: School MJIS 56, School BISJ 6, School AISJ 11
Neutral: School MJIS 11, School BISJ 22, School AISJ 56

Total number of teacher responses (Percentages)
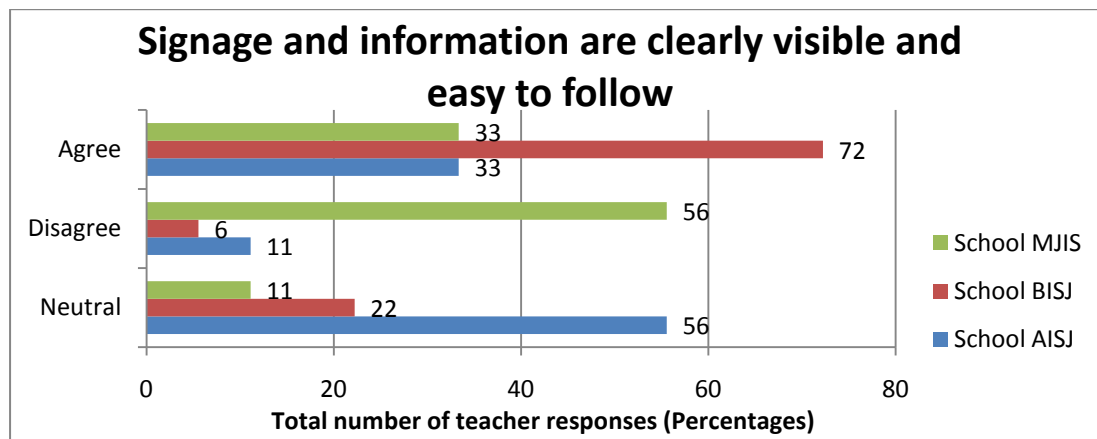
Figure 5.76

High percentages of teachers agreed that there were various displays of student work exhibited throughout the corridor except for MJIS School where half the teachers disagreed (Figure 5.70).

There are various displays or student work exhibited throughout the corridors

Agree: School MJIS 28, School BISJ 89, School AISJ 83
Disagree: School MJIS 50, School BISJ 0, School AISJ 6
Neutral: School MJIS 22, School BISJ 11, School AISJ 11

Total number of teacher responses (Percentages)
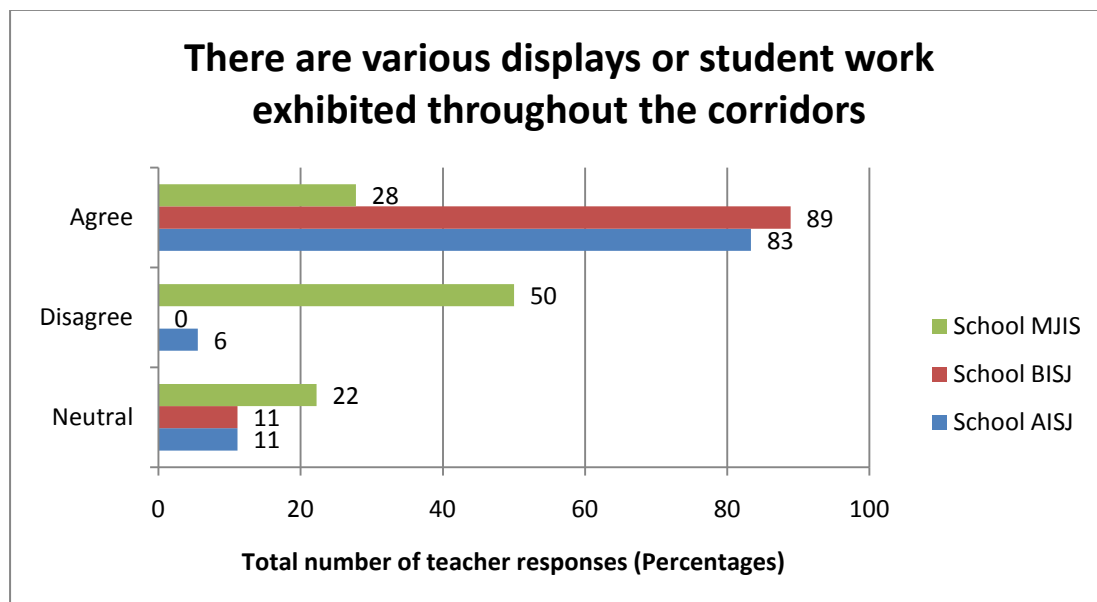
Figure 5.71

5.5.4.6 Landscape

Only BISJ School had a high positive result where 72% agreed that the school was well landscaped (Figure 5.72).

Site and building are well landscaped

	Agree	Disagree	Neutral
School MJIS	11	56	33
School BISJ	72	11	17
School AISJ	17	39	44

Total number of teacher responses (Percentages)
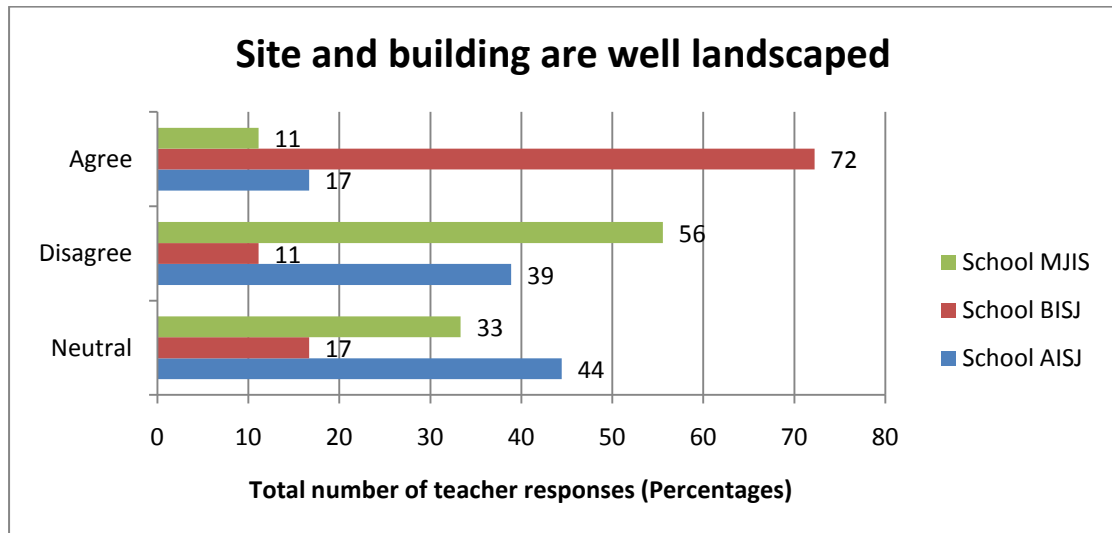
Figure 5.72

5.5.4.7 Overall building

High percentages of teachers at both AISJ and BJIS School agreed that the front entrance of the building was easy to identify and access. However only 44% at MJIS School agreed (Figure 5.73).

Front entrance of the building is easy to identify and access

	Agree	Disagree	Neutral
School MJIS	44	39	17
School BISJ	78	6	17
School AISJ	100	0	0

Total number of teacher responses (Percentages)
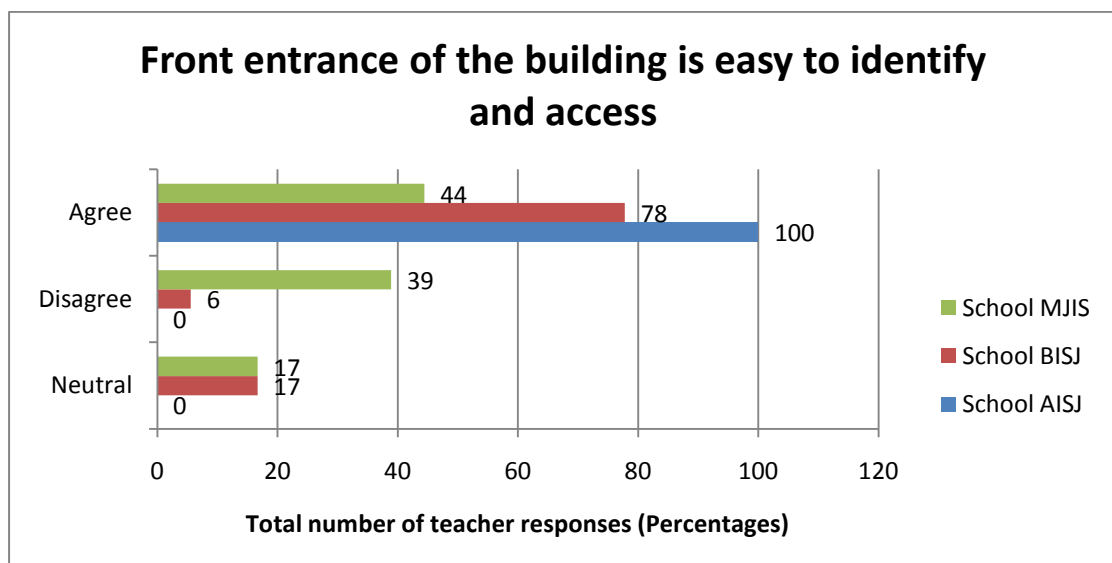
Figure 5.73

5.6 RESULTS: Parents Perception

5.6.1 Building Features

5.6.1.1 Cleanliness and Maintenance

The overall building is clean and maintained
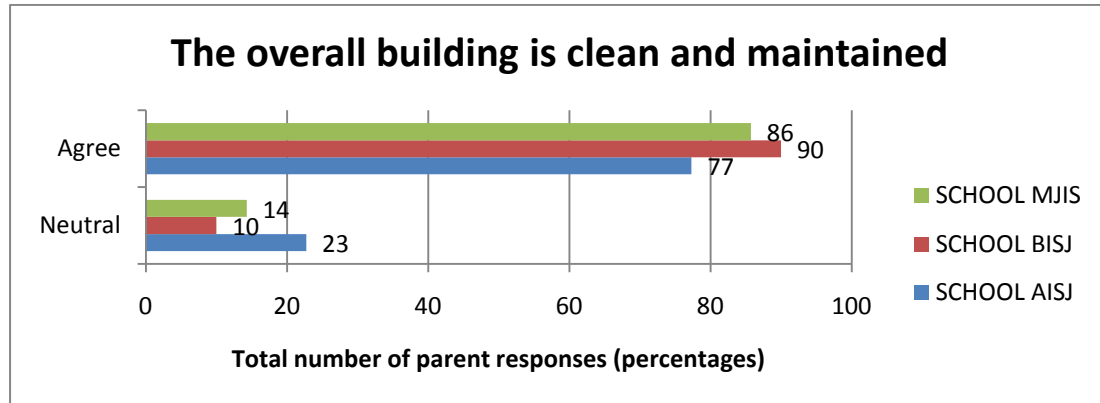
Figure 5.74

As seen in Figure 5.74, on the average, a high percentage of parents agreed that the overall building was clean and well maintained.

5.6.1.2 Aesthetics and Design

Overall design is aesthetically pleasing and age appropriate
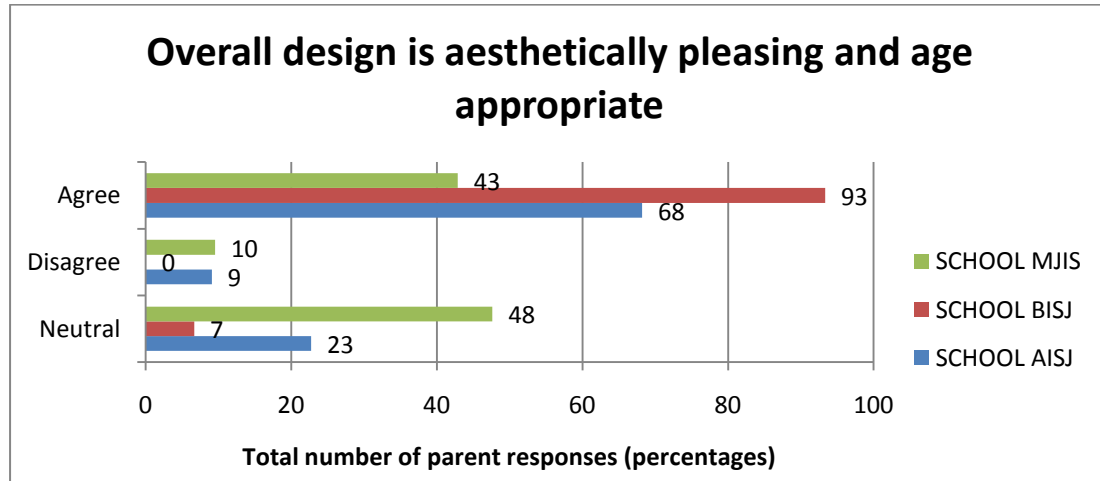
Figure 1.75

The lowest number of positive responses occurred at MJIS School where only 43% felt the overall design was aesthetically pleasing and age appropriate as compared to the high percentage at BISJ School (Figure 5.75).

5.6.1.3 Ambient Factors

Figure 5.76 Shows that almost 1/3 of the parents from both AISJ and MJIS School felt that there was not enough light in school but a high percentage of parents at BISJ School disagreed and were satisfied with the natural lighting conditions.
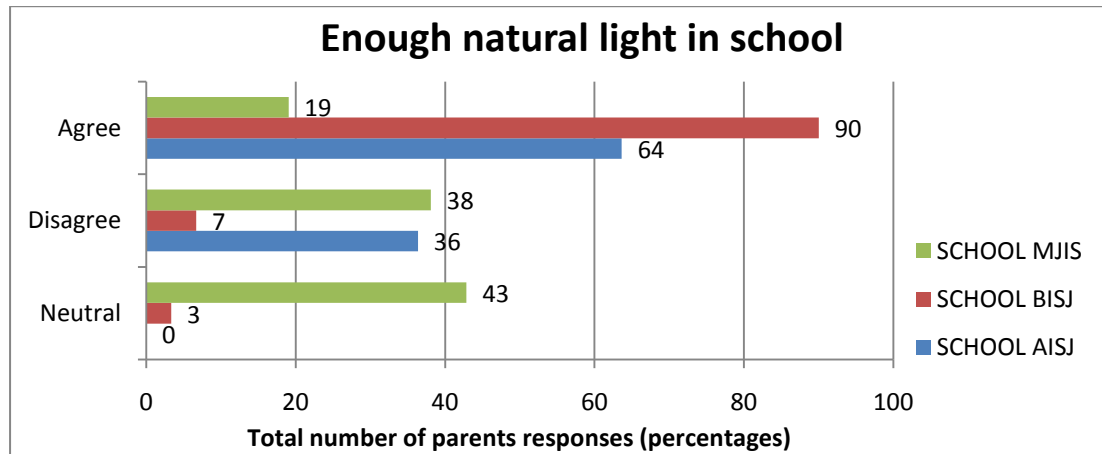
Figure 5.76

Although POE results revealed that most of the parents felt that the lighting systems provided proper intensity and illumination, 1/3 of the parents from AISJ School disagreed (Figure 5.76).
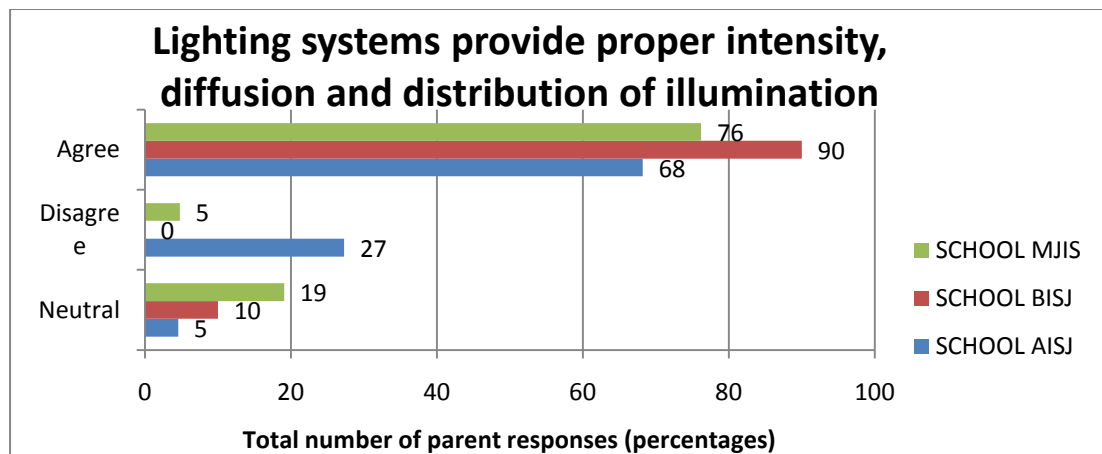
Figure 5.77

An average of 54% of the parents agreed that there was year round comfortable temperature however the highest number of negative responses occurred at AISJ School where 36% disagreed indicating more dissatisfaction with the temperature control at this school (Figure 5.77).
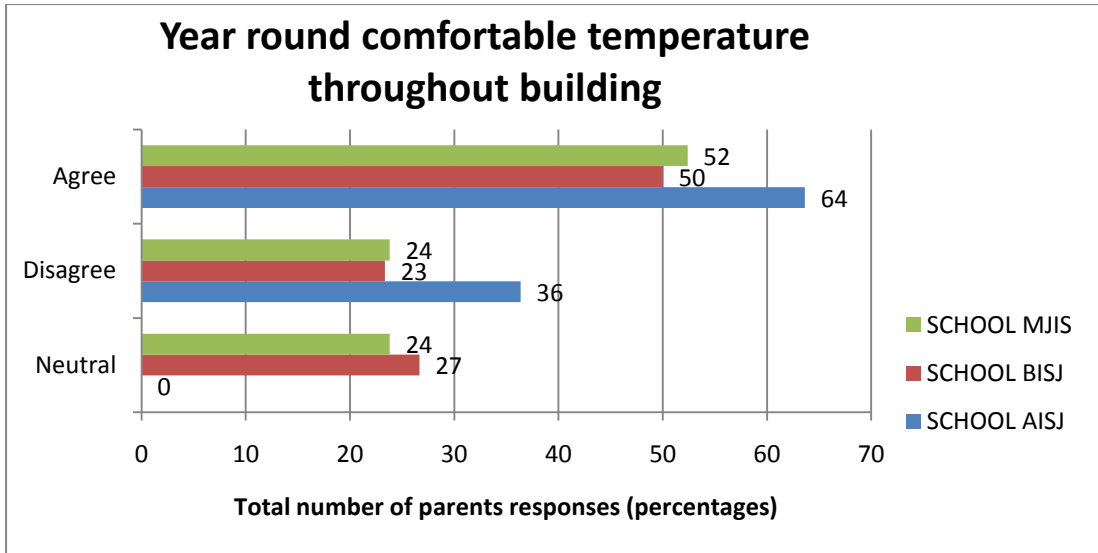
Figure 5.78

5.6.1.4 Circulation

MJIS School was rated more negatively than the other schools in terms of circulation. BISJ School achieved the highest number of positive responses in terms of navigation round the school, the adequacy of the school plan and width of the corridors.
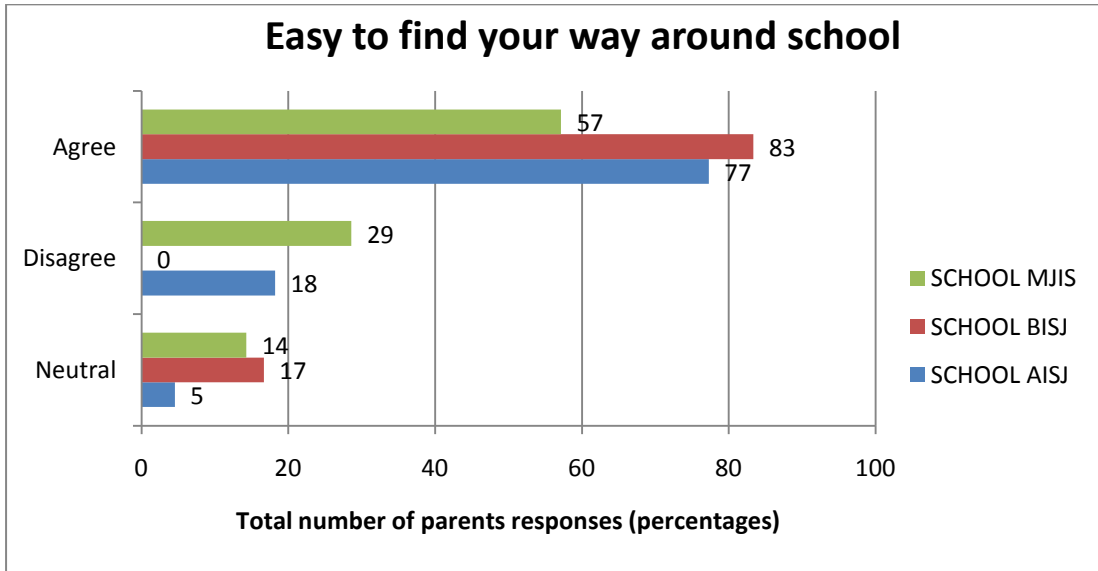
Figure 5.79

5.6.1.5 Signage and Display
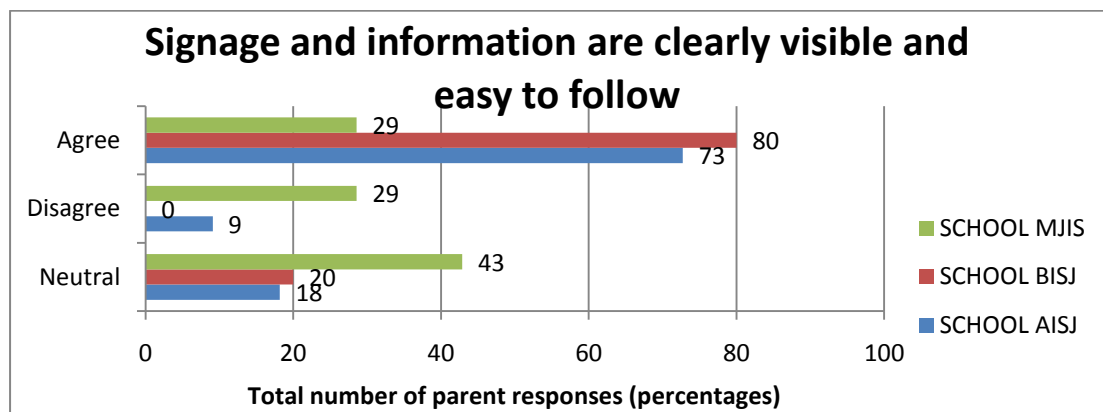
Figure 5.80

Parents at BISJ and AISJ School were generally satisfied with display and signage and high positive responses were observed (Figure 5.80).

5.6.1.6 Landscape
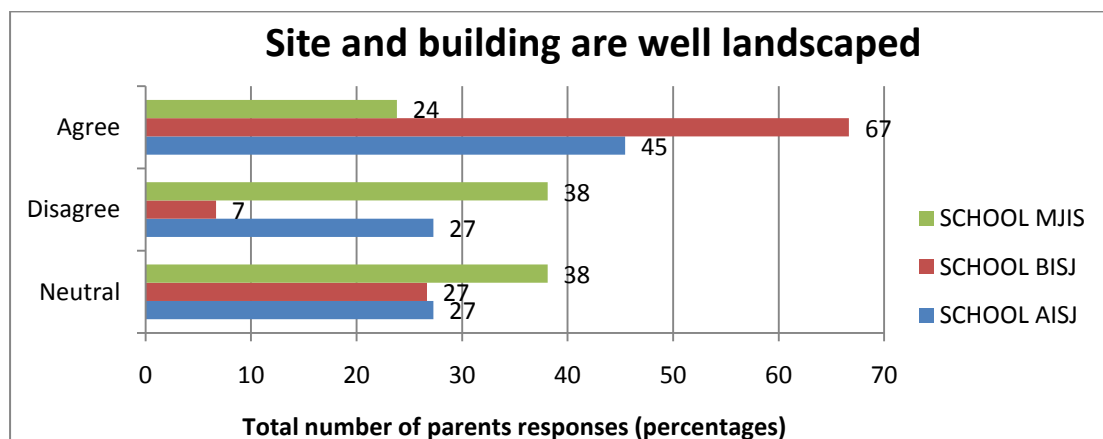
Figure 5.81

Figure 5.81 shows that both AISJ and MJIS School had a higher percentage of parents who were dissatisfied with the landscaping of the school.

5.6.1.7 Overall Building

Results showed that the parents at BJIS and AISJ School were satisfied with the number and size of restrooms as 73% agreed with this. However almost 1/3 disagreed at MJIS School and a more than half took a neutral stand (Figure 5.82).

Number and size of restrooms is adequate throughout the building

(Horizontal bar chart)

Categories:
- Agree: SCHOOL MJIS 19, SCHOOL BISJ 73, SCHOOL AISJ 73
- Disagree: SCHOOL MJIS 29, SCHOOL BISJ 10, SCHOOL AISJ 18
- Neutral: SCHOOL MJIS 52, SCHOOL BISJ 17, SCHOOL AISJ 9

X-axis: Total number of parent responses (percentages), scale 0 to 80

Legend: SCHOOL MJIS, SCHOOL BISJ, SCHOOL AISJ
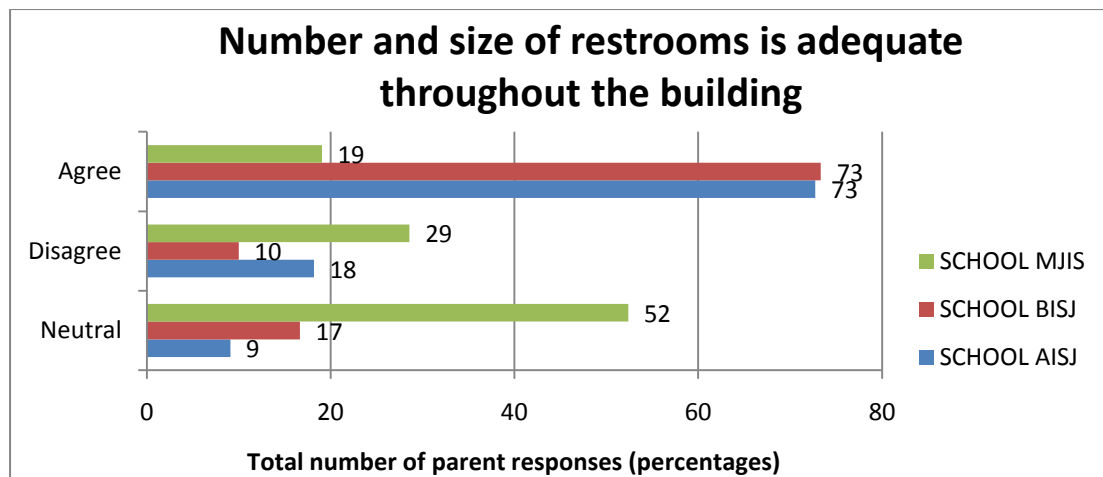
Figure 5.82

5.6 RESULTS: Discussion and Conclusion

To summarise, the POE results from the participating schools indicated specific concerns that were shared by all occupants.

For example, at BISJ School, both teachers and students felt that storage, art room, music room and display were satisfactory and adequate but both groups complained of uncomfortable thermal conditions. Conflicting results were obtained in the assessment of group work areas, individual study spaces, noise levels and toilets. Students felt that there were no provisions for individual learning styles and that noise levels in classrooms was the worst problem. They also considered toilets to be extremely unpleasant. However the teachers perceived differently and did not regard them poorly. Additionally both the parents and teachers agreed on many factors. They felt the building was aesthetically pleasing, age-appropriate, spacious, and had good circulation. They also agreed that there was clear and visible signage that was easy to follow with adequate display areas for student work and achievements. According to the results, they also felt that the building was well landscaped, with good lighting and ventilation. Conflicting responses were observed in relation to temperature and acoustics where parents were unaware of these.

Results showed that both AISJ and MJIS teachers and students were generally dissatisfied with several factors in regards to facility provisions. Both felt that there was inadequate storage, no space for group work or individual study, no provision

for wheelchair users, inadequate art rooms, music rooms, poor landscaping and unpleasant toilets. They also felt there was high noise levels and poor ventilation throughout the school.

Conflicting results were seen at both schools between parents and teachers. Results show that teachers complained about poor ambient factors such as temperature conditions, acoustics and aesthetics but parents did not consider these as concerns or were unaware of this. Parents were also unaware of the inadequate display, circulation and unpleasant toilets. At AISJ School both teachers and parents felt the school was spacious, with good signage and display but also felt that there was uncomfortable temperatures and poor lighting. On the other hand parents and teachers at MJIS School had mostly conflicting results in regards to spaciousness and good signage.

The POE revealed specific areas of concern that were felt by both teachers and students in general. Classrooms were of a particular concern where both students and teachers felt that display, user needs, storage and temperature were ignored and inadequate. This section will discuss these shared areas of concern, before looking at the parents' views.

5.7.1 Teachers and Students views of the school environment

Both teachers and students were dissatisfied with storage facilities (except at BISJ School).

Dedicated areas for group and individual work within class were not well supported in any of the schools from the perspective of the teachers and the students but particularly in AISJ and MJIS School. It must be noted that students at BISJ School were satisfied with the areas provided for group work.

Area available for display of student's work and other information was rated as adequate at BISJ but lower in the other schools.

The art room was rated as adequate at BISJ School by teachers and students but the occupants at MJIS and AISJ School felt they could not reach equipment; it was inadequately equipped and inappropriate for instruction.

Both teachers and students felt there were no common areas for interaction or socializing from all three schools.

The results regarding the music room were validated by both teachers and students at BISJ School who both felt the music room was adequate and acoustically treated. Both teachers and students at AISJ School disagreed and said that it disturbed other classes and was poorly sound insulated.

Students were generally satisfied with the ICT provisions in all three schools although the assessment proved otherwise. Many felt that more ICT suites were needed and that they were forced to share due to lack of computers. Teachers rated the ICT facilities adequately at BJIS School but were rated poorly at the other schools due to lack of internet access, poor thermal conditions, inadequate storage and space.

Similarly students in all schools were dissatisfied with the cafe as being unpleasant and unattractive place to eat and this too was verified by the POE results of the teachers.

Students from all three schools were generally dissatisfied with the restroom facilities. AISJ and MJIS School in particular felt they were unpleasant to use and inadequate in number. However, teachers felt the toilets were satisfactory except from AISJ School where a significantly high number of teachers felt that the number and size of toilets was inadequate.

With regard to ergonomic issues, it was clear that students and teachers perception of noise was different. For example, at BISJ School 53% of the students complained of noisy classrooms but only 17% of the teachers felt the same way. Both teachers and students in the other two schools complained that noise was a concern but with much higher negative responses from students. Teachers in all schools were disturbed by external noise (62% at BISJ, 89% at MJIS and 88% at AISJ School). This implies a general concern of internal and external noise which may be a major contributor to disturbances and distractions.

Temperature was a major concern with temperature levels being uncomfortable and uncontrollable. There was evidence of a difference in the perception of temperature, with students (at MJIS) reporting greater discomfort than their teachers.

Students from all three schools were not concerned with the lighting conditions but teachers felt that there was not enough daylight and complained that the fluorescent lighting created a sterile atmosphere.

5.7.2 Shared concerns and differences - Teachers and Parents

Parents were requested to take part in the survey but were only questioned about the overall building features and not to specialized learning or academic learning areas. The results varied in their degree of accordance with the teachers and students.

Teachers and parents from all three schools felt in general that buildings were clean, attractive and well maintained. AISJ School rated more poorly in this regard by the teachers (than the other groups).

Conflicts were seen between the results of AISJ and MJIS School where parents thought that the schools were aesthetically pleasing and age-appropriate but a high number of teachers disagreed. Furthermore, parents at all three schools felt the building was cosmetically and structurally in excellent condition but teachers at these schools felt differently revealing a general dissatisfaction. Parents and teachers also felt that schools were large and spacious but except at MISJ School where parents disagreed.

Other conflicting results were noted between MISJ and AISJ School regarding circulation. Teachers felt that the plan did not assist in easy movement and circulation but the parents were unaware of this.

Both participant groups at AISJ and BISJ School agreed that the signage and information was clearly visible and easy to follow and that there was adequate display for student work. Both participant groups at MJIS School felt that signage and display were inadequate.

Landscape was also considered another concern as both participant groups at AISJ and MJIS School felt the school was not well landscaped but results indicated that the participants felt the landscape was adequate.

Participant groups from all three schools were dissatisfied with the provision for barrier-free interiors and acknowledged that they were not provided for.

Conflicting results were noted with regard to temperature and acoustical treatment. Teachers felt that this was a concern and was inadequate however, parents were generally satisfied except at AISJ School where almost 1/3 of the parents felt the temperature was uncomfortable.

At BISJ and MJIS School both participant groups felt that light was adequate. However at AISJ School both participant groups felt that the lighting was inadequate. Results also showed that both participant groups at AISJ and MJIS School felt that the ventilation was inadequate except at BISJ School who felt that ventilation systems provided clean and fresh air.

In the next chapter we will compare the results between the two methods; assessment and the POE and justify why it is was necessary to use both methods.

CHAPTER 6

Comparison of results between assessment and evaluation tools

6.1 Introduction

In order to verify particular concerns that arose during the Post-Occupancy Evaluation process, it was necessary to validate the data with the results of the assessment process. Although the POE is primarily concerned with the perception and opinions of the occupants these need to be related back to the design of the teaching and learning environment. The use of the checklists in the first part provided a means of doing this. This chapter will draw together the themes which emerged from the different forms of assessment.

6.2 Triangulation of Data

6.2.1 Provision of academic learning spaces

The POE results indicated concerns by both teachers and students in terms of points of weakness, inefficiency, discomfort or poor functionality. The POE results indicated that both participant groups felt that the classroom did not fully accommodate the learner's needs, individual study areas or group space and that the classroom could be improved in terms of temperature, sound and light. Table 6.1 shows the areas rated poorly by students and teachers within each school and which schools had more concerns within their classrooms. This shows that BISJ School was rated the highest.

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Areas rated poorly	Students			Teachers		
	BISJ	AISJ	MJIS	BISJ	AISJ	MJIS
Classrooms	No individual spaces	No individual spaces	No individual spaces	No group spaces	No group spaces	No group spaces
		No group spaces	No group spaces	No large flexible spaces and work stations	No large flexible spaces and work stations	No large flexible spaces and work stations
	Noisy	Noisy	Noisy		Not enough storage	Not enough storage
	External Disturbances	External Disturbances	External Disturbances		High noise levels	High noise levels
		Lack of space	Lack of space		Uncomfortable furnishings	Uncomfortable furnishings
	Too cold	Too hot	Too hot	Too cold	Too hot	Too hot
		No place for bags	No place for bags		No technology	No technology
		Cannot see whiteboard		Inadequate light	Inadequate light	Inadequate light
		Not enough display		No individual temp control	No individual temp control	Insufficient displays
					Poor air quality	Poor air quality
				Not enough daylight		Not enough daylight
					Not enough storage	Not enough storage

⬜ Factors that was common among all three schools

The concerns indicated by the POE as seen in Table 6.1 were then compared against the results from the assessment tools to relate the comments to the school design. The POE revealed that areas of weakness were predominantly from AISJ and MJIS School and the results from all three assessment tools show similar weaknesses (Table 6.2)

Table 6.2 Comparison of Areas of concerns from POE to Assessment results

Classrooms	Areas rated poorly	DASE Degree of functionality			CEFPI Adequacy Assessment			Classroom Learning Modalities		
		BISJ	AISJ	MJIS	BISJ	AISJ	MJIS	BISJ	AISJ	MJIS
	Flexibility	7.5	3.5	0	80	53	40	12/18	5/18	2/18
	Small group spaces	7.5	0	0						
	Large flexible spaces and work stations	8.5	0	0						
	External Disturbances and noise control	8	4.5	3						
	No place for bags	6	5	0						
	Inadequate light	7.5	2.5	2.5						
	Not enough daylight	6.75	2	1.5						
	Displays	9.5	5.5	0						
	No technology	8.5	4.5	3						
	Not enough storage	6	4	0						
	No individual temp control	5.5	5	7.5						

☐ Factors that were below satisfactory

Table 6.2 shows that MJIS and AISJ School scored below standard scores on every POE concern with the DASE assessment tool. The CEFPI Adequacy assessment also revealed that MJIS and AISJ School scored below standard scores implying that they functioned poorly and did not provide a comfortable stress free environment. The learning modalities at these two schools also showed that the classrooms only provided 5 and 2 out of 18 of the learning modalities needed to have an effective learning environment (See Appendix B7 for Learning modalities checklist) which could not be determined by either the POE or the DASE checklist.

Overall the results of both the POE and Assessment tools both suggest that the classrooms were not catering for student needs, were inadequate and did not provide a comfortable stress free atmosphere especially at AISJ and MJIS School. The POE, DASE scale and CEFPI Adequacy tool indicated that BISJ School had satisfactory

conditions in their classrooms as seen in Table 6.1 and 6.2 (See Appendix B3 for score sheet).

6.2.2 Provision of support for non classroom based learning

Table 6.3 shows that students at AISJ and MJIS were dissatisfied with many factors in regards to their physical education facilities.

Table 6.3 Summary of areas rated poorly by the POE for Academic areas - PE

POE	Students		
Areas rated poorly	**BISJ**	**AISJ**	**MJIS**
PE	No concerns and satisfied	Inaccessible equipment	Inaccessible equipment
		No changing rooms	No changing rooms
			No shaded areas
			Disturbs other people
			Boring
		No equipment	No equipment
		PE classes missed because no place to go	PE classes missed because no place to go
		Nowhere to sit quietly	Nowhere to sit quietly
		Scary	Scary

At MISJ and AISJ School, the POE results indicated that indoor and outdoor areas for physical education were inadequate. Figure 6.4 shows the low scores achieved in the DASE and CEFPI Assessment confirm the negative perceptions shown in the POE as seen Table 6.4.

Table 6.4 Comparison of areas of concern with the Assessment tools

		DASE Degree of functionality			CEFPI Adequacy Assessment		
	Areas rated poorly	**BISJ**	**AISJ**	**MJIS**	**BISJ**	**AISJ**	**MJIS**
PE	Indoor physical education areas	8	3.5	1.5	86.7	33%	0

Factors that were below satisfactory

6.2.3 Support spaces

Table 6.5 shows the concerns of the both students and teachers with regard to support spaces. The results obtained from the DASE checklist and CEFPI Adequacy Assessment confirmed this.

Table 6.5 Summary of areas rated poorly by the POE for support areas

Areas rated poorly	Students			Teachers		
	BISJ	AISJ	MJIS	BISJ	AISJ	MJIS
Shared areas		No quiet or group areas to work	No quiet or group areas to work		Variety of shared areas (28% disagreed)	Variety of shared areas (67% disagreed)
Cafe	Not a nice place to eat	Not a nice place to eat		Unattractive interiors		Unattractive interiors
	Dirty	Dirty				
	Noisy	Noisy				
	Uncomfortable	Uncomfortable				
Playtime	Disturbs other people	Disturbs other people	Limited things to choose from			
Assembly	Cannot exit or enter easily	Cannot exit or enter easily	Cannot exit or enter easily			
	Cannot see stage	Cannot see stage	Cannot see stage			
			Not enough space to sit comfortably			
Lounge				Does not support teachers as professionals (28% agreed)	Does not support teachers as professionals (67% agreed)	Does not support teachers as professionals(39% agreed)
Landscape				Poor landscaping(12% agreed)	Poor landscaping (39% agreed)	Poor landscaping (56% agreed)

▢ Facility not provided for

The POE results indicated that teachers and students at AISJ and MJIS School had concerns about the shared areas for students to work and socialize (Table 6.5). As can be seen in Table 6.6, the DASE results confirm the lack of shared areas in both these schools. The results also show that no provision was made for shared areas at MJIS School but BISJ School had satisfactory results for all the shared areas and activity pockets (Table 6.6)

Table 6.6 Results for shared areas according to DASE

		DASE Degree of functionality		
	Areas rated poorly	**BISJ**	**AISJ**	**MJIS**
Shared Areas	Personal spaces	7	3.5	0
	Activity pockets	7	3	0
	Quiet spaces for children	8	0	0
	Hallways allowing personal spaces	6.5	0	0

Facility not provided for and below standards

Table 6.5 shows that both teachers and students in all the schools had concerns about the cafeteria and the POE indicated that the occupants felt it was dirty, noisy and unhygienic. However the CEFPI and DASE assessment tools indicated that that the degree of functionality and adequacy were satisfactory in both schools (Table 6.7). This contrast in results implies that although the cafeteria may have functioned efficiently but the occupants were not satisfied with the ambient qualities of the space such as acoustics, aesthetics and cleanliness which could not be determined by the assessment tools.

Table 6.7 DASE and CEFPI results for cafeteria

		DASE Degree of functionality			CEFPI Adequacy Assessment		
	Areas rated poorly	**BISJ**	**AISJ**	**MJIS**	**BISJ**	**AISJ**	**MJIS**
Cafe	Cafeteria	7.5	6.5	0	70	66.7	0

Facility not provided for

The teachers' lounge was considered the most inadequate. The POE indicated that teachers at all three schools did not feel that it supported them as professionals (Table 6.5) with the lowest rate at BISJ School but the DASE functionality tool revealed that the lounges had limited means of communication with no fax machines, phones, working tables, adequate storage or internet access. Table 6.8 shows the DASE and CEFPI results for the teachers' lounges and indicates that BISJ School had adequate results which conflicts with the POE. However MJIS and AISJ School scores in the CEFPI Adequacy Assessment correspond to the poor results in the POE and DASE.

Table 6.8 DASE and CEFPI results for teachers lounge

		DASE Degree of functionality			CEFPI Adequacy Assessment		
	Areas rated poorly	**BISJ**	**AISJ**	**MJIS**	**BISJ**	**AISJ**	**MJIS**
Teachers Lounge	Communication via phones	9	0	0	85	40	33.3
	Communication via fax machines	0	0	0			
	Storage for personal belongings	6	4	6			

■ Factors that were below satisfactory

Lack of landscaping and green areas to play was also highlighted in the POE by teachers but more so from MJIS School where 56% agreed that landscaping was poor and inadequate as seen in Table 6.5. The DASE Functionality tool also suggested this as a weakness with MJIS School achieving a score of zero clearly indicating that landscape was not a consideration at this school. The other two schools scored borderline suggesting room for improvement (Table 6.9). The CEFPI Assessment could not determine a score for landscaping.

Table 6.9 DASE results for landscape

		DASE Degree of functionality			Observation		
	Areas rated poorly	BISJ	AISJ	MJIS	BISJ	AISJ	MJIS
Landscape	Green areas	5.5	6	0	Hard-scape with a few trees	1 grassy field	None
	Outdoor defined areas with trees and fences	6	5	0	A few trees and patches	A few trees	None
	\Outdoor defined areas with arcades/paths	7.5	6	0	Well defined pathways	Somewhat defined pathways	None

⬛ Factors that were below satisfactory

Other areas of concern for students were the toilets. Students felt they were not enough and that they were unpleasant to use. Neither the DASE Assessment nor the CEFPI Adequacy tool could verify this although in the DASE Assessment all three schools scored 0 as none of them had en suite or home-style toilets (See appendix B2 for score sheet).

6.2.4 Specialized learning spaces:

The POE indicated that teachers from both schools felt the libraries had many inadequacies. It could not easily accommodate displays, the furniture was difficult to arrange and supervise and inadequate in size which did not cater to the number of students (Table 6.10).

Table 6.10 Summary of areas rated poorly POE results for specialized learning spaces

Areas rated poorly	Students			Teachers		
	BISJ	AISJ	MJIS	BISJ	AISJ	MJIS
Library	Calm	Calm	No library			No provided
	Spacious	Spacious				
	Can reach shelves	Can reach shelves		Difficult to supervise (72% agree)	Difficult to supervise (56% agree)	
	Enough places to sit	Enough places to sit		Furniture is easy to	Furniture is easy to	

ICT suites	Not enough pods	Not enough pods	Not enough pods		No access to ICT systems(44% agree)	No access to ICT systems(72 % agree)
				arrange (33% disagree)	arrange (44% disagree	
		Class gets disturbed from other classes	Class gets disturbed from other classes			
		Unable to see teacher	Unable to see teacher			
			Students have to share			
			Not enough PCs			

▨ Factors that were common among all three schools

The CEFPI Adequacy tool verified similar concerns and achieved low scores as seen in Table 6.11 implying low efficiency, uncomfortable and inadequate. However the DASE results conflicted with the other assessment tools and POE, with satisfactory scores implying a degree of functionality within these spaces was satisfactory at both schools.

Table 6.11 DASE and CEFPI for library

		DASE Degree of functionality			CEFPI Adequacy Assessment		
Library	**Areas rated poorly**	BISJ	AISJ	MJIS	BISJ	AISJ	MJIS
	Library	7.5	8.25	0	46.7	66.7	0

▨ Facility not provided

The common concerns amongst students and teachers revealed by the POE can be seen in Table 6.10, with regards to ICT suites especially at MJIS and AISJ School. The CEFPI Adequacy Assessment tool verified the results of the POE as the scores indicated in Table 6.12 show the conditions were all below standard scores implying

general dissatisfaction, a level of inadequacy and unsatisfactory conditions in all three schools. The DASE results were able to identify the precise short comings within the ICT suites which the CEFPI could not.

Table 6.12 DASE and CEFPI results for ICT suites

ICT Suites	Areas rated poorly	DASE Degree of functionality			CEFPI Adequacy Assessment		
		BISJ	AISJ	MJIS	BISJ	AISJ	MJIS
	Technology easily available	8.5	4.5	3	50	55.6	38
	Flexible ICT labs	6.5	6.5	7.5	50	55.6	38
	Teachers can easily supervise	4.5	4.5	7.5	50	55.6	38
	Internet connection	9.5	9.5	0	50	55.6	38

◼ Factors that were below satisfactory

Table 6.13 Summary of areas rated poorly by POE results for specialized learning spaces

Areas rated poorly	Students			Teachers		
	BISJ	AISJ	MJIS	BISJ	AISJ	MJIS
Science		No special place for experiments	No special place for experiments			
	No wet areas	No wet areas	No wet areas			
Music		Disturbs other classes			Not sound treated	No provided
Art rooms			Projects will be disturbed			
			No place to leave projects			
			Not enough room			
	Inaccessible equipment	Inaccessible equipment	Inaccessible equipment		Inadequate equipment	Inadequate equipment

◼ All three schools shared common concerns

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The POE also indicated general dissatisfaction with the art room at MISJ and AISJ School (Table 6.13) where the occupants complained that it was inadequate. The DASE results verify the POE results at these two schools but (Table 6.14) could not determine what ambient conditions were lacking. At AISJ School, the CEFPI results conflicted with the POE and DASE and scored satisfactorily

Table 6.14 DASE and CEFPI results for art room

		DASE Degree of functionality			CEFPI Adequacy Assessment		
	Areas rated poorly	BISJ	AISJ	MJIS	BISJ	AISJ	MJIS
Art room	Instructional wet areas for art	9.5	5.5	1	95.8	83	29

▨ Factors that were below satisfactory

Science labs were not provided in any of the three schools. Students from AISJ and MJIS had concerns (Table 6.13) but all three complained there were no wet areas. The DASE scores verified this but only BISJ School had satisfactory provisions for science work scoring 7 as seen in Table 6.15

Table 6.15 DASE results for Science labs

		DASE Degree of functionality		
	Areas rated poorly	BISJ	AISJ	MJIS
Science labs	Instructional spaces – wet areas for science	7	5.5	0

▨ Factors that were below satisfactory

6.2.4 Building Features:

Table 6.16 Summary of areas rated poorly by POE results for building features

Areas rated poorly	Parents			Teachers		
	BISJ	AISJ	MJIS	BISJ	AISJ	MJIS
External Noise					External noise does not disrupt (33% disagree)	External noise does not disrupt (56% disagree)
Acoustic Treatment	Effective acoustic treatment (67% agree)	Effective acoustic treatment (73% agree)	Effective acoustic treatment (33% agree)	Effective acoustic treatment (44% disagree)	Effective acoustic treatment (61% disagree)	Effective acoustic treatment (33% disagree)
Temperature	Comfortable temperature (23% disagree	Comfortable temperature (36% disagree	Comfortable temperature (24% disagree	Comfortable temperature (33% disagree)	Comfortable temperature (83% disagree)	Comfortable temperature (39% disagree)
Lighting		Good lighting systems (27% disagree)		Good lighting systems (28% disagree)		Good lighting systems (44% disagree)
Ventilation	Good ventilation (10% Disagree)	Good ventilation (36% Disagree)	Good ventilation (29% Disagree)	Good ventilation (28% Disagree)	Good ventilation (83% Disagree	Good ventilation (33% Disagree

[ ] Below standard results

Teachers felt that the amount and quality of natural and artificial light were concerns. Furthermore it indicated that there were not enough windows and inadequate light (Table 6.16). The DASE assessment tool verified the poor light conditions as scores were on the average 34% for adequacy of natural light and 32% for windows that allow natural light. Individually however, as can be seen in Table 6.17 only BISJ School scored satisfactory points at 7 and 6.75 respectively (Table 6.17)

Table 6.17 DASE results for lighting

Lighting		DASE Degree of functionality		
	Areas rated poorly	BISJ	AISJ	MJIS
	Adequate quantity of windows	7	0.5	1.5
	Adequacy of natural light	6.75	2	1.5

☐ Factors that were below satisfactory

The POE also indicated that external noise was a concern and caused disturbances for teachers at MJIS and AISJ School (Table 6.16). The Table also shows that acoustic control was considered poor by both teachers and parents in all three schools. The DASE results also revealed similar problems at these two schools where external noise control scored 4.5 and 3 as can be seen in Table 6.18. The DASE Assessment result suggested that the noise control was more than adequate at BISJ School conflicting with the POE as both participant groups were generally disturbed by external noise levels (Table 6.2).

Table 6.18 DASE results for Acoustic control

Acoustic control		DASE Degree of functionality		
	Areas rated poorly	BISJ	AISJ	MJIS
	External noise control	8	4.5	3

☐ Factors that were below satisfactory

The POE indicated that both participant groups from all three schools were dissatisfied with the temperature control (Table 6.16). However the DASE Assessment results indicate a contrasting result and only shows that AISJ School had poor temperature control (Table 6.19).

Table 6.19 DASE results for climate control

		DASE Degree of functionality		
	Areas rated poorly	**BISJ**	**AISJ**	**MJIS**
Climate	Climate control	6.5	5	7.5

▨	Factors that were below satisfactory

Table 6.20 Summary for areas rated poorly by POE for building features

Areas rated poorly	Parents			Teachers		
	BISJ	AISJ	MJIS	BISJ	AISJ	MJIS
Cleanliness and maintenance	Unmaintained and unclean (90% Disagreed)	Unmaintained and unclean (77% agreed)	Unmaintained and unclean (86% agreed)		Unmaintained and unclean (56% agreed)	
	Cleaning crew effective in keeping it clean (90% agreed)	Cleaning crew effective in keeping it clean (64% disagreed)	Cleaning crew effective in keeping it clean (43% agreed	Cleaning crew effective in keeping it clean (94% agreed)	Cleaning crew effective in keeping it clean (67% disagreed)	Cleaning crew effective in keeping it clean (83% agreed
Aesthetics and Design	Aesthetics pleasing and age appropriate (93% agreed)	Aesthetics pleasing and age appropriate (68% agree)	Aesthetics pleasing and age appropriate (43% agree)	Aesthetics pleasing and age appropriate (22% Disagree)	Aesthetics pleasing and age appropriate (39% Disagree)	Aesthetics pleasing and age appropriate (50% Disagree)
		Feel spacious (27% Disagree)	Feel spacious (38% Disagree)		Feel spacious (44% Disagree)	
Circulation			Floor directs movement (33% disagree)		Corridors aid traffic (56% disagree)	Corridors aid traffic (72% disagree)
Student Display						Various display Student work (50% Disagree)

▨	Factors that were below satisfactory

Table 6.21 DASE results for design and aesthetics

		DASE Degree of functionality		
	Areas rated poorly	**BISJ**	**AISJ**	**MJIS**
Aesthetics	Visual stimulation and aesthetically pleasing	5	4.5	2
	Background details and colours	7.5	4.5	1.5

☐ Factors that were below satisfactory

Results of the POE showed that teachers and parents at MISJ and ASIJ School did not feel the school was aesthetically pleasing and age appropriate (Table 6.20). The DASE results verify these concerns as scores showed they were all below standards (Table 6.21). It must be noted that the results of the POE at BISJ School conflicted with the DASE results and scored well in the background details and colours.

6.3 Summary

Results indicated that the POE revealed that students and teachers, especially from AISJ and MJIS School were unhappy with ambient qualities of the classrooms in particular the acoustics, temperature and lighting. At these two schools they were also dissatisfied with the overall conditions, limited facilities, aesthetically unpleasing and ill-maintained interiors. However the Assessment tools (CEFPI Adequacy Assessment and Lackney's Class Modalities) were able to identify exactly what elements were not present within the classroom and if it met the needs of the program. Through the CEFPI, the scoring system revealed that classrooms were the weakest areas with no variety and flexibility. Lackney's Class Learning Modalities checklist revealed that classrooms provided limited modes that are necessary to enhance learning such as performance based, seminar-style, and hands-on project areas. MJIS School had none. The DASE could not identify classroom weakness but was able to determine items missing from the overall school. MISJ and AISJ School repeatedly received poor results and general dissatisfaction where as BISJ School received satisfactory scores in the assessment tools within the classroom and POE.

DASE checklist and Nair and Fielding's 28 Design Patterns indicated items that were not present within the schools such as no variety of shared areas, quiet spaces, casual eating areas, activity hubs, soft furnishings, outdoor learning areas, landscaped areas and learning studios at AISJ and MJIS School. The DASE also determined the conditions of the items present by the scoring system enabling the researcher to understand the shortcomings and the condition of the items present. AISJ and MJIS did not provide for many of the items necessary in the DASE checklist or Nair's Design Patterns. The weakest areas revealed by the CEFPI were the teachers' lounges and dining areas. The POE process revealed participants complained about furnishings, quality and aesthetics of the interiors stating they were poor within these areas but the CEFPI Adequacy Assessment low scores indicated poor conditions, inappropriate sizes, no flexibility and that it did not meet standards.

The DASE toolkit and the CEFPI also showed that library, ICT suite, Art room, dining room were inadequate and lacked functionality and inadequacy scoring low but the POE showed that the occupant groups were generally satisfied only complaining about certain issues such as poor acoustics, hygiene, low quality furnishings and out of reach equipment. Despite these issues, it did not affect their perception of these spaces and were generally satisfied.

The assessment phase and POE process generally revealed that conditions at BISJ School were satisfactory in terms of the facilities needed such as ICT suites, PE areas (indoor and outdoor), art rooms etc. These areas were also well equipped and resourced. Results also indicated that they had better ambient conditions, maintenance, furnishings, functionality and adequacy of their school and both participant groups were generally happy.

At MJIS School the assessment tools were able to assist in determining the items not present. It indicated that it had the least amount of design patterns needed for an effective learning environment with no library, science lab, PE (indoor or outdoor) or shared areas. The school was not well equipped or resourced and technology was not integrated into the system. There was a general lack of organization within the

learning neighbourhoods and adhoc relationships between the adjacent areas e.g. office spaces and clinics placed near to classrooms. The POE could not determine these issues.

However the assessment revealed the poorest conditions were seen at AISJ School. The building could not be renovated, updated or adapted due to lack of space. The assessment revealed poor lighting conditions, no windows, unhealthy air due to poor ventilation systems and ill-maintained school. Their weakest areas were the ambient conditions of no natural light, poor acoustics, lighting, uncomfortable furnishings, crowded classes and poor interiors. The POE also supported the assessment in that the participants were extremely dissatisfied and unhappy with their schools. The POE also revealed numerous concerns regarding how the occupants felt about the facilities not provided.

In conclusion, the weakness in the POE was that it was based solely on the opinions of the stakeholders with little reference to the real environment. The weakness of the checklists were firstly they were conducted by an outside expert and secondly that they did not take into account the views of the occupants. Further details will be discussed in chapter 7.

Based on data collected from the assessment phase and POE evaluations, recommendations were made for each school that would enable them to cater for the needs of the occupants and meet the requirements as specified by best practice in relation to learning environments (See Appendices F2, F3, and F4). An overall set of recommendations were also made for schools in Jeddah as a guide line using the case studies as representative schools (see Appendix F1).

CHAPTER 7

DISCUSSION

7.1 Introduction

This chapter deals with the main contributions determined by the assessment and evaluation process on how the occupants feel about their learning environment and what differences were detected between what the students perceived and the adults. It also discusses the limitations in methods and their use in the research and how this study might inform future school design in Saudi Arabia.

7.2 Insight into the stakeholders' perception.

Although the POE process detected many similar concerns on particular factors such as classroom weaknesses, lack of flexibility and poor conditions within learning areas, students and teachers perceived comfort factors differently within classrooms. Results revealed that acoustics and class density were major concerns amongst students but teachers felt good lighting and temperatures were more important. Noise was a recurrent concern for the students within various areas including classrooms, dining room, music room, plays areas and they were generally disturbed by external noise. This indicates that children are particularly sensitive to noise and are easily distracted. The implications of this data would suggest that it is essential that acoustic treatment be applied to absorb reverberations within classrooms and locations re-considered to prevent disturbances. High density (crowded) classrooms was also another concern amongst students and may explain why students experienced in some classrooms, level of aggression and noise. Students require a certain level of physical movement and freedom. Appropriate classroom sizes are an essential factor in resolving this issue in school design and must be accommodated during the early planning stages.

The POE also suggested that children felt a certain degree of privacy was necessary but teachers were more concerned with flexibility and variety in classrooms to accommodate multiple user needs. The assessment results confirmed this and

allowed specific areas to be identified that were missing such as lecture-based areas, project-based areas, reading corners, and wet areas which the POE could not identify.

The need for privacy suggested by students in the POE implies the importance of a child's need to retreat or a place where they can work at their own pace. The need for variety and flexibility implies teachers recognize that students have multiple levels of intelligence and abilities and classrooms need to accommodate this factor.

The assessment clearly indicated poor functionality and inadequacy in various spaces. However the POE results suggested many students were still satisfied with the facilities (perhaps because they had not experienced anything else, or they did not see the school in the same way as the assessor). It was observed that children felt that classrooms were their least favourite place to be and were happy to be outside the classroom. Despite poor conditions within areas such as the library, dining area and play areas, all of which scored low on the assessment and teachers' evaluation but high on the students' evaluation. Such spaces gave students a chance to socialize and the opportunity to take a break from class. This may imply that students require and welcome opportunities for change and variety to enhance their learning environment. It can also suggest that confining a child within a classroom for several hours may go against a child's natural tendency to be active. Allowing a child the opportunity to leave the confines of a room may assist in preventing a certain level of boredom and assist in keeping students involved and active. According to the literature, allowing students the ability to choose how and where they study gives them a certain amount of control and ownership. In turn, students become more enthusiastic about learning. Considerations must be made to ensure that the design of schools allows for choice and change by providing a variety of learning spaces.

The POE results showed that teachers were mostly dissatisfied with two particular factors within the learning areas. The first being lack of resources and supplies and that learning areas did not cater to instructional needs. This implies that the school layout and design does not provide for the appropriate number of storage, resource areas, technology, equipment and communication facilities. All of these need to be considered prior to construction.

Secondly, the majority of the teachers were dissatisfied with the aesthetics and colour of the overall building. An observation was made in the POE score between the perceptions of the parents versus the teachers on building features. The score given by teachers was 1.82 out of 4 where as the score given by parents were 2.78 out of 4. Parents scored an average of 28% higher than teachers on each factor. This difference clearly suggests that perhaps parents are unaware of the conditions of the school or teachers' responses are more biased.

The main differences detected between the schools was that teachers at BISJ School were more concerned that the aesthetics be more child appropriate with brighter cheerful colours and that landscape needed to be integrated into the school grounds to make it more welcoming and relaxing for children. Due to the fact that the other two schools had several short comings, lack of facilities and basic needs, the teachers were more concerned with the difficulties they faced due to this and how it hindered their ability to work as professionals. They focused on functionality and adequacy of their learning areas and the need to renovate the school for a new and more functional facility. Students at these schools also focused on the lack of facilities and how it hindered their ability to learn.

7.3 Appraisal of the contribution the evaluation and assessment process can make to informing design

Data collected from the POE essentially focused on ambient factors and comfort levels where as data from the assessment tools provided information about the quality, functionality and adequacy of the existing facility, identified areas and design patterns that were missing or which were being referred to in the POE. Therefore the POE toolkits and the assessment checklists provided different levels of information, and together provided a more detailed picture of the school. Together the results indicate the areas within the built environment which needed attention such as temperature, acoustics, aesthetics and light; lack of design principles such as variety, flexibility, and choice in designed spaces. The evaluation has shown that some of the schools fail to provide facilities or environmental conditions that have been proved to enhance learning and has pinpointed where changes need to be made.

A factor which needs to be considered in the use of the assessment tools is that they were designed for use in western schools. The question that arises is how suitable these tools may be for use in Saudi Arabia and whether the educational systems support these sophisticated learning environments, financially or in terms of the level of educational development. According to the World Bank, Saudi Arabia is one of the 69 countries that are classified as 'high income economies (Wikipedia 2010) and it is also considered a developing country. This is defined as a country with high income per capita, rapid industrialization, and most recently another measure which is considered a prominent factor, education (Wikipedia 2010). According to an article published in their local papers, Saudi educational development is an economic priority:

'Speaking about educational reforms, he said King Abdullah has allocated SR9 billion for a new general education development project, which is named after the king. "This project is being supported by Saudi and foreign experts," he added. The King Abdullah Project for the Development of Public Education has allocated SR4.2 billion to improve the educational environment and SR3.58 billion for extra-curricular activities. The training and development of teachers is another thrust of the project and for this purpose SR2.94 billion has been set aside. A curriculum development program will receive SR980 million. Academics and other experts are working on the project's executive plan, which will be ready shortly'

P.K. Abdul Ghafour | Arab News (2009)

In 2007 alone, $15 billion dollars was spent on educational development to fund and develop higher education programs (Middle East info 2008). Saudi Arabia has the economic means to support several future developments and sustain sophisticated learning environments as evidence shows that the country has the financial means.

7.4 Limitations observed within the POE toolkit

Interviews suggested that air quality was poor within the schools and was considered a major health hazard amongst teachers complaining of allergies, flu, odour, humidity and a general unhealthy environment. The POE could not determine whether air

quality was satisfactory or even indicate it as a general concern. Heath and Mendell (2002), Lackney (1999), and Lyons (2002) stress the criticality of indoor air quality as a key component of the learning environment and it is essential to inquire whether the stakeholders are in a healthy environment and must be incorporated into the survey.

Considering that views, landscape and outdoor areas play an important role in learning and the well being of the child, it would be beneficial to understand their perception on this relationship. Severe climatic conditions may have an impact on the stakeholder's views as was the case in Saudi Arabia. Parents preferred their children to be indoors and out of the sun. In another case, all students conducted their playtime and sports within an enclosed air-conditioned arena and interviews with teachers suggested that they preferred students being indoors in fear of suffering from dehydration or sun strokes. Adding it to the survey may provide insight into how children perceive this and not simply a case of what parents and administration prefers.

The POE toolkit for key stage 2 children would have to be adjusted for specialized learning areas. Students continued to fill survey questions regarding facilities that were unavailable such as science labs, libraries, and quiet rooms. The POE should first request whether that learning area is present or not. Therefore if the POE was handed out by a researcher who had no familiarity with the school, it is likely that invalid results would be given.

Factors that were considered important criteria for good learning environments were cleanliness, class density, aesthetics, furniture and safety. None of which could be determined by the POE toolkit.

Other issues that could not be determined by the POE toolkit were cultural concerns. The majority of the children in the survey followed the Islamic faith. It could not be determined if the schools could accommodate their specific needs such as prayers areas, ablution facilities, privacy in changing rooms or allowing the call of prayer times to be announced on the PA system. It was also observed that maintaining absolute security to prevent male visitors entering the school was a major concern. However it was not known whether children agreed that their fathers should not enter the school

or attend any functions, plays, sporting events or graduations. Providing insight into this could lead to alternate design solutions to cater to this need such separating the auditorium, gym or sports arena to allow access to all visitors without disturbing the school.

7.5 Limitations observed within the Assessment toolkit

The criteria stipulated by Field and Nair Design Pattern checklist or Lackney's Learning Class Modalities can be adopted into the primary school system as these are directly related to the effectiveness of learning environments in classrooms and school interiors. However the Design Assessment Scales for Elementary Schools (DASE) has some limitations. It may be culturally inappropriate mainly due to climatic conditions. This checklist specifies several outdoor learning areas, landscaping and creating harmony with the exterior spaces. This may not be possible due to the harsh weather conditions in Saudi Arabia. Although outdoor areas are vital to the learning process of young children but there needs to be certain criteria to ensure comfort and safety such as ensuring all outdoor areas are appropriately shaded from the sun, water bodies (fountains and shallow pools) and green areas with large trees to provide cool shaded spaces, and considering wind and solar direction by avoiding the South side. Other concerns within the DASE checklist are the specification of large windows and skylights to provide natural light. Large glazing surfaces only create greater solar gain and glare which in turn leads to warmer conditions within classrooms and discomfort. Orientation and location of classrooms is also an important factor that needs to be considered such as ensuring that all classrooms are placed on the North side to provide good natural light without direct sunlight.

Other considerations are the inclusion of religious requirements such as prayer areas with attached ablution areas, privacy especially within all girls' schools, male-female segregation and private entrances to ensure control and privacy. Buildings also need to be enclosed and cannot be harmonized physically with the surrounding context as specified in the checklist as this hinders their religious requirements.

7.6 Implications of the POE and Assessment to serve as a model and inform future school design in Saudi Arabia

Previous studies have suggested that a POE can inform design. Through the literature review there is evidence that schools implementing the POE have become models for future developments as was the case in Scotland, United States, New Zealand and Brazil. For example, in Scotland a POE assisted local authorities in assessing how well a completed school building project meet the needs of pupils, staff, parents and the wider community. The guidance contributed to a growing emphasis by local authorities on the importance of evaluations as both a quality and continuous improvement tool. New Zealand also used their first POE study as a model to evaluate and identify the strengths and weakness of their first technologically oriented school before similar designs were replicated. This gave them the opportunity for replica models to be streamlined.

In a cursory review of the literature there is evidence that Saudi Arabia has implemented POE methods for their building appraisal and adequacy but there has been no POE implemented for primary schools. Saudi Arabia is ready for change and is in the transitional stage. The [International Code Council (ICC)](#) and the Saudi Building Code National Committee signed a memorandum of understanding to implement I-codes dedicated to building safety and fire protection.

In 2004 the Ministry of Education announced plans to renovate all educational sites and to design and execute future educational projects. This implies that the government is looking to improve building standards and that change and growth is inevitable. The time is ideal to introduce the POE within local schools where the findings of this study could serve as a model for renovation and future projects as was the case in New Zealand, Scotland and Brazil.

The evaluation and assessment results clearly indicated the problems in the three International schools selected for this study which could impact learning. A certain amount of dissatisfaction was expressed by the stakeholders, although this varied from school to school. It should be noted that the schools selected for this research

are considered amongst the top 5 private-funded schools in Jeddah and yet the degree of adequacy, functionality and safety were below the standard requirements. It may be hypothesized that local government-funded schools may be worseh as funding and resources are always limited.
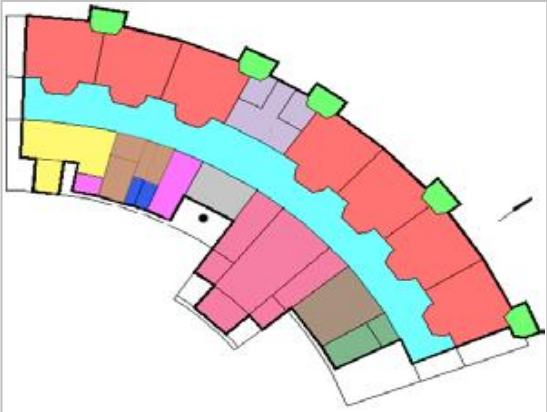
Allowing the Ministry of Education to note the results of the POE and demonstrating the advantages of giving children the opportunity to voice their concerns could provide opportunities for further developments and possibly institutionalizing the POE as a standard method to be incorporated into the design process. The findings clearly suggest that size, hygiene, temperature, colours, furniture, location, acoustics, landscaping, flexibility and aesthetics were problems in all three schools suggesting that these were reoccurring factors and is likely that other schools would have similar concerns.

The methods employed in this research could be used as a model and assist designers in understandings issues that cannot be overlooked. For example, experts suggest abundance of natural light as a solution, however in some schools, the stakeholders complained of extreme headaches due to glare. Understanding and identifying these types of issues where design practice and occupants views differ are invaluable to the design process. Incorporating these concerns into future development of schools ensures that the building completely serves the occupants within it and addresses all their learning and comfort needs. These findings can also assist in creating regionally specific design solutions within Saudi Arabia such shading devices for windows; cantilevers, lattice work or inset windows that can lend itself to the overall character of the building and in turn the city. Other recommendations that can contribute to more effective learning environments for the representative schools can be summarized in Table 7.6

Table 7.6 Item that improve learning environments

ACADEMIC LEARNING SPACES	
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Classrooms	
Furniture	• Adjustable and upholstered chairs. Providing a variety of styles.
Lighting	• Variety of lighting sources and full-spectrum lighting to cater to a variety of functions. • North side glazing preferably for classrooms
Flexibility and variety	• Clustered arrangements and moveable furniture • Open plans and learning studios
Colours and aesthetics	• Warm bright colours – salmon, pale yellow, yellow-

	oranges, coral and peach
Responsive classrooms	• Should extend into outdoor classrooms • Classes should extend out into shared areas and collaboration areas
Display	• Spread throughout hallways for student achievements and information • Floor to ceiling chip boards in classrooms
BUILDING FEATURES	
Scale	• Child oriented environments • Lowering heights of windows, door heights, stairs, and furniture • Reduce scale of building
Attractive and visually pleasing	• Facades painted strong warm colours • Design features that create diversity and involvement such canopies, fountains, pathways, circulation, courtyard and bridges

	• Contrasting materials such as glass and wood
	• Uniform texture or distinctive repetitive elements such as arches and motifs.
SUPPORT SPACES	
Corridors and hallways	• Should allow for personal spaces, display boards, books shelves and notice boards
	• Colour schemes should be applied to make hallways attractive such as light orange walls offset by blue doors.
Student dining	• Variety of furniture styles such as banquettes, lounges, and soft furnishings
	• Cafe style interiors with attractive colours such as corals, greens and peaches

	• Extending out into outdoors • Soft furnishings • Laminated table tops with wood grain, that stimulate appetite such warm red, oranges, or clear greens.
Hard play surfaces and playgrounds	Landscape furniture should be created through natural materials which blend into the landscape
Soft play areas and outdoor classrooms	• Trees, fences, hedges, fields, grass, arcades, walkways to sit and socialize • Integrate various outdoor spaces • Formal colourful shrubs • Paved areas with sheltered quiet areas
Quiet reflective outdoor areas	• Small outdoor lunch areas and areas for quiet reading
Shared areas and activity pockets	• Places for socializing and interacting where children can design as they see fit
SPECIALIZED LEARNING SPACES	
Library	• Variety of tables and chairs • Moveable screen dividers to allow for flexible arrangements • Incorporate quiet individual reading areas with soft furnishings • Total area should be 10m2 plus 0.05m2 for every pupil
ICT suite	• Layout should be perimeter based layout with a central free area for demonstrations and work areas • All furniture and equipment must be adjustable • Tables should be extendable

It must be understood that there are subtle differences between schools as there are between individuals and enforcing standard preconceived models negates their identity, character and educational needs. By incorporating an assessment process and POE into the design phase allows the designer, not only to fully understand the occupants' perception of their built environment but ensures that the design solution specifically caters to their needs and provides unique and interesting designs. It also gives the occupants a sense of control and that they are responsible for the outcome of their learning environment. In essence this is a key factor in creating effective learning environments as it enhances a sense of place, ownership, and pride for the occupants within.

7.7 Proposal for future plans

During the initial stages of the study, the schools agreed to participate in the evaluation and assessment on the condition that they would be provided with recommendations to improve their learning environment.

At the end of the study the recommendations will be provided to all the schools for long term and short term improvements. On implementation of the recommendations these schools will then be used as potential models to exemplify the benefits of implementing the POE to the Ministry of Education in Saudi Arabia in hopes of institutionalizing the POE and allowing for continuous assessments as a standardized process.

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TABLE OF FIGURES

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APPENDICES

Appendix A1: Design implications

Design implications of the built environment

Diversity and Order are two main design principles that may be applied to the built environment to enhance learning

Diversity: This can be achieved through adjustments to geometry of space, hard and soft forms and contrast, offering visual shape and tactile interest. Design features that can be used to create diversity and involvement are canopies to play under, pathways for circulation, courtyards, bridges, fountains, or simply using contrasting materials such as glass and wood (Barret and Zhang 2009).(**Figure 2.1**)

Figure 2.1 : Wood buildings with simple roof forms, shading devices, bridges and courtyards   (Hosmarinpuisto school and day care centre

Order can be achieved through uniform texture, low contrast, distinctive repetitive elements and replication of facade features like timber arches throughout the building as a motif or large glazed windows as a main feature (Barret and Zhang 2009)(Figure 2.2)

Figure 2.2: Timber on all the elevations to give a rustic and unified character (Kingsmead Primary school)

Appendix A2: Design implications

Design implications for circulation

Circulation must create gradual transitions between spaces and adjoins the various activities. Good circulation allows for clear supervision (Lueder and Rice 2008; Barret and Zhang 2009), ensures equal access for all including disables persons (Lueder and Rice 2008), and separates pedestrian from vehicular traffic (Lueder and Rice 2008). Primary circulation should allow for 6 students to walk abreast without columns. Successful case studies show that the curved shape or central spine proves to be a good solution where all the specialist spaces and display areas can be placed along it (**Figure 2.3**)
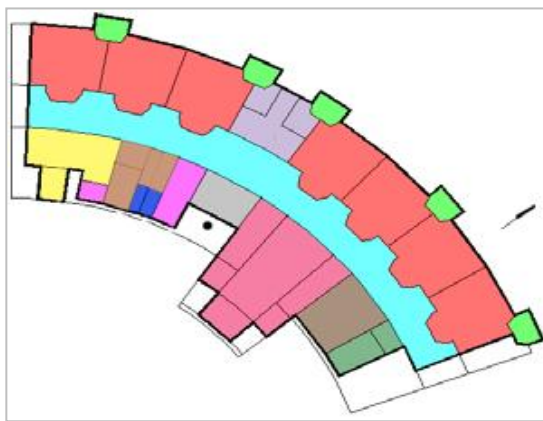
Figure 2.3: Curved Plan following a central corridor (Kingsmead Primary School)

Figure 2.4: Corridors with short-break-out spaces for play and socializing (Gila Ridge High)

Providing corridors with short break-out spaces for play and socializing is a good strategy for maintaining visual supervision as well avoiding long institutional style corridors (Lueder and Rice 2008; Barret and Zhang 2009)(**Figure 2.4**).

Appendix A3: Design implications

Design implications for Lighting

a. Orientation

The building should be elongated along the East-West axis and spaces such as library, classrooms and art room should be located on the North side for diffused light.

b. Location

The building or campus should be located where there are clear views all around with possible green areas and no traffic (Frumkin, Geller, Nodvin, 2007)

c. Windows

The distribution of light is determined by the size, number, shape and position of the glazing. The more the windows, the more daylight will be uniformly diffused. Their research recommends the glazing ratio (glazing area/wall area) should be 40% for the south side and 55% for the North side which also allows for a more evenly diffused day lighting effect (Frumkin, Geller, Nodvin, 2007) or east light borrowed from inner activity corridors (Evans 1995). High windows will allow more light and depth of illumination into the far corners of the class and can illuminate a distance of up to 2.5times the height of the window (Barret and Zhang 2009). For more uniform distribution of light, it is recommended to install clerestory windows which admits light deeper into the back of the class and to allow day light from two or more directions with a combination of view windows, high windows and skylights (Frumkin, Geller, Nodvin, 2007)(**Figure 2.5**). In addition windows should also have shades or louvers to control glare and direct sunlight (Frumkin, Geller, Nodvin, 2007)

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Figure 2.5- (Left) Classroom with large glazing (Right) (Ben Franklin Elementary School, Kirkland, US)(Source: Architectural Record)

Appendix A4: Design implications

Design implications for Sound

a. Location

School site should be at a reasonable distance from neighbourhoods but should be located away from busy roads and traffic. (Frumkin, Geller, Nodvin, 2007; Barret and Zhang 2009)
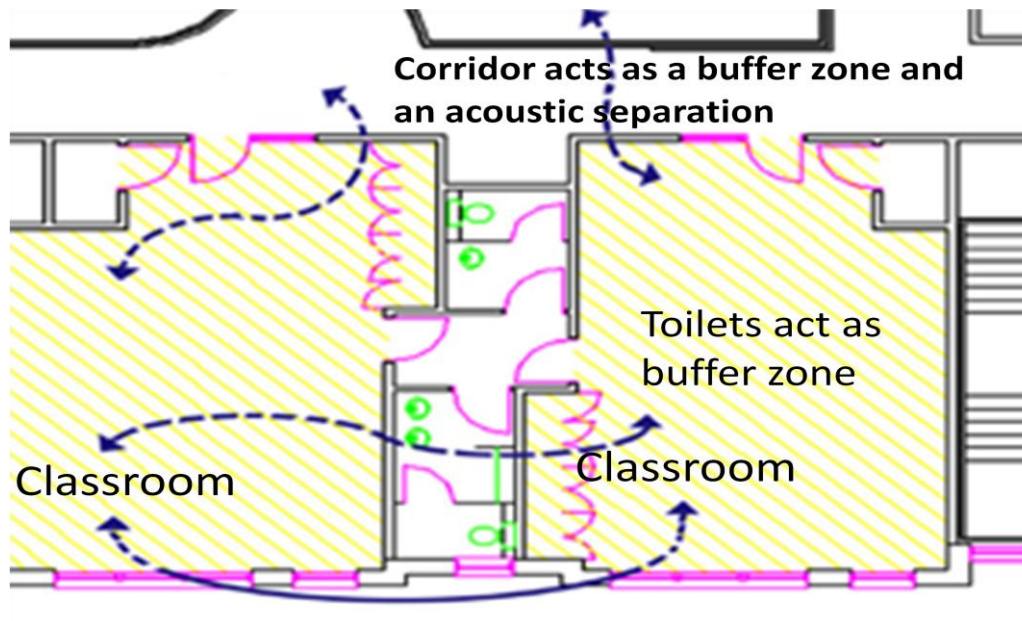
Figure 2.6: Toilet and corridor as buffers from the noise

b. Layout

The first step is that all sound related or noisy activities such as music rooms, play room or mechanical systems should be located away from learning spaces. (Frumkin, Geller, Nodvin, 2007; Lueder and Rice 2008; Barret and Zhang 2009)

These spaces can be further protected by using sound insulation materials, heavy weight walls, or floating floors. A secondary option would be in carefully placing the sensitive areas near toilets, storage and corridors to act as a buffer for further noise protection and it also provides good separation (**Figure 2.6**).

Appendix A5: Design implications

Design implications for thermal conditions

a. Orientation

Due to solar heat gain through surfaces, orientation of a building plays an important role in the indoor environment. Rooms placed on the south side have considerable heat gain as it has maximum exposure to the sun where as rooms on the west side experience more intense sunlight.

b. Layout

Layout links to building shape which heavily affects the heat gains and loss as the exchange is directly proportional to the surface area. To control heat gain, a simple and compact plan is recommended.

Appendix A6: Design implications

Design implications for Air Quality

a. Orientation

Prevailing winds can be diverted or pulled into the campus by careful designing and orientation of the school and choosing a good location away from polluted areas. If the location is near polluted areas, locate openings away from the prevailing winds. Rooms creating strong smells such as cafes, kitchens, or science labs need to be separated and located away from learning areas.

b. Windows

Windows provide flow into and out of the building such as heat, air, and wind. Ideally windows in classrooms should have ventilation options such as small windows placed high on the wall to allow for control of high wind or large centrally located windows for proper ventilation during hot summer temperatures and finally small windows placed at bench height to cater to general ventilation throughout the year (DFES 2003). Ideally windows in classrooms should have various ventilation options as seen in (**Figure 2.7, 2.8**)

small high-level opening windows
allow ventilation even in windy conditions

trickle ventilation allow some
ventilation all of the time

large opening windows are needed
in summer on still days

small low-level window encourage
air flow when conditions allow

lower height to accommodate
                    children
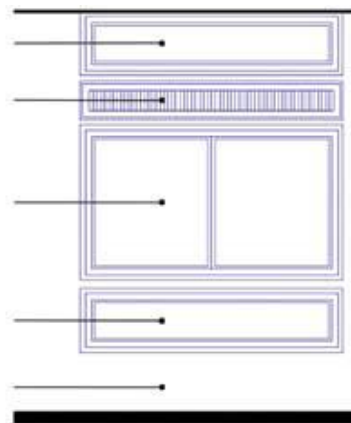
Figure 2.7 – ventilation options for varying options

Figure 2.8 - Small windows at the top allowing ventilation
Without draught (Rolls crescent Primary school, Manchester, UK

Appendix A7: Design implications

Design implications for Colour

A variety of tests have been conducted on the impact of colour in the environment. Warm colours draw emotional and visual interest in children where as cool colours have the opposite affect (Monk 2006).

a. Appearance

Central to the impact of colour is the issue of avoiding over or under stimulation throughout the campus (Barret and Zhang 2009). Too many colours should be avoided as it can create confusion making it difficult to determine what information is relevant (Lueder, R., Rice, J.V., 2008). Building facades may be painted strong colours to counter the listlessness effects of humid and hot climates as seen in figure 2.10 at the Xinzhou School in China. The colour is used to counter the negative energy with warm to hot paired colours (Barret and Zhang 2009)(Figure 2.9)

Figure 2.9: Warm to hot paired colours (Xinzhou Kindergarten School, China)

b. Rooms

Colour schemes should vary according to the rooms, tasks and function (Barret and Zhang 2009). Designers should ensure that the colour schemes remain consistent and mean the same thing throughout the applications (Lueder, R., Rice, J.V., 2008). Learning spaces for nursery and elementary require warm and bright colour schemes as it complements their extrovert nature (Engelbrecht 2003), reducing tension, nervousness and anxiety (Barret and Zhang 2009). Light salmon, soft warm-yellow, pale yellow-orange, coral and peach are preferable where colours of opposite temperatures should be introduced as accents (Barret and Zhang 2009). The child's need for change can be

satisfied through change in hue, colour intensity and lightness but avoid relying on only colour for contrast (Lueder and Rice 2008)

Appendix A8: Design implications

Design implications for Open plan classrooms and Learning studios:

It is important to identify the various activities that will take place within the classroom and provide well-defined shared areas and activity pockets such as seminar-style area, art, storytelling, project, lecture and peer tutoring area (Fielding and Nair 2005; Heath 2008) with all its necessary resources (Barrett and Zhang 2009). The aim is to accommodate a wide range of learning styles (Lueder and Rice 2008; Barret and Zhang 2009) with varied learning groups (**Figure 2.10**).

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University
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Figure 2.10-Large classrooms with varied learning groups and spaces (Redbrook Hayes Community Primary School, Rugeley, Staffordshire, UK) (Source: CABE)

a. L-shaped classroom

A child needs various activities example, reading, writing, working, and listening, therefore a plan has to accommodate instruction experimentation, and group related activities (Sanoff 2001). Lippman (n.d) mentions that variety of spaces supports student-teacher relationships.

Dyck (1994) developed criterion for modern classroom:

- Must accommodate formation and functioning of small learning groups while providing sense of separation because groups working together experience distractions (Sanoff 2001)
- Must be flexible enough to allow for continual reorganization of class into various sizes and number of small learning groups.
- Must be manageable by single teacher who commands entire space. (Dyck 1994:44)

Based on the above, some common shapes that are lend themselves well are the Cross, Rectangle, Square 'T' and 'L'. However Dyck (1994) as cited by Lippman (n.d), proposed layout of 'FAT L' as a design pattern that offers teachers options in how they might organize their class is suggested to be the most effective. (Dufult, Dyck, Jackson,2008; Barret and Zhang 2009)(**Figure 2.11**)

Cross   "L"   Rectangle   Square   "T"
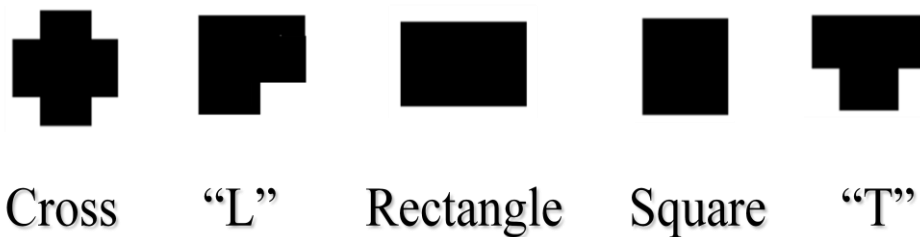
Figure 2.11: Common Classroom shapes

Appendix A9: Design implications

Design implications for L-Shaped Classroom:

The 'Fat L' offers a wide variety of student grouping as well as allowing teachers options in how they might organize their classrooms to facilitate the development of their students in various learning activities (Barret and Zhang 2009) It provides a natural sense of separation and eases perception of crowding as long as there are no permanent barriers (Dyck 1994:.44). It is capable of creating defined areas of activity which separate from the rest of the class and yet not be isolated, providing excellent nesting qualities and sense of places which can easily be grouped into wings, clusters and pods (Dyck 1994; Lippman (n.d) (**Figure 2.12**).

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Figure 2.12: (left) Conceptual 'L' shaped classroom; (Right) 'Fat L' classrooms paired within a building plan (The prairie Hill Learning Centre, Roca , US) (Source Architectural Partnership Photography)

The separation is only a visual barrier with good visibility, ease of movement for the teachers and minimum supervision (Tharp & Gallimore, 1987 cited in Lippman (n.d)). Additionally this shape also offers flexible layouts with the furniture and furnishings which may be organized to suit individual, one-to-one, small groups and large group activities.

The L-Shaped Layout can be used in various ways to suit the activities within. For example, at the Crow Island School, the legs were designed to be two different spaces

11

(**Figure 2.13**). The smaller narrower leg is used as a Workroom with counters, sinks and windows above and can be used to work on specific projects and individual or one-to-one activities. The larger longer leg is used as the classroom with a bay window to define large group meeting areas and flexible spaces (Lippman (n.d). At the Winston-Salem Montessori School, the L-shape arrangement allows for break-out areas at the entry for students to work and to display projects. These break-out areas also integrate with the main corridors providing a variety of spaces for socializing and working (Lippman (n.d))

Fig 2.13 have been removed due to third party copyright. The unabridged version of the thesis can be viewed at the Lanchester Library, Coventry University
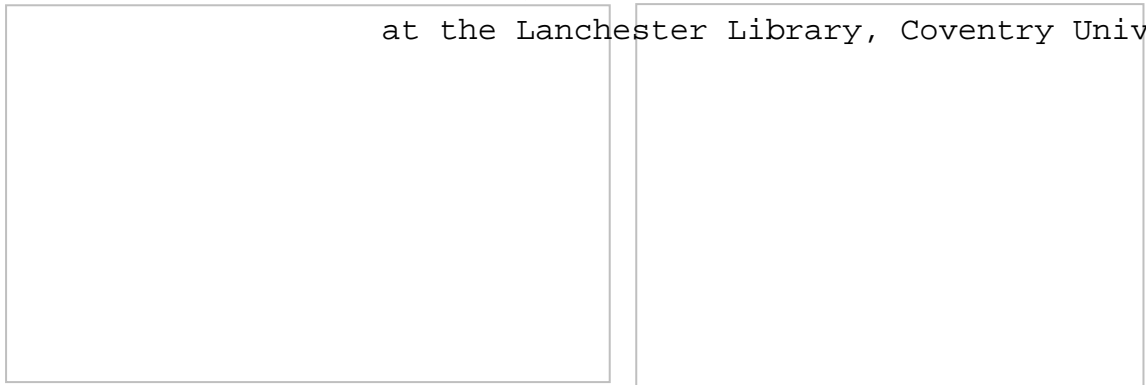
Figure2.13: (Left) Crow Island School (Designshare.com 2009); (Right) Winston-Salem Montessori School (Designshare.com 2009)

Appendix A10: Design implications

Design implications for scale

Windows

Specifically scaled windows create more engagement and allow children to use the space more independently. It also allows the children to enjoy a clear view and sunlight, especially if the glazing wraps around the whole class. A child-oriented environment can be successfully create by bringing down the height of the glazing to bench height of the children, denies the adults these views and implies that it is a privilege created just for them (Barret and Zhang 2009) (Figure 2.23)

Rooms

By reducing the scale and lowering the ceiling heights, a more engaging and intimate space is created which is of particular importance in when creating a child-centred environment. The size and scale of buildings, its exterior elements and interior spaces, make it possible for pupils to use spaces independently (Barret and Zhang 2009).

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Figure 2.14: Interior view of main playroom with lower and higher floor planes giving spatial drama to activity area (Childcare facility in the University of California, Los Angeles, UK)(Source: w.spacesforchildren.com)

Appendix A11: Final conclusion of design criteria for schools in the 21st century

Design Criteria Checklist

2.4.1   A sense of place and Inspiration:

Success of a project lies in how well the occupants engage with the settings and if it allows for a sense of belonging and ownership (Fielding 2006; Arnold, Olcayto, Olliff, 2009).

The school should have inspirational design that influences the behaviour and enthusiasm of the students in a positive way (DfES 2003) with unique architectural features and forms. Stimulating environment with proper use of soft seating, dramatic lighting, views, transparency, (Fielding and Prakash 2005) colour and texture enhances the sense of connection and ownership with the school (Lackney 1999) which is a contributing factor to creating ideal learning environments (Rydeen 2003; Earthman 2004; Monk 2006)

Another important factor in creating a sense of place is involving students in the design process. Studies conducted by Joinedupdesignsforschools shows that by involving students, they can achieve control over the outcomes of the spaces that matter to them (JUDS). They are able to create unique and personalized spaces that specifically cater to their needs and taste and offering the school fresh and new design solutions. This is an important factor that enhances the sense of ownership, belonging and place (DfES 2003).

2.4.2   Movement and Supervision:

Circulation and is movement is a key factor in good school design as it provides occupants a sense of welcome (Uline 2008) and defines the nature of traffic flow through the building (Tanner 2000). A good circulation pattern must allow for easy supervision and control as it is a vital part of ensuring their safety and security (Arnold, Olcayto, Olliff 2009) which is also a criteria for good learning environments.

2.4.3   Comfort

Comfort and well being ensures a successful learning environment by standardizing acoustic, lighting, temperature, ventilation and ergonomically designed furniture requirements (DfES 2003; Fielding 2006; Arnold, D., Olcayto, R., Olliff, M. 2009). This allows the school to operate efficiently and enhances best performance (Fielding and Prakash 2005)

2.4.4   Learning styles and Classrooms:

A good learning environment must respond to current teaching styles and the individual needs of every learner. Classrooms should now be referred to as learning studios or suites (Fielding and Prakash 2005) that cater to the following criterion.

a.   Need to accommodate a range of group sizes during lessons (DfES 2003)
b.   Learner mentor relationship (Building Futures 2004; Fielding 2005; Heath 2008)
c.   Student-centric (Building Futures 2004) or student focused individual development (Fielding 2005; Heath 2008)
d.   Customised modes of learning and teaching (Building Futures 2004)
e.   Multi-purpose teaching spaces (Building Futures 2004) that can accommodate art, project based learning, seminar style learning, lecture based, storytelling, independent study or performance based learning (Fielding 2005; Heath 2008)
f.   Full ICT integration and technology based learning with mobile computers and wireless connection(Sanoff 2001; DfES 2003; Building Futures 2004; Fielding 2005; Heath 2008)
g.   Full SEN integration (DfES 2003)

With these multiple demands on teaching and curriculum a wide range of support staff is required who can bring a variety of skills to class (DfES 2003). Nair and Fielding (2005) state that there are 18 modalities of learning that are essential for the success of learning facilities (See appendix). According to their research,

15

traditional classrooms only accommodate some 2-3 learning modes and yet they are still popular in most schools. They have designed and proposed three distinct studios that have the capability to cater to numerous modes of learning (Fielding, Lackney and Prakash 2006) making it an effective solution for future schools:

i.   Da Vinci Studio – Action through synthesis of Knowledge

A workplace that is part artist studio, part science lab and model building shop allows for free-flowing interchange. The studio must have high ceilings with plenty of daylight, directed artificial lighting and connection to an outdoor deck with transparency to the outside for good views and vistas. To ensure effective use of the space, access to water, floor or ceiling-grid power supply, wireless networks, ample storage, and acoustic separation are essential. The studio must have resilient flooring to avoid damage and finally a place to display finished projects.

ii.   Einstein Studio – Creative reflection and inspired collaboration

The key characteristic of an Einstein studio is that it must be a place that inspires and is connected to the outside world. The authors compare this studio to a 5-star hotel lobby with water features and welcoming, comfortable areas for individuals or small groups. This studio must have high ceilings as it nurtures inspiration with ample glass and visual connection to natural elements. Although this studio is essentially an open connected space it is important to have small private creative zones which still remain connected to the larger activity areas.

iii. Jamie Oliver Studio – Nourishing mind, body and spirit.

In today's school, Jamie Oliver studio can be compared to a teaching kitchen connected to a cafe. Student's participation is the focal point of its operations which contained mirrored cooking stations visible to the whole class and small round cafe tables with comfortable chairs. The studio does not have to be self-contained but can spill over into a circulation areas or outdoor patios.

h.   Outdoor classrooms and indoor- outdoor link:

This is now considered a vital part of the overall design for new schools and designers are now proposing ambitious options for future developments (DfES 2003) There should be a practical work area overlooking the garden or opens onto raised terrace. Messy projects such as painting or large scale projects can can be done outdoors shaded with overhanging roofs (Evans 1995)

i.   Specialized Learning spaces:

These spaces are customised and specialized learning areas that are specific to curriculum requirements. These spaces are fully equipped with independent storage, specialized lighting, water and gas connections, customised furniture and appropriate layouts and shapes. These are defined as life skill areas such science labs, music and art performances areas, libraries, ICT suites and Media rooms (Fielding and Prakash 2005; Evans 1995)

j.   Learning communities and class clusters :

Class clusters in various forms offer belonging to the students and creates an ambience that is conducive to learning (DfES 2003). Class clusters can than be an integral part of a larger learning community/environment that is self-contained and independent with their own storage, shared spaces, toilets, specialized learning and support areas. Exemplar models defined it as a school with in a school (DfES 2003)

k.   Changing displays:

Changing the environment and allowing for interaction stimulates brain development (Lackney 1999) and should be an integral part of all schools. Display of student work should be placed within classrooms and outside in a gallery so as not to create too much clutter within the class (Evans 1995)

l.   Group Learning places and shared spaces:

Special places such as breakout spaces, alcoves, niches, table groupings that will facilitate social learning and stimulate the social brain (Lackney 1999) and beneficial to learning and human development (Fielding and Prakash 2005).

m. Spatial variety:

Variety of places of different shapes colour and light with nooks and crannies to cater to a variety of student needs (Evans 1995; Lackney 1999)

n. Social areas and public areas:

Social areas are important in schools (Baum and Valins 1977) that encourage student movement (Lackney 1999) and should have a variety of places linking indoor and outdoor areas where students have quiet contemplation areas for reflection and retreat (Lackney 1999; Sanoff 2007) or large group formal/informal play areas for active engagement (Lackney 1999; Sanoff 2007).

o. Personalized Spaces:

Allowing students to express their self-identity and personalize the spaces that are important to them (Lackney 1999).

2.4.5   Community:

It is essential to find ways to fully utilize the community at large as the optimal learning environment (Lackney 1999) by creating links and partnerships beyond the school (DfES 2003; Building Futures 2004) and integrating it into the urban setting (Fielding, 2006; Arnold, Olcayto, Olliff 2009). By extending the school facility to the wider community, it sets a pattern for life-long learning (Building Futures 2004). This can be achieved by having shared spaces such as sports hall, public library or crèche that can be used during the school day (DfES 2003)

2.4.6   Environment and Sustainability:

It is important to design new schools with sustainability in mind and to consider energy saving, efficiency and waste minimisation (DfES 2003) by using systems such as solar energy (Fielding and Prakash 2005).

2.4.7   Flexibility and Adaptability:

New schools should be easily adaptable to new ideas and innovation. Spaces should allow internal walls to be moved to assist in adapting the size and shape to suite the future needs of the school (Lackney1999; DfES 2003). Flexibility is an essential part of school design where furniture and layouts should cater multiple options and should have a complete flexible infrastructure with portable, moveable and individual set ups (Evans 1995; Building Futures 2004)

2.4.8   Inclusiveness and accessibility:

New schools must to consider the needs of a much wider range of individual needs by providing full integration of SEN provision, accessibility throughout the school and more individualized needs (DfES 2003) and multiple intelligences (Fielding and Prakash 2005).

2.4.9   Safety and security:

The ability to supervise students with clear sightlines to all corners of the campus is an essential part to the school climate. School with good sightlines reduces bullying, poor behaviour, threat and vandalism (Lackney 1999; DfES 2003).

In conclusion, contemporary schools for the twenty first century may have standardized codes and by-laws that are applied to the design and planning stage, however there is a disadvantage that in the world of school design, the biggest roadblock to innovation is a standardized vocabulary that all schools must adhere too. Educational specifications and strict guidelines leave little room for innovation. On the other hand innovative designs such as the Exemplar models may look good on paper and under certain circumstance, may have even been successful. The danger lies in the isolation of the design solution and that it has little to do with the needs of particular communities and most prototypes are about cookie-cutter schools (Fielding and Prakash 2005). The solution lies within a shared vision of the users and occupants. A written solution that can be translated into built form or a

graphic pattern to supplement the written words (Fielding and Prakash 2005). There is a need for a design vocabulary that changes as cultures grow and change and caters to the school as a changing living thing (Fielding and Prakash 2005). Nair and Fielding's pattern language for schools is the most effective and an actual, usable design vocabulary that addresses schools needs to change, expand and adapt future needs. More importantly it has the ability to cater to the specific school needs as an individual case that has its own brief, context, site conditions, student capacity, cultural aspects and curriculum.

Appendix B1: Assessment Tools

Sanoff's Initial Observation Form with results for schools

INITIAL BUILDING OBSERVATION			
	BISJ	AISJ	MJIS
Building is in good condition	YES	NO	NO
Neat and clean	YES	YES	YES
work displayed on Bulletins, Walls	YES	YES	NO
Pictures display various ethnic groups	YES	NO	NO
Displays depict both boys and girls doing various activities, doctors, nurses etc	YES	NO	NO
Announcements of activitites	YES	NO	NO
Building is flexible including large open spaces,small multi-functional spaces	YES	NO	NO
Moveable furniture throughout school	YES	YES	YES
Quiet places for individual, group to withdraw/relax e.g lounges	YES	NO	NO
Identified places where students can be noisy and do physical activity	YES	NO	NO
Plenty of room in corridors/classrooms to move from one to the other	YES	NO	NO
Outdoor space for science projects etc	NO	NO	NO
Students responsible for upkeep and appearance of their school, e.g displays, trash etc	YES	NO	NO
Privacy in bathrooms through doors	NO	YES	YES
Privacy in changing rooms through curtains	NO	N/A	N/A
TOTAL	12/15 YES	3/15 YES	2/15 YES

Appendix B2: Assessment Tools

Design Assessment Scale for Elementary Schools (DASE) Checklist with Scores

DEGREE OF FUNCTIONALITY	BISJ	AISJ	MJIS
Connected Promenades and Walkways	8.8	2.5	0
Green Areas	5.5	6	0
Quiet areas - Quiet areas to refresh themselves	7	0	0
Play areas -	8.5	7	2
Connected Campus Plan -	8	5	0
Friendly Entrance area -	7	7.5	0
Private quiet spaces for children - Inside	8	0	0
Private quiet spaces for children - Outside	5	5.5	0
Instructional Neighbourhoods - Teacher planning areas	7.5	4.5	4
Instructional Neighbourhoods -flexible zones	7.5	3.5	0
Instructional Neighbourhoods - Small group areas	7.5	0	0
Instructional Neighbourhoods -Large group areas	8.5	0	0
Instructional Neighbourhoods - Wet areas for science	7	5.5	0
Instructional Neighbourhoods -Wet areas for art	9.5	5.5	0
Hearth areas	5	0	0
Outdoor Learning rooms	0	0	0
Well-lit broad Circulation within learning environments	7.75	7.25	4.5
Well-lit broad circulation among learning environments	7.75	7.5	4
Hallways allowing personal spaces	6.5	0	0
Reference and focal points	8.25	7.5	0
Student scale for light switches	6	4.5	4.5
Student scale for seats	8.5	5	5
Student scale for door handles	6	5	5
Student scale forhand rails	6	5	0
Student scale for shortened steps	7	5	0
Student scale for water fountains	8.5	5.5	6.5
Doors/windows allowing views	8.5	0	2
Appropriate classroom scale	8.5	4	4.5
Appropriate Ceiling heights	6	6	5.5
Administration centralized	8.5	8.5	5
Internal noise control	8	5.5	4.5
External noise control	8	4.5	3
Windows allowing natural light	7	2	3.5
Windows allowing unrestricted views	7.5	0.5	1.5
Adequacy of natural light inclues skylights/ borrowed light	6.75	2	1.5
Intimacy gradients	5.5	5	3
Technology for students	8.5	4.5	3
Flexible ICT labs	6.5	6.5	7.5
Teacher can easily supervise ICT labs	4.5	4.5	7.5

Teachers easily access PCs	9	8	0
DEGREE OF FUNCTIONALITY	**BISJ**	**AISJ**	**MJIS**
Teachers easily access Laptops	0	0	0
Teachers easily access Internet connection	9.5	9.5	0
Teachers easily access Multi-media	0	0	0
Teachers easily access Smart board	9.5	0	0
Pathways - Clearly defined areas that allow freedom of movement	8.5	5	3.5
Public areas - Auditorium	9.5	0	0
Public areas -amphitheater	0	0	0
Public Areas -media center	0	0	0
Common place of casual student meetings	8	0	0
Library	7.5	8.25	0
dining room	7.5	6.5	0
Context(compatible with surroundings	4	4.5	0
Harmony (with nature)	3.5	3.5	2.5
Comfortable stress-free classrooms	8	5.5	4
Excitement within classrooms	8	4	3
Variety of indoor Learning zones	8	3.5	2
Variety of outdoor learning zones	8.5	7	1.5
Climate control	6.5	5	7.5
Intimacy	8.5	7	7.5
Classrooms lead to courtyard or well planned outdoor learning areas	0	0	0
Communication via phones within classrooms	0	0	0
Communication via two way intercom system	0	0	0
Communication via phones in teachers workroom	9	0	0
Communication via fax machines in teachers workrooms	0	0	0
Workrooms near classrooms	8.5	0	0
Classrooms walls are conducive for displaying students work	9.5	5	2.5
Hallways are favourable for displays student work	9.5	5.5	0
Good Roof system - leaking roof can distrupt student learning	8.5	4.5	6
DEGREE OF SAFETY	**BISJ**	**AISJ**	**MJIS**
Safe location – No traffic or danger	9	9	6
Separate age-level playgrounds	9	5.5	2.5
Separation of large/small kids	9	5.5	2
Ensuite bathrooms	0	0	0
Supervisable circulation patterns	9	6	5.5
Day security systems	8.5	8	6
Good playground equipment	8.5	6	0

Evening security system	7.5	6	3.5
DEGREE OF ADEQUACY	**BISJ**	**AISJ**	**MJIS**
Storage for teachers personal belongings	6	4	6
Storage for students	6	6	0
Various Ceiling heights	2	2	2
Background details/ colourful displays/light switches,	7.5	4.5	1.5
visual stimulation	5	4.5	2
Personal artifacts	7	3	1
DEGREE OF QUALITY	**BISJ**	**AISJ**	**MJIS**
Artificial light plus natural from outside preferably on two sides of every room	7.5	2.5	2.5
Living views	6	0	2
Paths with goals designed to provide focal points	5.5	2.5	1
Personal spaces for children to participate in activities	7	3.5	0
Activity pockets - spaces designed for small group work	7	3	0
Outdoor defined areas with trees, fences	6	5	0
Outdoor defined areas with arcades, walkways	7.5	6	0
DEGREE IF THE PATTERN IS PRESENT	**BISJ**	**AISJ**	**MJIS**
Learning signature	4.5	2	0
Animal life	0	0	0
Community hub	4	4	0
OVERALL IMPRESSION	**BISJ**	**AISJ**	**MJIS**
Whether learning environments are student friendly and teacher friendly	8	6.5	4

10=100%

Appendix B3: Assessment Tools

Council of Educational facility Planners International Adequacy Assessment –
Results for BISJ School

School: BISJ   **Capacity of Building** :

Enrolment: 400   **Date:**   6th Feb

	SCORE	COMMENTS
1. SITE:	3	
General		
a. Enough usable acreage to meet educational needs	2	
b. Large enough for future expansion	1	
c. Play fields, appropriate to age group	3	
Safety		
a. Separation of car, school bus, and service traffic	2	
b. Separation of vehicular and pedestrian traffic	2	
c. Play fields are separate from streets and parking areas	3	
d. Direct access to play fields without crossing vehicular traffic	3	
e. Additional Comments		
TOTAL SCORE FOR THIS PAGE	19	
TOTAL POSSIBLE SCORE FOR THIS PAGE	24	

Standard Legend
0=Not present
1 = Below Standard
2 = Meets Standard
3 = Exceeds Standard

Based on the specific grade organization and /or program areas, one page should be completed for each area

School: BISJ _____

	SCORE	COMMENTS
2. General Building Considerations		
a. Opportunity for student display	3	Each class has their own display exhibited in the external corridor as well as within the classroom
b. Student Storage	2	Students have access to cubby holes and desk storage for their bags and books.
c. Teacher Storage	3	Each teacher has their own desk storage, cabinets and shelving as well as personal storage in the staff room
d. Room darkening capabilities	3	All classes have blinds installed
e. Electrical Service	3	
f. Technology	3	All classes have computers and smart boards
g. Additional Comments		
TOTAL SCORE FOR THIS PAGE	17	
TOTAL POSSIBLE SCORE FOR THIS PAGE	18	94.4%

Standard Legend
0=Not present
1 = Below Standard
2 = Meets Standard
3 = Exceeds Standard

School: BISJ _____

	SCORE	COMMENTS
3. Lobbies, Corridors & Commons Spaces		
a. Entrances and exits permit efficient and safe traffic flow	3	
b. Commons areas for student socialization	2	They have quiet seating areas for small groups with sofas
c. Size of lobbies/commons spaces supports numbers gathering	2	
d. Additional Comments		
TOTAL SCORE FOR THIS PAGE	7	
TOTAL POSSIBLE SCORE FOR THIS PAGE	9	77.7%

Standard Legend
0=Not present
1 = Below Standard
2 = Meets Standard
3 = Exceeds Standard

School: BISJ _____

	SCORE	COMMENTS
4. Administration / Student Services		
a. Adjacent to main entry	3	
b. Accessible from all areas of building	3	
c. Reception area sized to accommodate users	3	
d. Functional adjacencies among offices	2	
e. Office sizes support activities	2	
f. Health room/clinic appropriate for age level	2	
g. Workroom/ copy area accommodates	3	
h. Mailboxes	3	Each teacher has their own personal cubby holes for personal items and mail
i. Appropriate furnishings to support activities	3	
j. Counselors Area	0	
k. Additional Comments		
TOTAL SCORE FOR THIS PAGE	24	
TOTAL POSSIBLE SCORE FOR THIS PAGE	30	80%

Personnel:

Standard Legend
0=Not present
1 = Below Standard
2 = Meets Standard
3 = Exceeds Standard

School: BISJ _____

	SCORE	COMMENTS
5. * Educational Areas		
Learning Support		
a. Location within building	3	Appropriately placed in the quiet area of the building to avoid disturbing the students
b. Size of space	2	
c. Meets current educational program delivery system	3	
d. Space permits change in educational program	2	
e. Quality of room, furnishings and equipment	2	Rooms are bright, clean and fresh with ergonomically correct furniture
TOTAL SCORE FOR THIS PAGE	12	
TOTAL POSSIBLE SCORE FOR THIS PAGE	15	80%

Standard Legend
0=Not present
1 = Below Standard
2 = Meets Standard
3 = Exceeds Standard

School: BISJ _____

	SCORE	COMMENTS
5. * Educational Areas		
Library		
a. Location within building	1	Not appropriate as it is located near noisy areas of the school, near main circulation.
b. Size of space	1	Small and can only be used by one class at a time which has to follow a time schedule
c. Meets current educational program delivery system	2	
d. Space permits change in educational program	1	
e. Quality of room, furnishings and equipment	2	.Appropriate and comfortable soft furnishings for reading and work tables for assignments
TOTAL SCORE FOR THIS PAGE	7	
TOTAL POSSIBLE SCORE FOR THIS PAGE	15	46.7%

Standard Legend
0=Not present
1 = Below Standard
2 = Meets Standard
3 = Exceeds Standard

School: BISJ _____

	SCORE	COMMENTS
5. * Educational Areas		
Classes 3-6		
a. Location within building	3	
b. Size of space	1	
c. Meets current educational program delivery system	3	
d. Space permits change in educational program	2	
e. Quality of room, furnishings and equipment	3	
TOTAL SCORE FOR THIS PAGE	12	
TOTAL POSSIBLE SCORE FOR THIS PAGE	15	80%

Standard Legend
0=Not present
1 = Below Standard
2 = Meets Standard
3 = Exceeds Standard

School: BISJ _____

	SCORE	COMMENTS
5. * Educational Areas		
Music Room		
a. Location within building	2	
b. Size of space	3	
c. Meets current educational program delivery system	2	
d. Space permits change in educational program	3	
e. Quality of room, furnishings and equipment	3	
TOTAL SCORE FOR THIS PAGE	13	
TOTAL POSSIBLE SCORE FOR THIS PAGE	15	86%

Standard Legend
0=Not present
1 = Below Standard
2 = Meets Standard
3 = Exceeds Standard

School: BISJ _____

	SCORE	COMMENTS
11. Student Dining		
a. Location within building	3	
b. Capacity of facility	3	
c. Flexibility	2	
d. Appropriate furnishings to support activities	2	
e. Accessible for Community Use	3	
12. Food Preparation / Serving		
a. Kitchen & support spaces adequate for food prep	2	
b. Logical traffic patterns	1	
c. Serving area convenient to cafeteria entry & kitchen	2	
d. Delivery location convenient for deliveries	2	
e. Quality of room, furnishings and equipment	1	Poor sound absorption creating noise and echo. Uncomfortable furniture. Dull and inspiring
TOTAL SCORE FOR THIS PAGE	21	
TOTAL POSSIBLE SCORE FOR THIS PAGE	30	70%

Standard Legend
0=Not present
1 = Below Standard
2 = Meets Standard
3 = Exceeds Standard

School: BISJ _____

	SCORE	COMMENTS
8. Art		
a. Location	2	
b. Size of space	3	
c. Meets current educational program delivery system	3	
d. Space permits change in educational program	3	
e. Water access within room	3	
f. Kiln	3	
g. Ability to provide natural lighting	3	
h. Quality of room, furnishings and equipment	3	
TOTAL SCORE FOR THIS PAGE	23	
TOTAL POSSIBLE SCORE FOR THIS PAGE	24	95.8%

Standard Legend
0=Not present
1 = Below Standard
2 = Meets Standard
3 = Exceeds Standard

School: BISJ _____

	SCORE	COMMENTS
8. ICT Suite		
a. Location	2	Located near main circulation and noisy areas
b. Size of Space	1	Small and crowded
c. Meets current educational program delivery system	2	Difficult to supervise all screens and limited space for instruction
d. Space permits change in educational program	1	
e. Accessible for community use	1	
f. Quality of room, furnishings and equipment	2	Overcrowded and tight. Limited circulation space. Clinical ambience.
TOTAL SCORE FOR THIS PAGE	9	
TOTAL POSSIBLE SCORE FOR THIS PAGE	18	50%

Standard Legend
0=Not present
1 = Below Standard
2 = Meets Standard
3 = Exceeds Standard

School: BISJ _____

	SCORE	COMMENTS
9. Teacher Areas - Work Areas		
a. Location	2	Location near classes and exits. Not appropriate to be adjacent to classes and noisy exits
b. Appropriate equipment for area	3	
c. Appropriate furnishings to support activities	3	
d. Room sizes support activities and number of persons utilizing	3	
e. Additional Comments		
9. Teacher Areas - Lounge		
a. Location	2	
b. Appropriate equipment for area	2	
c. Appropriate furnishings to support activities	2	Furnishings could be more relaxed with soft furnishings and lighting.
d. Room sizes support activities and number of persons utilizing	3	
e. Quality of room	2	Enough natural light and windows but a clinical ambience.
TOTAL SCORE FOR THIS PAGE	23	
TOTAL POSSIBLE SCORE FOR THIS PAGE	27	85.2%

Standard Legend
0=Not present
1 = Below Standard
2 = Meets Standard
3 = Exceeds Standard

School: BISJ _____

	SCORE	COMMENTS
10. Educational Areas		
Outdoor Physical Education		
a. Location	2	
b. Size of space	3	
c. Meets current educational program delivery system	3	
d. Space permits change in educational program	3	
e. Play equipment	2	
TOTAL SCORE FOR THIS PAGE	13	
TOTAL POSSIBLE SCORE FOR THIS PAGE	15	86.7%

Standard Legend
0=Not present
1 = Below Standard
2 = Meets Standard
3 = Exceeds Standard

School: BISJ _____

	SCORE	COMMENTS
10. Educational Areas		
Indoor Physical Education/Gymnasium		
a. Location	3	
b. Size of space	3	
c. Meets current educational program delivery system	3	
d. Space permits change in educational program	3	
e. Play equipment	3	
TOTAL SCORE FOR THIS PAGE	15	
TOTAL POSSIBLE SCORE FOR THIS PAGE	15	100%

Standard Legend
0=Not present
1 = Below Standard
2 = Meets Standard
3 = Exceeds Standard

Appendix B4: Assessment Tools

**Council of Educational facility Planners International Adequacy Assessment –
Results for AISJ School**

School: AISJ   **Capacity of Building**   :

Enrolment:500   **Date:**   28th Feb

	SCORE	COMMENTS
1. SITE:	2	
General		
a. Enough usable acreage to meet educational needs	3	
b. Large enough for future expansion	1	
c. Play fields, appropriate to age group	2	
Safety		
a. Separation of car, school bus, and service traffic	3	
b. Separation of vehicular and pedestrian traffic	3	
c. Play fields are separate from streets and parking areas	3	
d. Direct access to play fields without crossing vehicular traffic	3	
e. Additional Comments		
TOTAL SCORE FOR THIS PAGE	20	
TOTAL POSSIBLE SCORE FOR THIS PAGE	24	83.3%

Standard Legend
0=Not present
1 = Below Standard
2 = Meets Standard
3 = Exceeds Standard

Based on the specific grade organization and /or program areas, one page should be completed for each area * see footnote

School AISJ _____

	SCORE	COMMENTS
2. General Building Considerations		
a. Opportunity for student display	2	Teachers have used wall space to put up work but there is no display boards
b. Student Storage	2	Cubby holes placed within classrooms for students bags and books
c. Teacher Storage	2	Shelves and cabinets placed with in classrooms but require more storage
d. Room darkening capabilities	1	All classes have been blackened out due to security reasons
e. Electrical Service	1	
f. Technology	1	Within classrooms each teacher has a pc but it is insufficient
g. Additional Comments		
TOTAL SCORE FOR THIS PAGE	9	
TOTAL POSSIBLE SCORE FOR THIS PAGE	18	50%

Standard Legend
0=Not present
1 = Below Standard
2 = Meets Standard
3 = Exceeds Standard

School AISJ_____

	SCORE	COMMENTS
3. Lobbies, Corridors & Commons Spaces		
a. Entrances and exits permit efficient and safe traffic flow	2	
b. Commons areas for student socialization	0	There are none
c. Size of lobbies/commons spaces supports numbers gathering	1	There are no common areas for staff or students to gather but tend to often meet in the wide corridors
d. Additional Comments		
TOTAL SCORE FOR THIS PAGE	3	
TOTAL POSSIBLE SCORE FOR THIS PAGE	9	33.3%

Standard Legend
0=Not present
1 = Below Standard
2 = Meets Standard
3 = Exceeds Standard

School AISJ_____

	SCORE	COMMENTS
4. Administration / Student Services		
a. Adjacent to main entry	3	
b. Accessible from all areas of building	2	
c. Reception area sized to accommodate users	3	
d. Functional adjacencies among offices	2	
e. Office sizes support activities	2	
f. Health room/clinic appropriate for age level	2	
g. Workroom/ copy area accommodates	2	
h. Mailboxes	0	No mailboxes
i. Appropriate furnishings to support activities	2	
j. Counselors Area	2	
k. Additional Comments		
TOTAL SCORE FOR THIS PAGE	20	
TOTAL POSSIBLE SCORE FOR THIS PAGE	30	66.7%

Standard Legend
0=Not present
1 = Below Standard
2 = Meets Standard
3 = Exceeds Standard

School AISJ_____

	SCORE	COMMENTS
5. * Educational Areas		
Learning Support		
a. Location within building	1	Located in busy circulation areas creating distraction and disturbance
b. Size of space	1	Does not meet the standards and below the size requirements creating crowding leading to aggression
c. Meets current educational program delivery system	1	
d. Space permits change in educational program	1	
e. Quality of room/furnishings/equipment	1	No windows, poor lighting, noisy, variety of furnishings, old and unmaintained, dull
TOTAL SCORE FOR THIS PAGE	5	
TOTAL POSSIBLE SCORE FOR THIS PAGE	15	33.3%

Standard Legend
0=Not present
1 = Below Standard
2 = Meets Standard
3 = Exceeds Standard

School AISJ_____

	SCORE	COMMENTS
5. * Educational Areas		
Special Education		
a. Location within building	1	
b. Size of space	2	
c. Meets current educational program delivery system	2	
d. Space permits change in educational program	1	
e. Quality of room/furnishings/equipment	2	No windows leading to a space with purely artificial light, not conducive to a healthy learning environment
TOTAL SCORE FOR THIS PAGE	8	
TOTAL POSSIBLE SCORE FOR THIS PAGE	15	53.3%

Standard Legend
0=Not present
1 = Below Standard
2 = Meets Standard
3 = Exceeds Standard

School AISJ_____

	SCORE	COMMENTS
5. * Educational Areas		
Library		
a. Location within building	2	
b. Size of space	2	
c. Meets current educational program delivery system	2	
d. Space permits change in educational program	2	
e. . Quality of room/furnishings/equipment	2	No natural light or windows. Not conducive to a healthy inspiring learning environment.
TOTAL SCORE FOR THIS PAGE	10	
TOTAL POSSIBLE SCORE FOR THIS PAGE	15	66.7%

Standard Legend
0=Not present
1 = Below Standard
2 = Meets Standard
3 = Exceeds Standard

School AISJ _____

	SCORE	COMMENTS
5. * Educational Areas		
Classes 1-3		
a. Location within building	2	
b. Size of space	1	
c. Meets current educational program delivery system	2	
d. Space permits change in educational program	2	
e. . Quality of room/furnishings/equipment	1	Mismatched furniture, only clerestory windows, no views, old and unmaintained furniture
TOTAL SCORE FOR THIS PAGE	8	
TOTAL POSSIBLE SCORE FOR THIS PAGE	15	

Standard Legend
0=Not present
1 = Below Standard
2 = Meets Standard
3 = Exceeds Standard

School AISJ _____

	SCORE	COMMENTS
5. * Educational Areas		
Classes 4-5		
a. Location within building	1	Not ideal location as it is located near busy circulation areas and due to poor acoustic neighboring
b. Size of space	1	Below size requirements leading to congestion and aggression
c. Meets current educational program delivery system	1	
d. Space permits change in educational program	1	
e. . Quality of room/furnishings/equipment	1	No windows, no natural light, unhealthy air quality, warm temperatures,
TOTAL SCORE FOR THIS PAGE	5	
TOTAL POSSIBLE SCORE FOR THIS PAGE	15	33.3%

Standard Legend
0=Not present
1 = Below Standard
2 = Meets Standard
3 = Exceeds Standard

School AISJ _____

	SCORE	COMMENTS
5. * Educational Areas		
Music Room		
a. Location within building	2	
b. Size of space	2	
c. Meets current educational program delivery system	1	
d. Space permits change in educational program	1	
e. Quality of Room/furnishing and equipment	0	No windows, no acoustics, no equipment or appropriate furnishings
TOTAL SCORE FOR THIS PAGE	6	
TOTAL POSSIBLE SCORE FOR THIS PAGE	15	40%

Standard Legend
0=Not present
1 = Below Standard
2 = Meets Standard
3 = Exceeds Standard

School AISJ_____

	SCORE	COMMENTS
11. Student Dining		
a. Location within building	3	
b. Capacity of facility	3	
c. Flexibility	2	
d. Appropriate furnishings to support activities	2	
e. Accessible for Community Use	2	
12. Food Preparation / Serving		
a. Kitchen & support spaces adequate for food prep	2	
b. Logical traffic patterns	1	
c. Serving area convenient to cafeteria entry & kitchen	2	
d. Delivery location convenient for deliveries	2	
e. Quality of Room/furnishing and equipment	1	Extremely noisy, overcrowded, aggressive behavior, and echo. The furniture and space is
TOTAL SCORE FOR THIS PAGE	20	
TOTAL POSSIBLE SCORE FOR THIS PAGE	30	66.7%

Standard Legend
0=Not present
1 = Below Standard
2 = Meets Standard
3 = Exceeds Standard

49

School AISJ_____

	SCORE	COMMENTS
8. Art		
a. Location	1	In appropriate as it is located near classrooms creating noise and disturbance
b. Size of space	2	
c. Meets current educational program delivery system	2	
d. Space permits change in educational program	1	
e. Water access within room	2	Limited and require more sinks and water sources
f. Kiln	0	No kiln
g. Ability to provide natural lighting	1	Limited natural light which is not conducive to art and drawing.
h. Quality of Room/furnishing and equipment	1	Furniture is old and unmaintained and not ergonomically correct to suit little children
TOTAL SCORE FOR THIS PAGE	10	
TOTAL POSSIBLE SCORE FOR THIS PAGE	27	37.03%

Standard Legend
0=Not present
1 = Below Standard
2 = Meets Standard
3 = Exceeds Standard

School AISJ _____

	SCORE	COMMENTS
8. ICT Suite		
a. Location	2	
b. Size of Space	2	Students can not fit on the carpet area for lectures and instruction for teacher.
c. Meets current educational program delivery system	2	It does not meet educational needs as the students are not able to see the screen for instructions.
d. Space permits change in educational program	1	
e. Accessible for community use	1	
f. Quality of Room/furnishing and equipment	2	No natural light. Equipment is old and unmaintained. Furniture is not ergonomically correct. Dull space
TOTAL SCORE FOR THIS PAGE	10	
TOTAL POSSIBLE SCORE FOR THIS PAGE	18	55.6%

Standard Legend
0=Not present
1 = Below Standard
2 = Meets Standard
3 = Exceeds Standard

School AISJ_____

	SCORE	COMMENTS
9. Teacher Areas - Work Areas		<u>No work space</u>
a. Location	0	
b. Appropriate equipment for area	0	
c. Appropriate furnishings to support activities	0	
d. Room sizes support activities and number of persons utilizing	0	
e. Additional Comments		
9. Teacher Areas - Lounge		
a. Location	2	Located in a quite area
b. Appropriate equipment for area	1	Poor maintained and limitedequipment
c. Appropriate furnishings to support activities	1	Old fashioned furniture. Mismatched with no consistency in appearance. Un maintained and broken
d. Room sizes support activities and number of persons utilizing	1	Limited space and usage.
e. Quality of Room	1	Dull and uninspiring. No windows and natural light. Artificial lighting creating a clinical ambience
TOTAL SCORE FOR THIS PAGE	6	
TOTAL POSSIBLE SCORE FOR THIS PAGE	15	40%

Standard Legend
0=Not present
1 = Below Standard
2 = Meets Standard
3 = Exceeds Standard

School AISJ_____

	SCORE	COMMENTS
10. Educational Areas		
Outdoor Physical Education		
a. Location	3	
b. Size of space	3	
c. Meets current educational program delivery system	3	
d. Space permits change in educational program	3	
e. Play equipment	1	Old and not age appropriate
TOTAL SCORE FOR THIS PAGE	13	
TOTAL POSSIBLE SCORE FOR THIS PAGE	15	86.7%

Standard Legend
0=Not present
1 = Below Standard
2 = Meets Standard
3 = Exceeds Standard

School AISJ_____

	SCORE	COMMENTS
10. Educational Areas		
Indoor Physical Education/Gymnasium		
a. Location	1	In appropriate location as it is situated near the KG playground
b. Size of space	1	Below standard space requirements which does not allow room for physical activity
c. Meets current educational program delivery system	1	Does meet the educational needs as there is no equipment
d. Space permits change in educational program	1	
e. Quality of Room	1	Unmaintained. Electric lights limited. Walls are damaged. Dark
TOTAL SCORE FOR THIS PAGE	5	
TOTAL POSSIBLE SCORE FOR THIS PAGE	15	33.3%

Standard Legend
0=Not present
1 = Below Standard
2 = Meets Standard
3 = Exceeds Standard

Appendix B5: Assessment Tools

Council of Educational facility Planners International Adequacy Assessment – Results for MJIS School

School: MJIS   **Capacity of Building**   :

Enrolment: **Date:**   6th Feb

	SCORE	COMMENTS
1. SITE:	1	
General		
a. Enough usable acreage to meet educational needs	1	
b. Large enough for future expansion	1	
c. Play fields, appropriate to age group	1	No playfield
Safety		
a. Separation of car, school bus, and service traffic	2	
b. Separation of vehicular and pedestrian traffic	2	
c. Play fields are separate from streets and parking areas	1	No playfield
d. Direct access to play fields without crossing vehicular traffic	1	No playfields
e. Additional Comments		
TOTAL SCORE FOR THIS PAGE	10	
TOTAL POSSIBLE SCORE FOR THIS PAGE	24	41.7%

Standard Legend
0=Not present
1 = Below Standard
2 = Meets Standard
3 = Exceeds Standard

School MJIS_____

	SCORE	COMMENTS
2. General Building Considerations		
a. Opportunity for student display	1	
b. Student Storage	1	
c. Teacher Storage	2	
d. Room darkening capabilities	2	
e. Electrical Service	2	
f. Technology	1	
g. Additional Comments		
TOTAL SCORE FOR THIS PAGE	9	
TOTAL POSSIBLE SCORE FOR THIS PAGE	18	50%

Standard Legend
0=Not present
1 = Below Standard
2 = Meets Standard
3 = Exceeds Standard

School MJIS_____

	SCORE	COMMENTS
3. Lobbies, Corridors & Commons Spaces		
a. Entrances and exits permit efficient and safe traffic flow	1	
b. Commons areas for student socialization	1	There are no common areas for students to socialize except for a large central hall surrounded by classes
c. Size of lobbies/commons spaces supports numbers gathering	2	
d. Additional Comments		
TOTAL SCORE FOR THIS PAGE	4	
TOTAL POSSIBLE SCORE FOR THIS PAGE	9	44.4%

Standard Legend
0=Not present
1 = Below Standard
2 = Meets Standard
3 = Exceeds Standard

School MJIS_____

	SCORE	COMMENTS
4. Administration / Student Services		
a. Adjacent to main entry	1	
b. Accessible from all areas of building	2	
c. Reception area sized to accommodate users	0	
d. Functional adjacencies among offices	1	
e. Office sizes support activities	1	
f. Health room/clinic appropriate for age level	2	
g. Workroom/ copy area accommodates	2	
h. Mailboxes	0	
i. Appropriate furnishings to support activities	2	
j. Counselors Area	0	
k. Additional Comments		
TOTAL SCORE FOR THIS PAGE	11	
TOTAL POSSIBLE SCORE FOR THIS PAGE	30	36%

Standard Legend
0=Not present
1 = Below Standard
2 = Meets Standard
3 = Exceeds Standard

Based on the specific grade organization and /or program areas, one page should be completed for each area * see footnote

School MJIS_____

	SCORE	COMMENTS
5. * Educational Areas		
Learning Support		
a. Location within building	0	
b. Size of space	0	
c. Meets current educational program delivery system	0	
d. Space permits change in educational program	0	
e. Quality of room, furnishings and equipment	0	
TOTAL SCORE FOR THIS PAGE	0	
TOTAL POSSIBLE SCORE FOR THIS PAGE	15	0

Standard Legend
0=Not present
1 = Below Standard
2 = Meets Standard
3 = Exceeds Standard

School MJIS _____

	SCORE	COMMENTS
5. * Educational Areas		
Library		NO LIBRARY
a. Location within building	0	
b. Size of space	0	
c. Meets current educational program delivery system	0	
d. Space permits change in educational program	0	
e. Quality of room, furnishings and equipment	0	
TOTAL SCORE FOR THIS PAGE	0	
TOTAL POSSIBLE SCORE FOR THIS PAGE	15	0

Standard Legend
0=Not present
1 = Below Standard
2 = Meets Standard
3 = Exceeds Standard

#

School MJIS _____

	SCORE	COMMENTS
5. * Educational Areas		
Classes 1-6		
a. Location within building	2	
b. Size of space	1	
c. Meets current educational program delivery system	1	
d. Space permits change in educational program	1	
e. Quality of room, furnishings and equipment	1	
TOTAL SCORE FOR THIS PAGE	6	
TOTAL POSSIBLE SCORE FOR THIS PAGE	15	40%

Standard Legend
0=Not present
1 = Below Standard
2 = Meets Standard
3 = Exceeds Standard

School MJIS_____

	SCORE	COMMENTS
5. * Educational Areas		
Music Room		NO MUSIC ROOM
a. Location within building	0	
b. Size of space	0	
c. Meets current educational program delivery system	0	
d. Space permits change in educational program	0	
e. Quality of room, furnishings and equipment	0	
TOTAL SCORE FOR THIS PAGE	0	
TOTAL POSSIBLE SCORE FOR THIS PAGE	15	

Standard Legend
0=Not present
1 = Below Standard
2 = Meets Standard
3 = Exceeds Standard

School MJIS _____

	SCORE	COMMENTS
11. Student Dining		NO DINING AREA
a. Location within building	0	
b. Capacity of facility	0	
c. Flexibility	0	
d. Appropriate furnishings to support activities	0	
e. Accessible for Community Use	0	
12. Food Preparation / Serving	0	
a. Kitchen & support spaces adequate for food prep	0	
b. Logical traffic patterns	0	
c. Serving area convenient to cafeteria entry & kitchen	0	
d. Delivery location convenient for deliveries	0	
e. Quality of room, furnishings and equipment	0	
TOTAL SCORE FOR THIS PAGE	0	
TOTAL POSSIBLE SCORE FOR THIS PAGE	30	

TOTAL OVER ALL SCORE =   **TOTAL POSSIBLE SCORE** =

Standard Legend
0=Not present
1 = Below Standard
2 = Meets Standard
3 = Exceeds Standard

School MJIS _____

	SCORE	COMMENTS
8. Art		
a. Location	2	
b. Size of space	1	
c. Meets current educational program delivery system	1	
d. Space permits change in educational program	1	
e. Water access within room	0	
f. Kiln	0	
g. Ability to provide natural lighting	1	
h. Quality of room, furnishings and equipment	1	
TOTAL SCORE FOR THIS PAGE	7	
TOTAL POSSIBLE SCORE FOR THIS PAGE	24	29%

Standard Legend
0=Not present
1 = Below Standard
2 = Meets Standard
3 = Exceeds Standard

School MJIS_____

	SCORE	COMMENTS
8. ICT Suite		
a. Location	1	Located near clinic and classes. Adhoc relationship between the space and its location
b. Size of Space	2	
c. Meets current educational program delivery system	1	No internet connection
d. Space permits change in educational program	2	
e. Accessible for community use	0	
f. Quality of room, furnishings and equipment	1	The furniture is not enough for the 25 student capacity and is not ergonomically appropriate as students between the ages of 5 to12 use the same space.
TOTAL SCORE FOR THIS PAGE	7	
TOTAL POSSIBLE SCORE FOR THIS PAGE	18	38%

Standard Legend
0=Not present
1 = Below Standard
2 = Meets Standard
3 = Exceeds Standard

School MJIS _____

	SCORE	COMMENTS
9. Teacher Areas - Work Areas		
a. Location	2	Teachers work area and lounge are used for the same purpose.
b. Appropriate equipment for area	2	
c. Appropriate furnishings to support activities	2	
d. Room sizes support activities and number of persons utilizing	2	
e. Quality of room	1	
9. Teacher Areas - Lounge		
a. Location	0	
b. Appropriate equipment for area	0	Only a microwave and mini bar. No printer. No PCs
c. Appropriate furnishings to support activities	0	No sofas, coffee tables, and comfortable furniture
d. Room sizes support activities and number of persons utilizing	0	
e. Quality of room	0	
TOTAL SCORE FOR THIS PAGE	9	
TOTAL POSSIBLE SCORE FOR THIS PAGE	27	33.3%

Standard Legend
0=Not present
1 = Below Standard
2 = Meets Standard
3 = Exceeds Standard

School MJIS_____

	SCORE	COMMENTS
10. Educational Areas		
Outdoor Physical Education		
a. Location	0	
b. Size of space	0	
c. Meets current educational program delivery system	0	
d. Space permits change in educational program	0	
e. Play equipment	0	
TOTAL SCORE FOR THIS PAGE	0	
TOTAL POSSIBLE SCORE FOR THIS PAGE	15	0

Standard Legend
0=Not present
1 = Below Standard
2 = Meets Standard
3 = Exceeds Standard

School MJIS_____

	SCORE	COMMENTS
10. Educational Areas		
Indoor Physical Education/Gymnasium		
a. Location	1	Central interior courtyard which is surrounded by classrooms creating noise and distraction
b. Size of space	1	Is under the standard space requirements
c. Meets current educational program delivery system	1	Does not meet standards as there is no equipment or space that is conducive to physical activity
d. Space permits change in educational program	1	
e. Play equipment	0	There is no equipment.
TOTAL SCORE FOR THIS PAGE	4	
TOTAL POSSIBLE SCORE FOR THIS PAGE	15	26.7%

Standard Legend
0=Not present
1 = Below Standard
2 = Meets Standard
3 = Exceeds Standard

Appendix B6: Assessment Tools

Nair and Fielding's 28 Design Patterns – Results for all schools

	DESIGN PATTERNS		
DEGREE OF FUNCTIONALITY	**BISJ**	**AISJ**	**MAN**
Parts of the whole - Describes specfic functional areas			
Traditional Classroom			
a. Learning Studio	No	No	No
b. Learning Suite	No	No	No
c. Learning studio-based small learning community.	yes	Yes	Yes
d. Small Learning Community	yes	Somewhat	No
e. Advisory based small learning community	yes	Yes	No
Brain-Based - Deals with spaces that stimulate the brain and are beneficial to learning			
Campfire space	yes	No	No
Watering Hole Space	No	No	No
Cave space, niches and alcoves	yes	No	No
Designing for Multiple Intelligences	yes	Yes	No
Shared Learning resources	yes	Yes	No
Physical fitness	yes	Yes	Somewhat

*(Leftmost vertical header spanning the table rows: **ACADEMIC LEARNING SPACES**)*

	DEGREE OF FUNCTIONALITY	BISJ	AISJ	MAN
SUPPORT SPACES	**High Performance - Applies to the efficient operation of building to get best performance**			
	Student Display Space	yes	Yes	No
	Home based and individual storage	yes	No	No
	Casual Eating Areas	yes	Yes	No
	Home-like bathrooms	No	No	No
SPECIALIZED SPACES	Life skill areas and science labs	yes	Yes	No
	Art Labs and performance	yes	Yes	No
BUILDING FEATURES	Daylight and Solar Energy	No	No	No
	Sustainable elements and buildings as a 3d textbook	No	No	No
	Learning, lighting and color	No	No	No
	Natural Ventilation	yes	No	Somewhat
	Full Spectrum Lighting	No	No	No
	DEGREE OF QUALITY	BISJ	AISJ	MAN
	Spatial Quality			
	Welcome Entry	yes	Yes	No
	Transparency	No	No	No
	Interior/exterior Vistas	Somewhat	No	No
	Dispersed Technology	yes	No	No
	Indoor-outdoor connection	Somewhat	No	No
	Furniture:Soft Seating	No	No	No

	BISJ	AISJ	MAN
Flexiblilty, adaptability and variety	**Somewhat**	**No**	**No**
OVERALL IMPRESSION	BISJ	AISJ	MAN
Community Connected			
Welcome Entry	**Yes**	**Yes**	**No**
Local Signature	**No**	**No**	**No**
Connected to the Community	**No**	**No**	**No**
High-Order - Encompasses other patterns within it			
Bringing it all together	**Yes**	**No**	**No**

Appendix B7: Assessment Tools

Lackney's Learning Modalities for Classrooms – Results for all schools

LEARNING MODALITIES				
		BISJ	AISJ	MAN
1	Independent study	yes	No	No
2	Peer tutoring	yes	Somewhat	No
3	Team collaborative work in small/mid size groups	yes	Yes	Somewhat
4	One-on-one learning with the teacher	yes	Somewhat	No
5	Lectures format with the teacher at center stage	yes	Yes	Yes
6	Project-based learning	Somewhat	Somewhat	No
7	Technology based learning	yes	No	No
8	Distance learning	No	No	No
9	Research via Internet with wireless networking	Yes but not wireless	No	No
10	Student presentation	Somewhat	Somewhat	No
11	Performance-based learning	Somewhat	No	No
12	Seminar-style instruction	Yes	Somewhat	Somewhat
13	Hands on project based learning	Yes	Somewhat	No
14	Naturalist learning	No	Somewhat	No
15	Social/emotional learning	Yes	No	No
16	Art-based learning	Somewhat	No	No
17	Storytelling	Somewhat	Yes	No
18	Teach teaching.	Yes	Yes	Somewhat

Newman's POE toolkit for students

Cool Crew Come to School

Cal

Jay

A
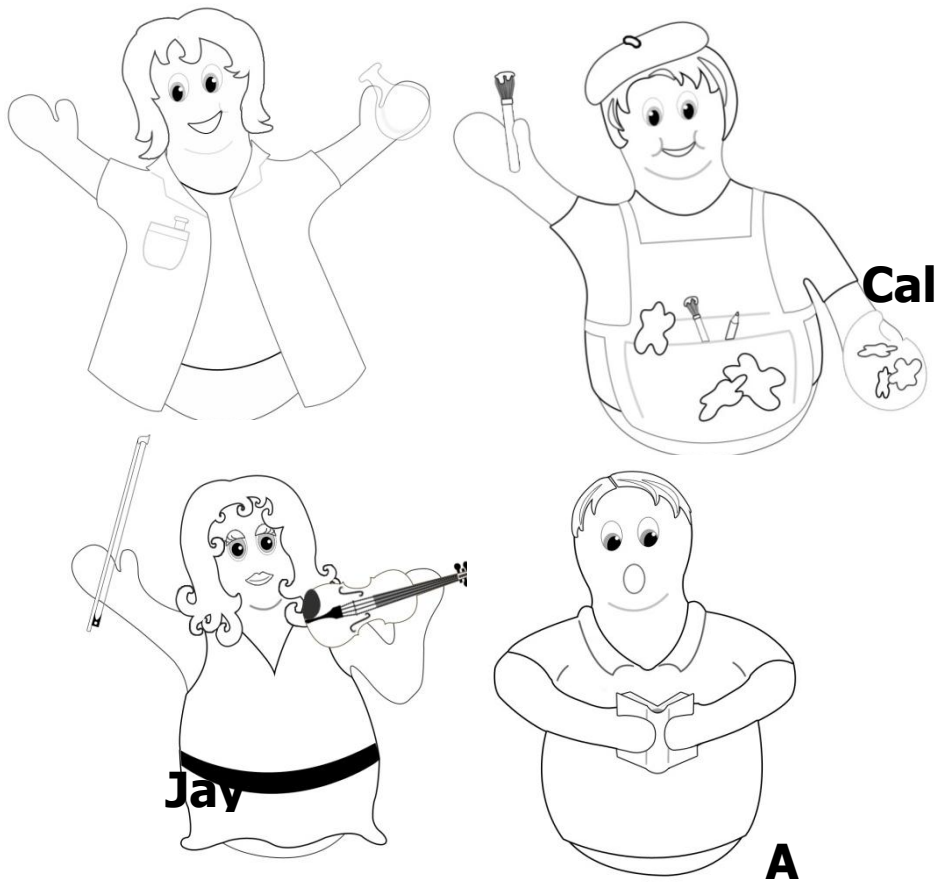
Your Name...

Your School..

Your Class..

Your Age..

Welcome to our school

**Today is the first day at your school for the Cool Crew.
They are going to spend the day with you to find out all
about your school buildings.
First they have to find the way to your classroom.**

Is your classroom easy to find?   **Yes   No**

Cal wants to put his bag away.

Is there a special place for your coats and bags? **Yes   No**

Is there enough space for Cal's bag?   **Yes   No**

Cal remembers that he's left his pencil in his bag.

Can he get to his bag quickly from his classroom? **Yes   No**

**Underline or circle the words Cal would choose to describe
your cloakroom (the place you leave your coats) from the
list below.**

bright	dangerous	uncomfortable	friendly
	dark		safe
scary		squashed	
	comfortable		lots of space

Your Classroom

The Cool Crew have come to your classroom. They want to sit at a desk.

Is there enough space for them to sit comfortably? **Yes   No**

The teacher is now explaining what everyone should do next.

Can everyone see the whiteboard clearly? **Yes   No**   Can they hear the teacher clearly? **Yes   No**   Does the class ever get disturbed by noise from another room or outside? **Yes   No**

It is now time to do some work in groups.

Is there room for the Cool Crew to sit comfortably to work in a group? **Yes   No**

Jay wants to work quietly on her own.

Is there a place in the classroom where she can work quietly on her own? **Yes   No**

Ash says that he feels too cold. Mo says she feels too hot.

Does your classroom often get too hot? **Yes   No**   Does your classroom often get too cold? **Yes   No**

The Cool Crew would like to see some of the children's work.

Are there enough places to show the children's work? **Yes   No**

Now underline or circle four words or phrases from the list below that best describe your classroom

calm   happy   interesting   hard to work in dark   noisy   unfriendly   bright   sad easy to work in   quiet   scary   safe   boring

Write a sentence or some more words of your own to describe your classroom.

Classrooms are very important places as they are where you go to work and to learn.

Do you think that your classroom is a good place to work and to learn? **Yes   No** Give a reason for your answer

Some classrooms have doors that open between them so that two or more classrooms may be opened up to become one big room.

Does your classroom have these sliding doors? **Yes   No**

If your classroom does have them how often do they get opened up?

   never   only on special occasions   less than once a week

            once a week   most days   every day

                     they are always open

Do the sliding doors ever distract you from your work? **Yes   No**

Are the sliding doors a good idea? **Yes   No**

In the box below write a reason for your answer

Draw a map of your classroom. Show and label all the important places.

Science

Mo's favourite lesson is science so she is very pleased when the teacher tells her that she will be doing an experiment. The teacher stands at the front of the classroom and shows the class what to do.

Can everyone see the teacher clearly? **Yes   No**

Can everyone hear the teacher clearly? **Yes   No**

Mo needs some water for the experiment.

Is there a sink nearby? **Yes   No**

Is the sink in the classroom? **Yes   No**

Can she manage to turn the taps on by herself? **Yes   No**

Mo has to leave her experiment somewhere where it won't be disturbed.

Is there a special place where she can leave the experiment where it won't be disturbed? **Yes   No**

Toilets

Before the class goes outside, Cal needs the toilet.

Is the toilet far from the classroom? **Yes   No**

Are there enough toilets? **Yes   No**

Are the toilets nice to use? **Yes   No**

Music

Jay loves music! She can't wait for the music lesson.

Is there a special room for music lessons? **Yes   No**

Do music lessons ever disturb other classes? **Yes   No**

ICT

It's time for ICT. The Cool Crew want to use the computers.

Underline or circle the sentence that best describes your ICT room

It is a separate room

It is a part of a corridor

The teacher wants to show the whole class how to do something on the computers.

Are the whole class able to see what the teacher is doing? **Yes No**

Is there a special screen to show the class what to do? **Yes No**

Are there enough computers for everyone? **Yes No**

Do some people have to share a computer? **Yes No**

Is there enough space for everyone in the class to sit comfortably at a computer? **Yes No**

Does the lesson ever get disturbed by people from other classes? **Yes No**

Back in the classroom Mo wants to use a computer to do some writing in her literacy lesson.

How many computers are there in the classroom?

Are there enough? **Yes No**

Assembly

It's time for assembly. The whole school will be there.

Is there enough space for everyone to sit comfortably during assembly? **Yes   No**

The head teacher is telling the school something very important. Can everyone hear clearly? **Yes   No**

Someone from another class is holding up a picture they have drawn. Is everyone able to see it clearly? **Yes   No**

Can everyone get in and out of the hall quickly? **Yes   No**

Library

After assembly the Cool Crew visits the library with your class.

Underline or circle the sentence that best describes your library

It is a separate room

It is a part of a corridor

Are there enough tables and chairs for everyone to sit down?
Yes   No

Ash has found a very exciting book and wants to sit down to read it.
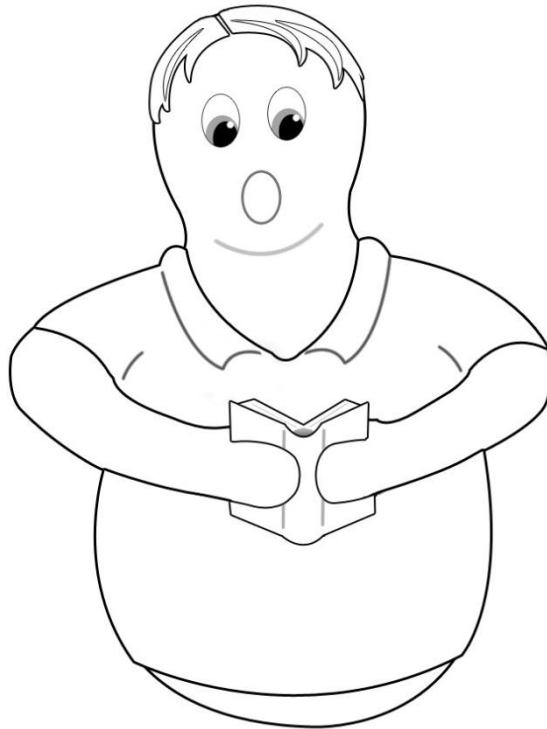
Is there somewhere comfortable for him to sit down and enjoy his book in the library? **Yes   No**

Can everyone reach the books on the shelves? **Yes   No**

Underline or circle some words or phrases from the list below that best describe the library.

peaceful   calm   noisy   uncomfortable

I get disturbed   cramped   quiet   ordinary

comfortable   special   lots of space

Use this page to draw and label a map of your school.
Show all the places you think are important.

Shared Area

The Cool Crew notice a large area in the corridor next to the classroom where some children are working

Is there a shared area next to your classroom? **Yes   No**

The cool crew wonder what the shared area is used for

In the box below write some of the things that <u>your</u> shared area gets used for.

Do you think that having a shared area outside the classroom is a good idea? **Yes   No**

Give a reason for your answer

P.E. and Games

Cal and Jay love P.E. and games.

Is there a special place to get changed for P.E? **Yes   No**

Cal and Jay are sent to get some equipment. Can they reach it easily? **Yes   No**

They go outside for their lesson, but it soon starts to rain. The class have to come inside for their lesson.

Where do they go?

Is this place ever used for anything else? **Yes   No**

If so, what?

Do you ever have to miss indoor P.E. because there is nowhere to go? **Yes   No**

Lunchtime

The Cool Crew have worked hard all morning so they are very hungry! They take a look at the dining hall and decide to have a school lunch.

Can they see all the food on offer? **Yes   No**

Do they have far to carry their tray? **Yes   No**

Is there room for the Cool Crew to sit comfortably at a table with their friends? **Yes   No**

Do the Cool Crew think that it is a nice place to eat? **Yes   No**

Give a reason for your answer in the box below

Underline or circle four words that best describe your dining hall

noisy	bright	scary	uncomfortable	clean
dark nice	horrible	comfortable	dirty	squashed
	lots of space	friendly	quiet	

Quiet Rooms

Mo and some of her friends need some extra help with reading.

Is there a special room they go to? **Yes   No**

Is the room big enough for Mo and her friends? **Yes   No**

Is it used for anything else? **Yes   No**

Is the room a nice place to go? **Yes   No**

Art

Cal is very good at art. He wants to be an artist when he grows up so he is very pleased that they are going to have an art lesson today.

Is there room for everyone to paint at the same time? **Yes   No**

Does everyone stay in the classroom to paint? **Yes   No**

Are all the things Cal needs to paint nearby? **Yes   No**

Can he reach all the equipment himself? **Yes   No**

When Cal has finished his work is there a special place for him to leave it? **Yes   No**

Will it be disturbed? **Yes   No**

Playtime

It's time to go out to play.

Ash wants to play football.

Is there somewhere he can play? **Yes   No**

Will he disturb other children? **Yes   No**

Jay wants to see some wildlife.

Is there somewhere to see wildlife outside? **Yes   No**

It's very hot. Cal wants to find some shade.

Is there somewhere in the shade for Cal to sit? **Yes   No**

Mo is not sure what to play.

Are there lots of different things to choose from in the playground? **Yes   No**

Underline or circle four of these words or phrases that best describe your playground

places to be quiet   exciting   lots to do   happy

  can see nature   nowhere to sit quietly   sad   safe

   too small   scary   lots of equipment   boring

Home time

It's time for the Crew to go home now. They've had a very busy day at your school.

What do you think they would like about your school building?

What do you think they would not like about your school building?

What do you think would they like to change about your school building?

Is there anything else you would like to say about your school building?

Thank you for telling the Cool Crew all about your school

Don't forget to colour in the pictures of the Cool Crew. There will be a prize for the best colouring.

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055679841
karims@coventry.ac.uk

Appendix C2: POE Toolkit

CEFPI ELEMENTARY SCHOOL POST-OCCUPANCY EVALUATION

Item Number	Please write the number of your response in the box beside each item. If you Disagree or Strongly Disagree please write the item number on the last page and explain why you disagree.	Strongly Agree	Agree	Disagree	Strongly Disagree	No Opinion
		4	3	2	1	0
	Building Features					
1	Front entrance of the building is easy to identify and access.					
2	Building is barrier-free [handicapped accessible], both externally and internally.					
3	Entrances and exits are located to permit efficient student traffic flow.					
4	Number and size of restrooms is adequate throughout the building.					
5	Intercom system allows dependable 2-way communication throughout the building.					
6	Floor coverings are appropriate to the room's/area's intended use.					
7	Building layout provides good separation for after-hours and weekend use.					
8	Building details, color schemes, material, and décor are aesthetically pleasing.					
9	Year-round comfortable temperature is provided throughout the building.					
10	Ventilation system provides adequate circulation of clean air.					
11	Mechanical systems operate quietly and don't disrupt learning areas.					
12	Building acoustics provide for appropriate ambient noise levels.					
13	Areas are provided for student socialization.					
14	Quantity and quality of windows contributes to a pleasant environment.					
15	Corridor widths are adequate for student movement.					
16	Site and building are well landscaped.					
17	Finishes are of durable quality and easily maintained.					

	Safety and Security					
18	Access to the building is effectively controlled throughout the school day.					
19	Car, bus, and service vehicular traffic are separate.					
20	Pedestrian and vehicular traffic are separate, except in designated crosswalks.					
21	Sidewalks are designed and maintained for safety.					
22	Ample space is provided in corridors or protected areas for student safety in the event of natural disasters.					
23	Building has no "blind spots" that are difficult to monitor.					
24	Building has good sight lines in corridors and is easy to supervise.					
25	Site plantings do not allow for areas of concealment.					
26	Stairwells are easy to supervise.					
27	Restrooms are easy to supervise.					

	The School Site					
28	Site is large enough to meet educational needs.					
29	Site is well landscaped.					
30	Pedestrian services include adequate sidewalks with designated crosswalks, curb cuts, and appropriate slopes.					
31	Sufficient on-site, solid surface parking is provided for daily use.					
32	Sufficient on-site, solid surface parking is provided for evening/event use.					

	Educational Adequacy					
33	Rooms are adequately sound isolated.					
34	Lighting is sufficient for tasks.					
35	Light switching is conveniently located.					
36	Room lighting levels can be controlled for audio-visual presentations.					
37	Number of electrical outlets in teaching areas is sufficient.					
38	Size of academic learning areas meets desirable standards.					
39	Classroom space permits arrangements for small group activity.					
40	Location of academic learning areas is near related educational activities and away from disruptive noises.					
41	Personal space in the classroom away from group instruction allows privacy time for individual learning.					
42	Storage for student materials is adequate.					
43	Storage for teacher materials is adequate.					
44	Furniture and equipment are appropriate for instructional uses.					
	The following teaching stations are designed and arranged to support the learning activities that need to occur:					
45	Core Academic Classroom					
47	Self-Contained Special Education Classroom					
48	Special Education Resource Classroom					
49	Visual Arts Classroom					
50	Music Room					
51	PE Multipurpose Room					

	Support Areas					
52	Teacher work areas are adequately sized and furnished.					
53	Media Center has adequate learning and support spaces.					
54	Student Dining Area is properly located and adequately sized.					
55	Administrative areas are in appropriate locations.					
56	Administrative personnel are provided sufficient workspace and privacy.					
57	Counselors' offices insure privacy and sufficient storage.					
58	Health clinic is centrally located and equipped to meet requirements.					
59	Suitable reception space is available for students, teachers, and visitors.					
60	Custodial closets are conveniently located and sufficiently equipped.					
	Total					

Appendix C3: POE Toolkit

Newman's POE toolkit for teachers

<u>Teachers and teaching assistants</u>

	Teacher in nursery or reception	Teacher in K.S. 1	Teacher in K.S. 2	Teaching assistant nursery/reception	Teaching assistant in K.S. 1	Teaching assistant in K.S. 2
Please tick your job description						

Section A

These questions will ask about your classroom

	Strongly disagree	Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree	Strongly agree	Not applicable
The classroom does not have enough space								
The design of the classroom helps me feel in control								
Sliding doors between two or more classrooms are a good idea								
The design of the classroom supports my teaching philosophy								
Having a shared area outside the classroom helps teaching and learning								
Acoustics in the classroom are poor								
	Strongly disagree	**Disagree**	**Slightly disagree**	**Neither agree nor disagree**	**Slightly agree**	**Agree**	**Strongly agree**	**Not applicable**
I am able to control the temperature in my classroom								
There are not enough accessible sinks								

	Strongly disagree	Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree	Strongly agree	Not applicable
My classroom has enough storage								
There are not enough power points								
My classroom does not have enough natural light								
I am able to control the amount of light in the classroom								
Pupils cannot always see the whiteboard								
My classroom has adequate ventilation								
The design of my classroom inhibits whole class teaching								
The classroom enables children to work in groups								
The ICT provision in my classroom facilitates effective teaching and learning								
My classroom makes the children feel safe								
Generally the design of the classroom facilitates learning								

	Strongly disagree	Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree	Strongly agree	Not applicable
The classroom does not meet the requirements of children with special needs								
My classroom inhibits the effective delivery of the curriculum								
My classroom allows for flexibility in teaching styles								
The design of the classroom makes demonstrating practical skills to the whole class difficult								
Pupils are able to undertake teacher directed activities without distraction								
The classroom facilitates a differentiated curriculum								
Pupils have space and opportunity to work on their own								
Pupils have space and opportunity to work co-operatively								
Generally the classroom facilitates teaching								
Children do not have access to a quiet area								

Pupils are sometimes confined to an area of teaching space due to limited space being available								
There is room for pupils to leave work in progress to one side until it is needed								
I have a base in the classroom to store equipment for immediate teaching needs								
All pupils can reach necessary equipment								

Section B

These questions ask about other areas in the school

	Strongly disagree	Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree	Strongly agree	Not applicable
Pupil toilets are easily accessible								
Toilets are not easy to supervise								
There are not enough toilets for pupils								
The design of the corridors allow children to move easily around the school								
There are not enough small group rooms in the school								
Cloakrooms are secure								
There is not enough storage for pupils' coats and bags								
The design of the library inhibits teaching and learning								
In the library children are able to work at tables								

	Strongly disagree	Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree	Strongly agree	Not applicable
Children can reach the books in the library								
Furniture in the library is difficult to rearrange								
The library can easily accommodate displays								
A whole class would find it difficult to use the library								
The library is difficult to supervise								
The school building facilitates the teaching of music								
The school building facilitates the teaching of P.E.								
The school building facilitates the teaching of art and craft								
The school building facilitates the teaching of design and technology								

Section C

Other aspects of the internal school environment

	Strongly disagree	Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree	Strongly Agree	Not applicable
All pupils are able to reach and use necessary equipment								
Pupils have access to a networked ICT system								
In ICT lessons I have access to a large demonstration computer screen/interactive whiteboard								
I am disappointed with ICT provision								
Children have easy access to their own belongings								
More space for displays is needed								
Pupils are able to see a responsible adult at all times								
I have access to a dedicated space to meet with other teachers to plan and evaluate								
I have access to workspace for individual curriculum planning and preparation								

	Strongly disagree	Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree	Strongly agree	Not applicable
The physical well being of pupils is well catered for in the building								
The design of the school buildings supports the behaviour policy of the school								

Section D

This section will ask about the outdoor environment of the school

	Strongly disagree	Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree	Strongly Agree	Not applicable
Needs for the outdoor curriculum are met in the school design								
The outdoor area is well designed								
The outdoor classroom provides for the needs of all children								
The outdoor classroom is large enough								
The outdoor classroom provides adequate shelter from the weather								
The immediate school environment offers only limited opportunities for learning								
The design of the school grounds enables children to appreciate the natural environment								
Children with physical difficulties are able to access all parts of the school site								

The design of the outside area ensures that all children can be supervised								
	Strongly disagree	**Disagree**	**Slightly disagree**	**Neither agree nor disagree**	**Slightly agree**	**Agree**	**Strongly agree**	**Not applicable**
The outside area makes good use of space								
Play equipment is used frequently								
The children need more space outside								
Children generally behave well on the playground								
There is enough large play equipment								
There is enough small play equipment								
The playground is unsafe								
The playground encourages imaginative play								

Please write here any explanations you feel would help us to understand why you have given the answers you have, we would particularly like to hear why you are dissatisfied with any aspects of the school building. Continue on a separate sheet if necessary.

Appendix C4: POE Toolkit

Final amalgamated POE toolkit for teachers

COVENTRY UNIVERSITY

A Design Investigation of Primary schools in Saudi Arabia

TEACHERS

Student Name: Sana Omari
Type of Study: Full-time MAR in Art and Design

Mobile:

POST-OCCUPANCY SURVEY
Participant Background:
1. How many years have you worked in this building? _____
2. How long have you been working at your present workspace? _____
3. In a typical week, how many hours do you spend in your workspace? _____
4. How would you describe the work you do? _____
5. What class grade do you teach? _____
6. What is your gender? _____
7. What is your age group ☐ 25-30 ☐ 30-35 ☐ 35-40 ☐ 40-45 ☐ 45-55 ☐ 55-60

Assessing the School Environment: PLEASE TICK THE APPROPRATE BOX

		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
		4	3	0	2	1
	Academic Learning Spaces					
1.	Size of learning (classroom) space meets state standards(700sft)					
2.	Classroom space permits arrangement for small group activity					
3.	Location of academic learning areas is near related educational activities and away from disruptive noise.					
4.	Personal space in the classroom away from group instruction allows privacy time for individual students					
5.	Storage for student materials is adequate					
6.	Storage for teachers is adequate					
7.	Classrooms can be arranged to enhance the teaching/learning objectives					
8.	The school facilities are adaptable to users needs					
9.	The school facility accommodates a variety of learning styles					
10.	Large flexible spaces and/or workstations are available to accommodate student projects					
11.	Computers in classrooms and computer labs have functional furniture designed for this use					
12.	Classrooms have telephones for communicating both within and outside the facility					
13.	Classrooms have logical, well designed integrated technology					
14.	Classrooms have computers that are networked for both the intranet and internet					
15.	There are sufficient and well located electrical outlets available in the instructional areas of the building					

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
	4	3	0	2	1
Specialized Learning Space					
16. Size of specialized learning areas meet standards (e.g PC labs, library, media)					
17. Design of the specialized learning areas are compatible with the instructional needs of students					
18. Music room provides adequate sound-treated space					
19. Space for art is appropriate for instruction and supplies/equipment are adequate					
20. Science program is provided sufficient space and equipment with science lecture-lab rooms					
21. Science lab equipment has been updated less than five years ago to meet the current standards					
22. Utilities such as gas, water, electricity are available and are in usable condition in science labs					
23. Academic team/department members occupy specific areas together within the school building or are organized by pods					
24. The media centre is well equipped with computers					
25. There are conference areas and meeting rooms available for things such as team/department meetings, parent conferences or faculty planning sessions					
26. The design of the library supports teaching and learning					
27. Library/Resource/Media Centre provide appropriate space and can act as an instructional lab					
28. In the library children are able to work at tables					
29. In the library children can easily access the books					
30. In the library children can easily find their way around					
31. Furniture in the library is difficult to arrange					
32. The library can easily accommodate displays					
33. The library is difficult to supervise					
34. All pupils are able to reach and use necessary equipment in the different facilities such as library, cafeteria, labs etc					
35. Pupils have easy access to networked ICT systems throughout the building					

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
	4	3	0	2	1
Support Space					
36. Teachers lounge and work areas support teachers as professionals					
37. Cafeteria/kitchen is attractive with sufficient space for dining, delivery, storage and food preparation					
38. Clinic is near or can communicate with administrative offices and is equipped to meet requirements					
39. Teachers have their own office space(apart from their classroom) with access to telephones					
40. School facility has a teacher professional library that is accessible as well as current					
41. The school facility permits teachers to function as professionals					
42. Suitable reception space is available for students, teachers					
43. The school building has meeting rooms for parents, and/or offices for volunteers and volunteer coordinators					
44. The school facility is an integral part of the community in that it is utilized after school, evenings or weekends					

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
	4	3	0	2	1
Cleanliness and Maintenance					
45. The overall building is clean and maintained					
46. The cleanliness enhances the overall performance of the building					

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
	4	3	0	2	1
Building Features					
47. Overall design is aesthetically pleasing and appropriate for the age of the students					
48. Exterior noise and surrounding environment do not disrupt learning					
49. Entrances and walkways are sheltered from sun and inclement weather					
50. Building materials provide attractive color and texture					
51. Proper maintenance of the school facility is a priority and /or graffiti are repaired and removed quickly					
52. Site and building are well landscaped					
53. Exterior walls or windows and trim were painted less than 5yrs ago or are in excellent condition					
54. Location of the facility enhances the leaning environment					
55. Color schemes, building materials, and décor provide an impetus to learning					
56. Year round comfortable temperature and humidity provided throughout the building					
57. The floor plan of the building helps direct student movement and minimizes student disruptions					
58. Ventilation system provides adequate quiet circulation of clean air					
59. Lighting systems provide proper intensity, diffusion and distribution of illumination					
60. Building acoustics provide appropriate ambient noise levels					
61. Mechanical systems operate quietly and do not disturb learning areas.					
62. Quantity and quality of windows contributes to a pleasant environment					
63. Corridor widths are adequate for student movement					
64. Sufficient drinking fountains and restroom facilities are conveniently located per building codes					
65. Communication among students is enhanced by common areas					
66. Appropriate foyers and corridors aid traffic flow					
67. Areas for students to interact and socialize are available and suitable to the age group					
68. Large group areas are designed for effective management of students					
69. Acoustical treatment of ceilings, walls,					

and floors provide effective sound control					
70. Custodial daily routines are effective in keeping facility clean and attractive					
71. The condition of the facility is excellent both structurally and cosmetically					
72. There are a variety of places, both inside and out of the school where students can meet together in both small and large groups					
73. The school facility fosters communication					
74. The school facility creates appropriate behavioural setting.					
75. Interior walls, including classroom spaces, were painted less than 5yrs ago or are in excellent condition					
76. There are various displays or student work exhibited throughout the corridors					
77. School rules and consequences are posted in each room and corridors					
78. Signage and information are clearly visible and easy to follow					
79. Student accomplishments are highlighted though out the building					
80. There are posters, mobiles or display of current events and topics					
81. Front entrance of the building is easy to identify and access					
82. Building is barrier-free(handicapped accessible) both externally and internally					
83. Number and size of restrooms is adequate throughout the building					
84. Building layout provides good separation for after-hours and weekend use.					
85. Site and building are well landscaped					
86. The design of the facility encourages good behaviour and a positive ethos.					
87. The school is a pleasant place to work					
88. The school feels spacious					

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
	4	3	0	2	1
Safety and Security					
89. Access to the building is effectively controlled throughout the school day					
90. Building has good sight lines in corridors and is easy to supervise					
91. Stairwells are easy to supervise					
92. Restrooms are easy to supervise					

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
	4	3	0	2	1
Classroom Workspace					
93. The amount and type of storage space available for your individual work is sufficient					
94. The amount and type of storage space available for student work is sufficient					
95. The classroom layout enhances the ability to get the job done					
Classroom furnishings					
96. The classroom furnishings are comfortable					
97. The furniture is easy to adjust to meet your needs					
98. The furniture can easily be cleaned					
99. The colors and textures of flooring, furniture and surface finishes enhance the classrooms					
100. The classroom allows for flexibility in teaching styles					
101. The furnishings enhance the ability to get the job done					
102. The temperature in the classroom is comfortable					
103. The temperature in the classroom is easily controlled					
104. The air quality in the classroom is fresh and clean					
105. There is plenty of daylight in the classroom					
106. The glare can be controlled by blinds					
107. The daylight enhances the performance in the classroom					
108. The lighting levels are visually comfortable					
109. There is enough electric light in the classroom					
110. The light can be controlled and adjusted to suite the needs of the classroom					
111. The noise levels in the classrooms are lw and do not interfere with teaching and learning					
112. Students at the back of the class find it easy to hear the teacher					
113. The cleanliness and maintenance of the classroom enhances teaching and learning					
114. The classroom design for technology education maximizes the use of state-of-the-art equipment					
115. Space for small groups and remedial instruction is provided adjacent to the classrooms					

116. There are sufficient displays for student work and accomplishments					
117. All pupils can reach necessary equipment					

Any comments you would like to add regarding the overall campus

_____
_____
_____
_____
_____
_____
_____
_____
_____

Any comments you would like add regarding the interiors or layout of your building

_____
_____
_____
_____
_____
_____
_____
_____
_____

Any comments you would like to add regarding the design and functionality of your classrooms

_____
_____
_____
_____
_____
_____
_____
_____
_____

Any comments regarding how the built environment supports or does not support the learning environment

_____
_____
_____
_____
_____
_____
_____
_____
_____

Appendix C5: POE Toolkit

POE toolkit for Parents

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
	4	3	0	2	1
Building Features					
118. Overall design is aesthetically pleasing and appropriate for the age of the students					
119. Exterior noise and surrounding environment do not disrupt learning					
120. Entrances and walkways are sheltered from sun and inclement weather					
121. Building materials provide attractive color and texture					
122. Proper maintenance of the school facility is a priority and /or graffiti are repaired and removed quickly					
123. Site and building are well landscaped					
124. Exterior walls or windows and trim were painted less than 5yrs ago or are in excellent condition					
125. Location of the facility enhances the leaning environment					
126. Color schemes, building materials, and décor provide an impetus to learning					
127. Year round comfortable temperature and humidity provided throughout the building					
128. The floor plan of the building helps direct student movement and minimizes student disruptions					
129. Ventilation system provides adequate quiet circulation of clean air					
130. Lighting systems provide proper intensity, diffusion and distribution of illumination					
131. Building acoustics provide appropriate ambient noise levels					
132. Mechanical systems operate quietly and do not disturb learning areas.					
133. Quantity and quality of windows contributes to a pleasant environment					
134. Corridor widths are adequate for student movement					
135. Sufficient drinking fountains and restroom facilities are conveniently located per building codes					
136. Communication among students is enhanced by common areas					
137. Appropriate foyers and corridors aid traffic flow					

138. Areas for students to interact and socialize are available and suitable to the age group					
139. Large group areas are designed for effective management of students					
140. Acoustical treatment of ceilings, walls, and floors provide effective sound control					
141. Custodial daily routines are effective in keeping facility clean and attractive					
142. The condition of the facility is excellent both structurally and cosmetically					
143. There are a variety of places, both inside and out of the school where students can meet together in both small and large groups					
144. The school facility fosters communication					
145. The school facility creates appropriate behavioural setting.					
146. Interior walls, including classroom spaces, were painted less than 5yrs ago or are in excellent condition					
147. There are various displays or student work exhibited throughout the corridors					
148. School rules and consequences are posted in each room and corridors					
149. Signage and information are clearly visible and easy to follow					
150. Student accomplishments are highlighted though out the building					
151. There are posters, mobiles or display of current events and topics					
152. Front entrance of the building is easy to identify and access					
153. Building is barrier-free(handicapped accessible) both externally and internally					
154. Number and size of restrooms is adequate throughout the building					
155. Building layout provides good separation for after-hours and weekend use.					
156. Site and building are well landscaped					
157. The design of the facility encourages good behaviour and a positive ethos.					
158. The school is a pleasant place to work					
159. The school feels spacious					

Appendix D: Floor Plans

D1: BISJ Floor Plans
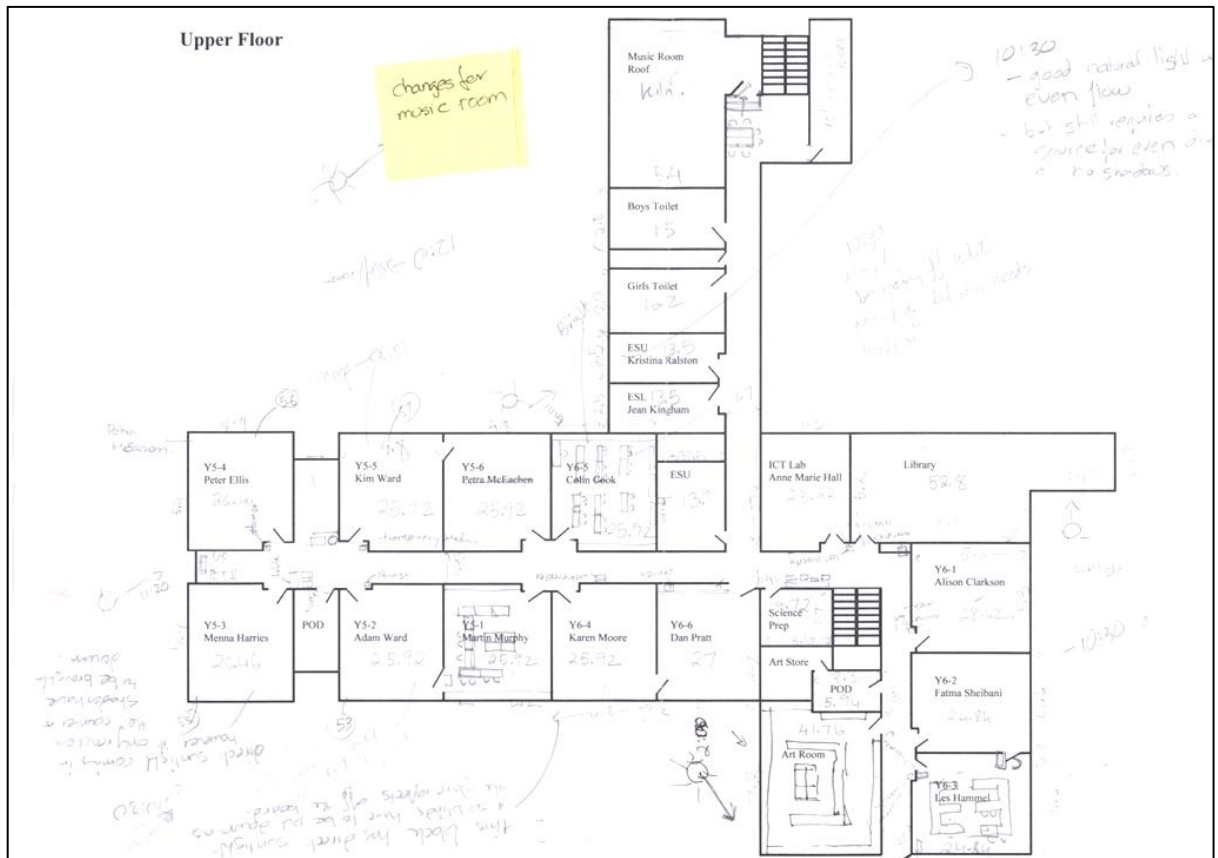
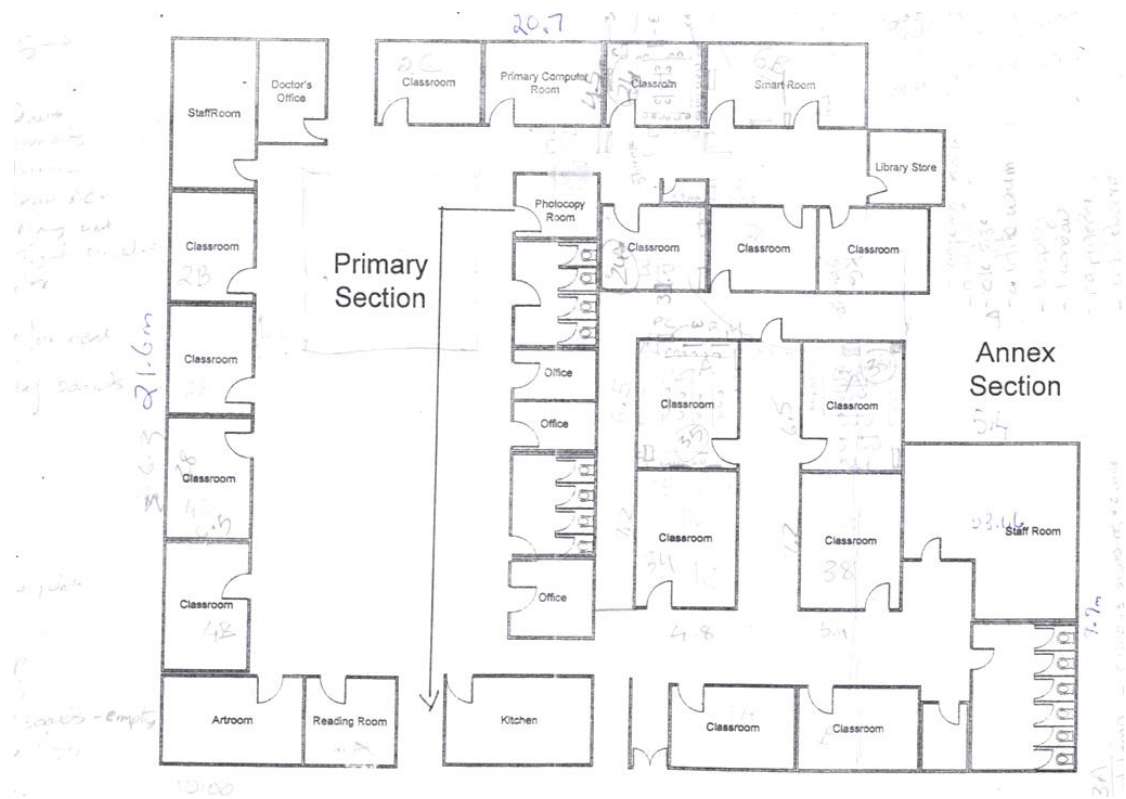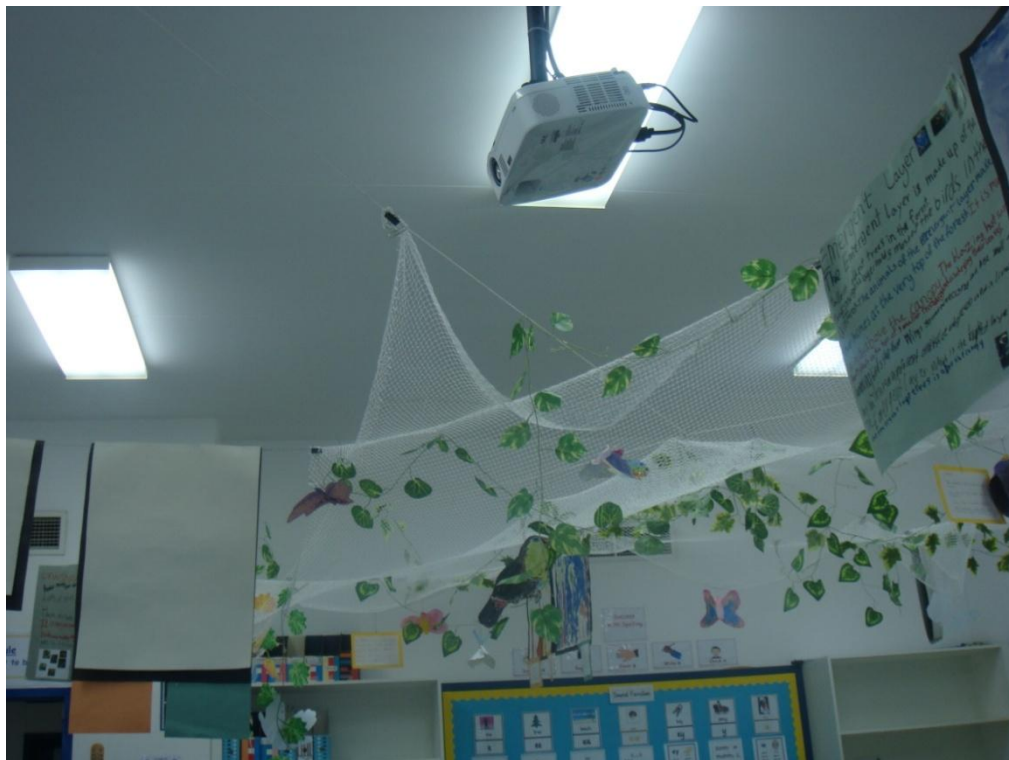**D2:AISJ Floor Plans**
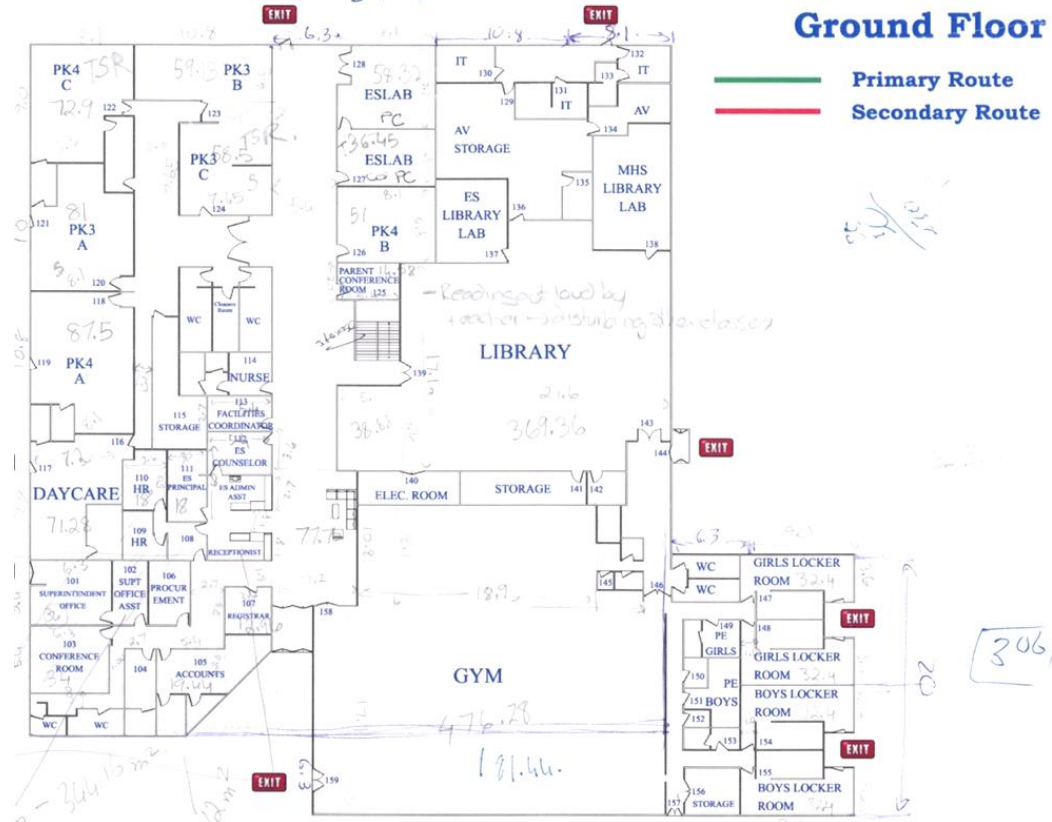
D3: MJIS Floor Plans

Appendix E1: Photo Documentation

(MJIS School did not give authorization so no photos will be included)

Classrooms relying heavily on Fluorescent lighting - BISJ School

BISJ School Classrooms

Appendix E2: Photo Documentation

Classrooms relying heavily on Fluorescent lighting - AISJ School

AISJ Classrooms

Appendix E3: Photo Documentation

No windows - AISJ School

AISJ School: All photos were taken of four different classrooms.

Appendix E4: Photo Documentation

Poor Storage - BISJ School

BISJ School classrooms with limited storage for student belongings blocking circulation

Appendix E5: Photo Documentation

Poor Storage - AISJ School

AISJ School – Cluttered classrooms with limited storage for student belongings

Appendix E6: Photo Documentation

Teachers' Storage - BISJ School

BISJ School – Teacher workstations and storage

Appendix E7: Photo Documentation

Teachers' Storage - AISJ School

AISJ School – Teachers workstation with limited storage

Appendix E8: Photo Documentation

Physical Education areas (Outdoors and indoors) - BISJ School

BISJ School Outdoor physical education areas

Indoor physical education areas

Appendix E9: Photo Documentation

Physical Education areas (Indoors) - AISJ School

AISJ School – Indoor gymnasium and no outdoor areas for key stage 2 children. No equipment was observed except for a few items as seen in the photos.
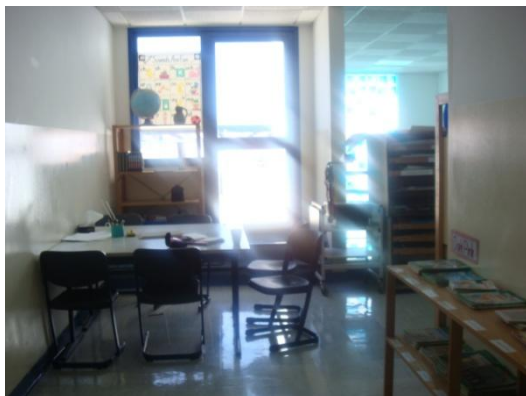
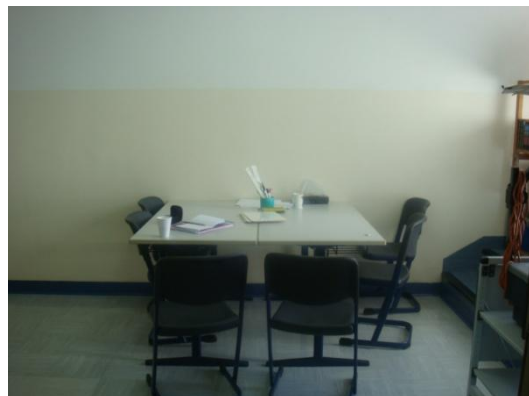# Appendix E10: Photo Documentation

Shared areas - BISJ School

Shared areas for reading and group work

Common ICT pods with internet access and printing. Used for research.

Areas for group work or remedial lessons

Appendix E11: Photo Documentation

Teachers' Lounge - BISJ School

Work tables for grading and other types of desk work

Areas for relaxing, discussing or reading

Storage for teachers personal belongings

Kitchenette

Appendix E12: Photo Documentation

Teachers' Lounge - AISJ School

No windows, old furniture and used as extra space for storage. A few old pc with no internet access.

AISJ School – Teachers Lounge

Appendix E13: Photo Documentation

Cafeteria - BISJ School

Heavy reliance on fluorescent lighting, uninspiring aesthetics and no variety of furniture

Appendix E14: Photo Documentation

Outdoor areas for relaxing or play - BISJ School

Shaded areas with limited play equipment

Outdoor play areas for active play such as sports with attached shaded area for lunch and chatting

Appendix E15: Photo Documentation

Outdoor areas for relaxing or play - AISJ School

Shaded area with play equipment but for key stage 1 children only

Appendix E16: Photo Documentation

Restrooms - BISJ School

BISJ School - Toilets

Appendix E17: Photo Documentation

Restrooms - AISJ School

Aesthetically unpleasing, unhygienic and old

AISJ School - Toilets

Appendix E18: Photo Documentation

Science labs- BISJ School

No windows for ventilation and only one small work surface for lab technician. Equipment is difficult to access for teacher due to high shelving areas.

Only one work table for lab technician and is also used for prep work

Appendix E19: Photo Documentation

Art rooms - BISJ School

Adequate work tables for projects

Plenty of storage areas

Special equipment for drying and cutting

Plenty of windows for ventilation and light

Storage for student projects and sink area

Appendix E20: Photo Documentation

Art rooms - AISJ School

Inappropriate seating as all age groups are required to use the same space.

AISJ School – Art room

Appendix E21: Photo Documentation

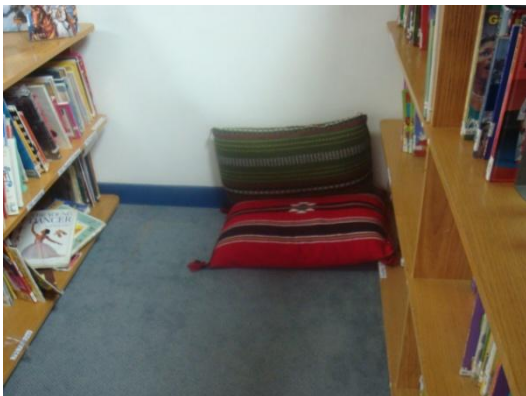## Library - BISJ School

Too small for 400 students

Not enough storage

Not enough storage

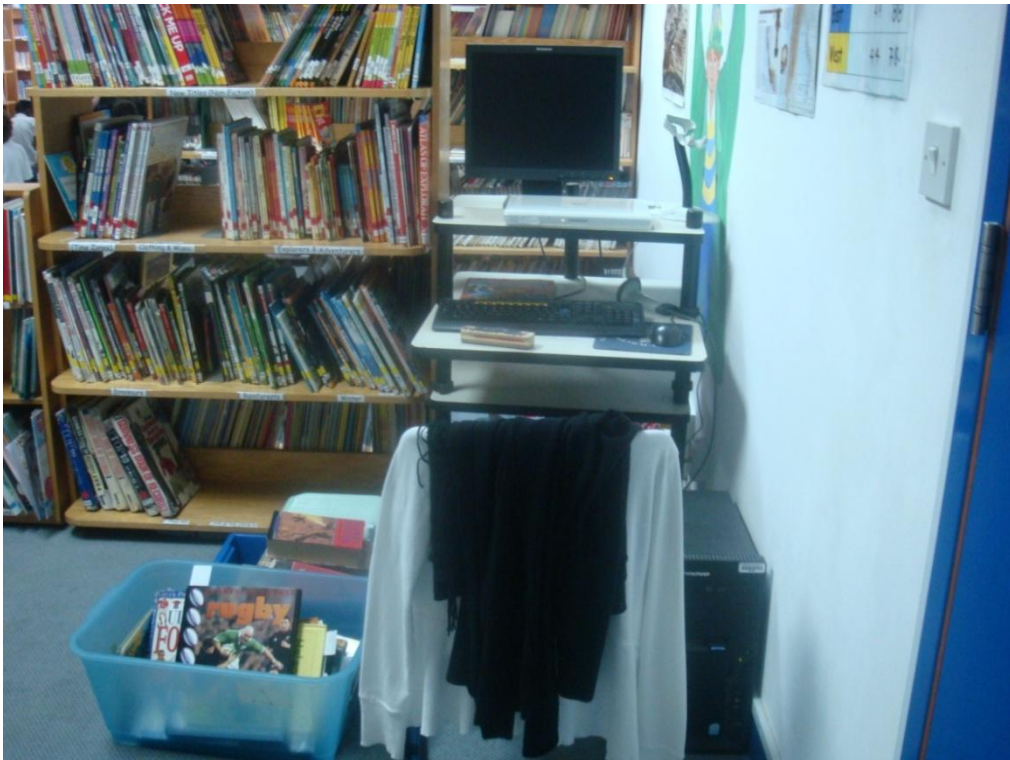**Individual areas but insufficient lighting**

Dark and under lit reading areas

Only scheduled classes can be accommodated

Poor storage area

Only one PC for teachers to use. Students do not have access to internet or PC for research

Appendix E22: Photo Documentation

Library - AISJ School

Adequate tables and chairs however no natural light or windows

Easy access to books and age appropriate scale

Variety of seating provided

Heavily reliance on fluorescent

Central area for librarian

Appendix E23: Photo Documentation
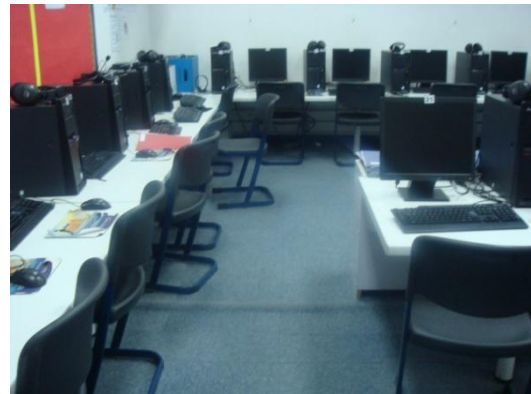
ICT Suite - BISJ School

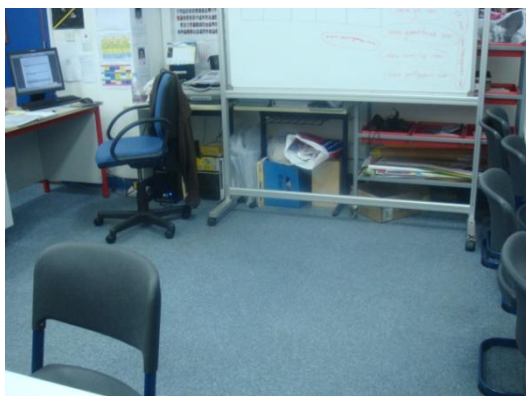**Adequate number of PCs but cramped**

No natural light

Storage area for student work

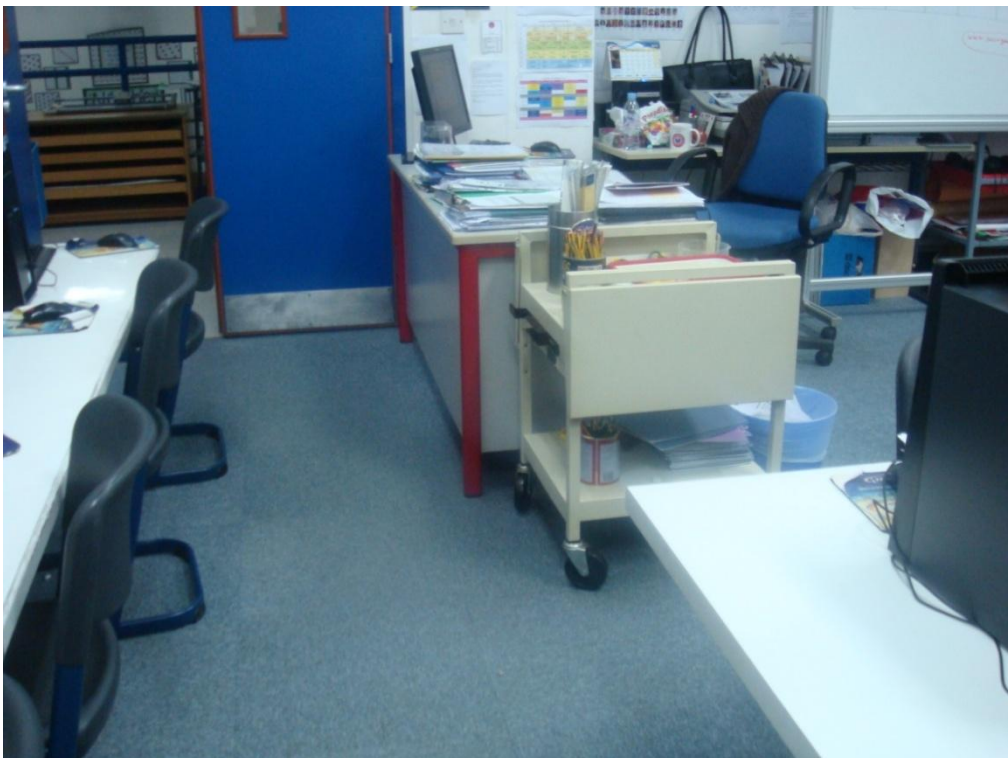**cabling protruding creating a safety hazard**

Inadequate floor space for demonstrations where students sit on floor

Not enough display and storage. Not enough work surfaces for taking notes or writing

Congested circulation at entrance with teachers desk is inappropriate

Appendix E24: Photo Documentation

ICT Suite - AISJ School

Inappropriate location of terminals

Equipment laying around

No windows, no natural light
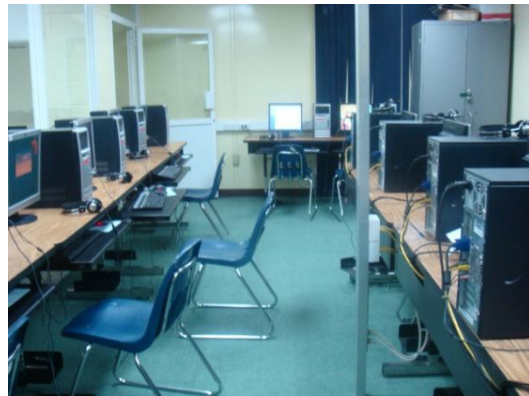
Tight circulation and exposed wires

Aesthetically unpleasing and outdated furnishings

Exposed wiring

Exposed wiring and easy access for students – Safety hazard

Out dated electrical systems. Damaged electric socket.

Appendix E25: Photo Documentation

Special education - AISJ School

No windows or full spectrum lighting. Unhealthy atmosphere for children with special needs.

Appendix E26: Photo Documentation

Learning Support - BISJ School

Small classroom for small groups with a specialist

Small group work table

Floor space for reading and demonstrations. Clean will lit and maintained. Adequate storage.

Appendix E27: Photo Documentation

Learning Support - AISJ School

No window, fresh air or natural light

Mixed and old furniture – aesthetically unpleasing

Cramped and no room for circulation or storage

Appendix E28: Photo Documentation

Landscaping - BISJ School

Hard-scape shaded areas for lunch

Isolated grass unused patches

Shaded walkways and promenades

On peripheral flower beds with planted trees

Sporadic planting of lone trees and bushes

Appendix F1: Recommendations

General recommendation for schools in Jeddah

7.1 Academic Learning spaces

7.1.1 Classrooms

7.1.1.1 Furniture:

POE results revealed that furniture was inadequate. Schools need to purchase new furniture which is age appropriate and to set up a maintenance department for its upkeep as teachers and students complained of old and damaged furniture.

- Provide soft furnishings to create a cosy home-style ambience as it greatly impacts learning, productivity and creativity (Heath 2008).

- The furniture should include adjustable chairs and tables, padded chairs, lounge chairs, bean bags, couches and coffee tables (Building Bulletin 99). Furniture should also accommodate different types of environments within learning studios such as collaborative activities or individual work (Lueder and Rice 2008). For example, couches and coffee tables for small group meeting areas, desks and chairs for larger group instruction, bean bags and book corners for quiet reflective or individual learning (Heath 2008; Building Bulletin 99).

7.1.1.2 Lighting:

Teachers and students mostly complained that the fluorescent lighting was dull and sterile. All classrooms should incorporate full-spectrum lighting and natural light with individual control to adjust to the needs of the classroom.

- There should be a variety of light settings. Directional spot light should be used to highlight areas such as display or the library corner. Group areas and work areas should also have drop lights to help create a sense of place and to highlight the task below.

- It was observed that a majority of classrooms had minimum windows and in many instances no windows. Classrooms require glazing to allow for natural light and extended views to the outside.

- The recommended glazing ratio (glazing area/wall area) should be 40% for the south side and 55% for the North side which also allows for a more evenly diffused day lighting effect (Frumkin, Geller, Nodvin, 2007). Installing clerestory windows admits light deeper into the back of the class. (Frumkin, Geller, Nodvin, 2007) (**Figure 4**). In addition windows should also have shades or louvers to control glare and direct sunlight (Frumkin, Geller, Nodvin, 2007)

7.1.1.3 Temperature

Poor classroom temperature was a consistent problem for both teachers and students. A temperatures range of 67F to 73F needs to be maintained and more importantly to be individually controlled to maintain comfort.

- Due to solar heat gain through surfaces, classrooms in Saudi Arabia should avoid being placed on the south side as it has considerable heat gain and maximum exposure to the sun. North side is preferable as it does not receive direct sunlight or heat most of the day (Barret and Zhang 2009)

- An important note should be added although abundance of natural light is preferable but large windows should be avoided as heat gain increases (Barret and Zhang 2009).

7.1.1.4 Acoustics

61% of the students complained that their class was noisy and it was disturbed by external noise.

- The first step is that all sound related or noisy activities such as music rooms, play room or mechanical systems should be located away from learning spaces. (Frumkin, Geller, Nodvin, 2007; Lueder and Rice 2008; Barret and Zhang 2009)

- These spaces can be further protected by using sound insulation materials, heavy weight walls, or floating floors. A secondary option would be in carefully placing

the sensitive areas near toilets, storage and corridors to act as a buffer for further noise protection and it also provides good separation (**Figure 5**).

- Within classrooms sound absorbent materials or double glazing can be used to change the sound characteristics of the space, particularly if used on ceilings and floor to control unwanted sound reverberation or transfer (Frumkin, Geller, Nodvin, 2007; Heath 2008; Barret and Zhang 2009).

- Installing acoustic tiles on the ceiling or carpets made of woven wool or tufted long pile can cover 60% of the surfaces drastically reducing reverberation (Smith 2002; Monk 2006; Lueder and Rice 2008) or by simply angling walls five degrees out of the parallel plane (Monk 2006).

- Wall treatments can be achieved by installing bookshelves, dividers, acoustic or plywood panels, gypsum boards and draperies to absorb more sound (Smith 2002; Lueder and Rice 2008). To assist in blocking exterior playground noise suspended ceilings, door and window seals and noise reduction windows are good solutions (Lueder and Rice 2008).

7.1.1.5 Air quality

Teachers and students complained of various health problems due to poor ventilation such as asthma, allergies and headaches.

- Air ducts need to be cleaned regularly and if the building is old, air purifiers should be installed to counter the effects of poor mechanical systems. Mechanical ventilation systems need to be installed and CO_2 needs to be monitored in occupied areas (Department of education 2009).

- Windows in classrooms should have ventilation options such as small windows placed high on the wall to allow for control of high wind or small windows placed at bench height to cater to general ventilation throughout the year (DFES 2003). Ideally windows in classrooms should have various ventilation options to accommodate climate changes during the year.

7.1.1.6 Flexibility and variety

Classrooms make up the main body of school buildings. It was observed that classroom layout was restrictive and did not allow for various activities required to create a healthy learning environment.

- To maximize the flexibility of instructional clusters it is important to focus on creating a learner- centred classroom, allowing for multiple teaching and learning activities with flexible furniture arrangements (Monk 2006; Lueder and Rice 2008). To achieve this, a Learning studio or open plan model is a good solution.

a. Open plan classrooms and Learning studios:

- Classrooms must provide for a variety of groups varying from small groups of 1-2 individuals, 4-6 members or the entire class of 20-25 students (Fielding and Nair 2005; Lueder and Rice 2008; Barrett and Zhang 2009).

- Besides the small to large learning group areas, it is vital to have a third option for break-out sessions (Weinstein1979; Sanoff 2001).

- Open classroom should also have their own home-style toilets, kitchen area, generous range of storage, sink area, ICT and wireless, and a strong link to external areas (Dudek 2000, Fielding 2005 and Nair; Heath 2008).

- To maximize flexibility, moveable screens or furniture can be used to create different layouts allowing for a variety of activities to take place. Sliding partitions between rooms is also a good solution allowing team teaching provided they are acoustically effective (DfES Building bulletin 99).

7.1.1.7 Colours and aesthetics

Almost 50% of teachers stated that colour was important in providing inspiring interiors and complained of the dull and sterile atmosphere.

- Colours and interiors need to be child friendly and visually pleasing. Nursery and elementary require warm and bright colour schemes as it complements their extrovert nature (Engelbrecht 2003), reducing tension, nervousness and anxiety (Barret and Zhang 2009). Light salmon, soft warm-yellow, pale yellow-orange, coral and peach are preferable where colours of opposite temperatures should be introduced as accents (Barret and Zhang 2009).

7.1.1.8 Responsive classrooms and learning clusters

As stated in the literature review, interior-exterior connections are an important design pattern for classrooms.

- All classes must extend into outdoor areas as seeing things in real life outside of class are more effective (Dufult, Dyck, Jackson 2008).

- In order to create ideal Learner-centred environments and responsive to the needs of the students, all classrooms should be adjacent to science labs, toilet facilities, breakout areas, shared areas, collaboration spaces and lockers. (Sanoff 2001, Dufult, Dyck, Jackson 2008).

7.1.1.9 Classroom size and layout.

1/3 of the students and almost 50% of the teachers both complained of small and crowded classes leading to noisy, aggressive and cramped classrooms. An ideal capacity is 15-18 students per class.

- The average number of students observed per class was 20 and the average size of classrooms were 36 square meters.

- Classrooms with this capacity need to be enlarged between 95.7 to 135 square meters (Building bulletin 82).

7.1.1.10 Storage for student bags and personal belongings

Teachers and students complained of not enough space for bags and student belongings. They considered it a safety hazard as bags were placed in main circulation areas creating tripping accidents.

- It is important to provide appropriate storage facilities such as hooks or cubby holes within the classroom or at the entry for quick and easy access. An allocated area of 15 square meters must be allocated for this purpose.

7.1.1.11 Display

Teachers complained that the display boards were not enough and that it was difficult to keep work on the walls as they were required to use tape. It was observed that work had to be repeatedly taped back.

- A good solution is to eliminate framed display areas and install floor to ceiling height soft chip boards. This ensures that teachers and students can pin-up work efficiently, independently and within a minimum amount of time.

7.1.1.12 Resources and technology

All classes must have integrated technology with at least two desktops computers, laptops or tablets for research.

- Wireless network access should be installed as it allows for more flexibility in classes. Interactive smart boards should also be installed for students and teachers (DfES Building Bulletin 99).

7.1.1.13 Barrier-free

Classrooms need to consider wheel-chair users as 2/3 of the schools did not provide barrier-free classrooms.

- Wide doors must be installed with vision panels from a height of 500mm to enable wheelchair users to see and be seen and that desks and location are adjusted to accommodate wheel chair users.

7.1.2 PE and sports changing rooms

Suitable safe paving should be provided with markings for physical education play.

- Indoor sports facilities need to be well stocked with sports equipment located nearby for easy access.
- Changing rooms must be provided for and located nearby with separate stalls to ensure privacy for the students with curtains or doors. Girls and boys changing rooms should be separate.

7.2 Building features

7.2.1 Building Scale

- A child-oriented environment can be successfully created by lowering the heights of the windows to bench height of the children (Barret and Zhang 2009) reducing door heights, adjust door handle height, shelf heights and dropping ceiling heights to 2.9 meters. Other considerations can be stairs, railings and furniture.

- Appropriate size and scale of buildings, its exterior elements and interior spaces, make it possible for pupils to use spaces independently and enhances ownership (Barret and Zhang 2009).

7.2.2 Attractive and visually pleasing school

A common complaint by students and teachers were the dull and uninspiring interiors and exteriors.

- Building facades may be painted strong colours from warm to hot paired colours to negate the negative effects of the hot humid weather (Barret and Zhang 2009).

- Other design features that can be used to create diversity and involvement are canopies to play under, pathways for circulation, courtyards, bridges, fountains, or simply using contrasting materials such as glass and wood (Barret and Zhang 2009).

- Other solutions to be considered; uniform texture or distinctive repetitive elements and replication of facade features like timber arches throughout the building as a motif or large glazed windows as a main feature (Barret and Zhang 2009).

7.2.3 Barrier-free

Majority of the schools assessed did not make any considerations for special needs or disabled children.

- The school must provide access to the buildings from point of entrance with a convenient vehicle setting-down point with dropped ramped footpath kerb and

level access at the main entrance to the building (Department of education 2009).

- All buildings should be installed with an elevator to provide access to each floor. Raised pathways and steps must have an alternate ramp provided and thresholds should either be removed or sloped.

7.2.4 Signage and information

It is important that every facility and room is appropriately labelled.

- Signage to assist in directing visitors and new students to the necessary areas such as administration, auditorium, sports area and classrooms must be incorporated.

7.3 Support spaces

7.3.1 Corridors and hallways

Although many of the corridors and hallways were sufficiently wide but were ineffectively used.

- Hallways should allow for personal spaces, display boards, book shelves and notice boards. Colour schemes should be applied to make hallways attractive and offer the school a distinctive personality (Engelbrecht 2003).

- The hue maybe lively where each floor can be differently treated or complementary colour schemes of light orange walls offset by blue doors or light-green wall with lower chroma red doors (Barret and Zhang 2009).

7.3.2 Student dining

Student dining and casual eating areas need to be renovated as 45.7% of the students considered it a poor place to eat and that there was not enough place to sit comfortably.

- It was also considered extremely noisy, uncomfortable and dirty. The school needs to enlarge the dining area and create a variety of seating arrangements

and furniture styles; Built-in banquettes and moveable tables and chairs for formal eating or comfortable soft furnishings for casual snacks and drinks.

- The dining areas can offer more seating areas by extending it into an outdoor area with shaded picnic tables. Soft furnishings, rugs, acoustic tiles on the ceiling, vinyl floating floors, and textured walls can be used to absorb some of the noise levels.

- To block sound of dragging furniture, rubber pads should be placed on all table and chair legs.

- Interiors should be based on cafe style ambience with attractive colours. It can be intense, aggressive and brighter than the other spaces. Light red-orange, pale-yellow, warm-yellow, apricot, or pale green are good dominant wall colours and blue, blue-green are strong colours for accents. Laminated table tops maybe in wood grain or colours that may stimulate appetite such as warm red, oranges, warm yellow or clear green. Floors should be light for cleanliness purposes (Barret and Zhang 2009).

7.3.3   Teachers lounge

Teachers complained that their lounges were inadequate, uncomfortable and without enough resources.

- This space must allow teachers to function as professionals by providing phones, fax machines, printers, internet, and computers.

- An accessible and current teachers' library may also be incorporated into the lounge. The lounge must be located and easily accessible from the main entrance. Preferably it should allow for supervision of the main playground (Department of education).

- There should be a minimum of 2 external landlines in addition to the various building service lines. Extensions should be provided in all the rooms (Department of education).

- The furniture should allow for work spaces and to relax during their breaks by providing home-style comfortable furniture such as sofas and coffee tables. Colours can also be used to enhance the ambience.

- In offices where concentration is required, cool hues are preferred however; in general the choice of warm or cool hues depends on preference. Recommended colours could range from soft yellows, sandstone, pale gold, pale orange, pale green or blue-green (Barret and Zhang 2009).

7.3.4   Toilets and personal care

Almost 65% of the students felt that the toilets were unhygienic, unpleasant to use and aesthetically poor.

- Toilets should be decorated with a home-style atmosphere. A cleaning crew must be hired for regular cleaning and maintenance.

- More restroom facilities need to be added. One toilet for every 20 pupils aged 6-11 and washbasins should equal the number of sanitary fittings.

- A need for accessible WCs or consider the reorganisation of toilets in order to provide on accessible WC (size 2200 x 1500mm) (DfES Building Bulletin 99). There should be two staff toilets for the first 25 full-time staff members and one for every further 25 (DfES Building Bulletin 99).

- For religious requirements, considerations should be made including orientation and ablutions.

7.3.5   Assembly

- Screens and projectors need to be placed to allow for pictures and demonstrations to be shown to students as 62% of students said they could not see the pictures or objects being shown during assembly.

7.3.6   Hard play surfaces and Playground

- For every 5 classes there needs to be 2 paved spaces at 350 square meters for healthy and active play.

- These spaces should have a smooth durable, non-slip surface with adequate drainage, reasonably informal and if possible located where there are no shadows from buildings.

- Furniture should be created through natural materials which blend into the landscape. There should be varied stimulating colours, texture, patterns, shapes and sizes (DfES Building Bulletin 71).

7.3.7 Soft play areas and outdoor classrooms

The schools assessed lacked green areas and several teachers complained of the unfriendly ambience felt on entry.

- Trees, fences, hedges, fields, grass, arcades, walkways need to be integrated into the school grounds to allow students to sit and socialise.

- A planting framework should be provided which integrate the various outdoor spaces, define and control access, and provide an atmosphere that is conducive to both work, imagination and play.

- To offset the building and enhance the sense of arrival, more formal colourful shrubs should be planted (Department of education 2009).

- A specific area should also be allocated for outdoor education. This should be partially paved and located in a sunny, quiet, sheltered position easily accessible from the building. Sloping sites may offer the opportunity to create a modest amphitheatre.

7.3.8 Resource areas

- Where possible, classrooms should be extended to provide for small resource areas for various activities such as watching videos, using computers, slides and tapes.

- A cluster of classrooms may also share a common resource area. The recommended size is 40 square meters with a height clearing of 2.7 square meters. These areas should have at least two 6m2 storerooms for teachers' supplies and equipment.

7.3.9 Access and inclusion

- Students with speech, language, learning difficulties, physical disabilities or SEN must be included into the mainstream schools.

- To ensure inclusiveness multi-purpose small group rooms for specialist teaching and student support must be added.

- Group sizes for children with severe to profound needs should range between six and eight with one teacher and can range in area between 200-400 square meters (DfES Building Bulletin 102).

- These classes must included learning aids, ICT and specialist furniture, fittings and equipment such as interactive whiteboards, adapted keyboards and touch screen.

- The interiors need to provide a calming background using colour, light, sound texture and in certain instances aroma therapy. Children with SEN can be easily distracted so location of the rooms must be placed in quiet areas (DfES Building Bulletin 102).

7.3.10 Quiet reflective outdoor areas

Children need quiet outdoor areas where they can read, eat their lunch or quietly play in small groups.

- These areas also have to be easily supervised but yet maintain a certain level of privacy for those who choose to be on their own.

7.3.11 Shared Areas and Activity Pockets

Students need to have shared areas and activity pockets where they can work in small groups for their projects.

- These areas also provide an opportunity for children to socialize and interact. Activity pockets also need to provided for as areas where children are free to use these spaces as they please to encourage ownership.

7.3.12 Quiet Areas

Students had no areas where they could be on their own. Quiet indoor areas are an essential component in effective learning environments where students can work at their own pace independently.

- These areas can be used for quiet reflection, reading, working or studying. They need to be placed in quiet zones away from high traffic areas but also need to be placed to maintain easy sightlines for supervision.

7.4 Specialized learning spaces

7.4.1   Library

The library needs to be enlarged to allow for walk-in students to use as they please. It is inadequate in size, aesthetics, furniture, layout and capacity.

- There needs to be more tables and chairs to cater to the large student enrolment. The library must have a sufficient amount of good natural light with additional full spectrum lighting and spot lights to highlight display.

- Moveable screen dividers should be installed to allow for flexibility in arrangement and can provide surfaces for more display.

- Furniture needs to be adjustable and should be flexible to accommodate any arrangement.

- The library must incorporate quiet individual reading areas and provide soft furnishings such as sofas, padded chairs, floor cushions or rugs.

- The total area should be 10m2 plus 0.05m2 for every pupil (DfES Building Bulletin 99). All equipment and furnishings have to be replaced or renovated.

7.4.2   ICT suite

All ICT suites need to be enlarged with a minimum of 30 desktop computers.

- The layout can be perimeter based layout with a central 'free' area for demonstrations, notes and discussions or a peninsula based layout where teaching and demonstrations can be done at ICT tables.

- All furniture and equipment must be adjustable to accommodate the various sizes and ages of the students.

- Tables should be extendable to allow for more work surfaces when needed. Such as taking notes tests and writing.

- Exposed cables and sockets need to be secured. Pin-up boards for procedures, announcements and safety rules need to be installed.

7.4.3 Music room

The room must be re-located to an isolated area so as not to disturb learning areas. Walls, ceilings, and floors need to be replaced with sound absorbing materials and all equipment must be replaced.

7.4.4 Art room

New equipment and supplies need to be purchased and old furnishings to be replaced. Furniture needs to be adjustable to accommodate the various ages and sizes of students.

- A wet area needs to be installed and maximum glazing is required to allow natural light to enter the space. All supplies need to be located nearby for easy acces. The art room must extend into an outdoor area for messy projects and to allow students to draw and observe nature.

7.4.4 Science labs

Science labs need to be provided for as it was observed that none of the schools had one.

- This area needs to have a wet area, a kitchen and a store room for toxic materials and chemicals. The room must also have a specialist teacher supervising the students at all times.

Appendix F2: Recommendations

Recommendation for BISJ School

7.1 Academic Learning spaces

7.1.1 Classrooms

7.1.1.1 Furniture:

- The furniture should include adjustable chairs and tables, padded chairs, lounge chairs, bean bags, couches and coffee tables (Building Bulletin 99).

- Furniture should also accommodate different types of environments within learning studios such as collaborative activities or individual work (Lueder and Rice 2008). For example, couches and coffee tables for small group meeting areas, desks and chairs for larger group instruction, bean bags and book corners for quiet reflective or individual learning (Heath 2008; Building Bulletin 99)

7.1.1.2 Lighting

Teachers and students mostly complained that the fluorescent lighting was dull and sterile.

- All classrooms should incorporate full-spectrum lighting and natural light with individual control to adjust to the needs of the classroom.

- There should be a variety of light settings. Directional spot light should be used to highlight areas such as display or the library corner. Group areas and work areas should also have drop lights to help create a sense of place and to highlight the task below.

- Classrooms require glazing to allow for natural light and extended views to the outside. The recommended glazing ratio (glazing area/wall area) should be 40% for the south side and 55% for the North side which also allows for a more evenly diffused day lighting effect (Frumkin, Geller, Nodvin, 2007).

- Installing clerestory windows admits light deeper into the back of the class. (Frumkin, Geller, Nodvin, 2007) (**Figure 4**). In addition windows should also have shades or louvers to control glare and direct sunlight (Frumkin, Geller, Nodvin, 2007)

7.1.2.3 Temperature

Poor classroom temperature was a consistent problem for both teachers and students. A temperatures range of 67F to 73F needs to be maintained and more importantly to be individually controlled to maintain comfort.

An important note should be added that although climatic conditions are hot in this country. The common complaint was the air conditioning created extremely cold temperatures. This implies that 2 solution:

1. Mechanical systems need to be adjusted to maintain comfortable temperatures.

2. To allow for individual control within each classroom.

7.1.2.4 Acoustics

Students complained that their class was noisy and it was disturbed by external noise.

- The first step is that all sound related or noisy activities such as music rooms, play room or mechanical systems should be located away from learning spaces. (Frumkin, Geller, Nodvin, 2007; Lueder and Rice 2008; Barret and Zhang 2009).

- These spaces can be further protected by using sound insulation materials, heavy weight walls, or floating floors.

- A secondary option would be in carefully placing the sensitive areas near toilets, storage and corridors to act as a buffer for further noise protection and it also provides good separation (**Figure 5**).

- Within classrooms sound absorbent materials or double glazing can be used to change the sound characteristics of the space, particularly if used on ceilings and floor to control unwanted sound reverberation or transfer (Frumkin, Geller, Nodvin, 2007; Heath 2008; Barret and Zhang 2009).

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- Wall treatments can be achieved by installing bookshelves, dividers, acoustic or plywood panels, gypsum boards and draperies to absorb more sound (Smith 2002; Lueder and Rice 2008).

- To assist in blocking exterior playground noise suspended ceilings, door and window seals and noise reduction windows are good solutions (Lueder and Rice 2008).

7.1.2.5 Flexibility and variety

Classrooms make up the main body of school buildings. It was observed that classroom layout was restrictive and did not allow for various activities required to create a healthy learning environment.

- To maximize the flexibility of instructional clusters it is important to focus on creating a learner- centred classroom, allowing for multiple teaching and learning activities with flexible furniture arrangements (Monk 2006; Lueder and Rice 2008).
- To achieve this, a Learning studio or open plan model is a good solution.

b. Open plan classrooms and Learning studios:

- Classrooms must provide for a variety of groups varying from small groups of 1-2 individuals, 4-6 members or the entire class of 20-25 students (Fielding and Nair 2005; Lueder and Rice 2008; Barrett and Zhang 2009).
- It is vital to have a third option for break-out sessions (Weinstein1979; Sanoff 2001). Open classroom should also have their own home-style toilets, kitchen area, generous range of storage, sink area, ICT and wireless, and a strong link to external areas (Dudek 2000, Fielding 2005 and Nair; Heath 2008).
- To maximize flexibility, moveable screens or furniture can be used to create different layouts allowing for a variety of activities to take place. Sliding partitions between rooms is also a good solution allowing team teaching provided they are acoustically effective (DfES Building bulletin 99)

7.1.2.6 Colours and aesthetics

Teachers stated that colour was important in providing inspiring interiors and complained of the dull and sterile atmosphere.

- Colours and interiors need to be child friendly and visually pleasing. Nursery and elementary require warm and bright colour schemes as it complements their extrovert nature (Engelbrecht 2003), reducing tension, nervousness and anxiety (Barret and Zhang 2009). Light salmon, soft warm-yellow, pale yellow-orange, coral and peach are preferable where colours of opposite temperatures should be introduced as accents (Barret and Zhang 2009).

7.1.2.7 Responsive classrooms and learning clusters

As stated in the literature review, interior-exterior connections are an important design pattern for classrooms.

- All classes must extend into outdoor areas as seeing things in real life outside of class are more effective (Dufult, Dyck, Jackson 2008).
- In order to create ideal Learner-centred environments and responsive to the needs of the students, all classrooms should be adjacent to science labs, toilet facilities, breakout areas, shared areas, collaboration spaces and lockers. (Sanoff 2001, Dufult, T., Dyck, J., Jackson, J., 2008).

7.1.1.9 Classroom size and layout.

1/3 of the students and almost 50% of the teachers both complained of small and crowded classes leading to noisy, aggressive and cramped classrooms.

- An ideal capacity is 15-18 students per class.
- Average size of classrooms was 36 square meters. Classrooms with this capacity need to be enlarged between 95.7 to 135 square meters (Building bulletin 82).

7.1.1.10 Barrier-free

Classrooms need to consider wheel-chair users as 2/3 of the schools did not provide barrier-free classrooms. Wide doors must be installed with vision panels from a height of 500mm to enable wheelchair users to see and be seen and that desks and location are adjusted to accommodate wheel chair users.

7.2 Building features

7.2.1 Building Scale

A child-oriented environment can be successfully created by lowering the heights of the windows to bench height of the children (Barret and Zhang 2009) reducing door heights, adjust door handle height, shelf heights and dropping ceiling heights to 2.9 meters. Other considerations can be stairs, railings and furniture.

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A common complaint by students and teachers were the dull and uninspiring interiors and exteriors.

- Building facades may be painted strong colours from warm to hot paired colours to negate the negative effects of the hot humid weather (Barret and Zhang 2009).

- Other design features that can be used to create diversity and involvement are canopies to play under, pathways for circulation, courtyards, bridges, fountains, or simply using contrasting materials such as glass and wood (Barret and Zhang 2009).

- Other solutions to be considered; uniform texture or distinctive repetitive elements and replication of facade features like timber arches throughout the building as a motif or large glazed windows as a main feature (Barret and Zhang 2009).

7.2.3 Barrier-free

Majority of the schools assessed did not make any considerations for special needs or disabled children.

- The school must provide access to the buildings from point of entrance with a convenient vehicle setting-down point with dropped ramped footpath kerb and

level access at the main entrance to the building (Department of education 2009).

- All buildings should be installed with an elevator to provide access to each floor. Raised pathways and steps must have an alternate ramp provided and thresholds should either be removed or sloped.

7.5 Support spaces

7.5.1 Student dining

Student dining and casual eating areas need to be renovated as the students considered it a poor place to eat and that there was not enough place to sit comfortably. It was also considered extremely noisy, uncomfortable and dirty.

- The school needs to enlarge the dining area and create a variety of seating arrangements and furniture styles; Built-in banquettes and moveable tables and chairs for formal eating or comfortable soft furnishings for casual snacks and drinks.

- The dining areas can offer more seating areas by extending it into an outdoor area with shaded picnic tables.

- Soft furnishings, rugs, acoustic tiles on the ceiling, vinyl floating floors, and textured walls can be used to absorb some of the noise levels.

- To block sound of dragging furniture, rubber pads should be placed on all table and chair legs.

- Interiors should be based on cafe style ambience with attractive colours. It can be intense, aggressive and brighter than the other spaces. Light red-orange, pale-yellow, warm-yellow, apricot, or pale green are good dominant wall colours and blue, blue-green are strong colours for accents.

- Laminated table tops maybe in wood grain or colours that may stimulate appetite such as warm red, oranges, warm yellow or clear green. Floors should be light for cleanliness purposes (Barret and Zhang 2009).

7.5.2 Teachers lounge

- This space must allow teachers to function as professionals by providing phones, fax machines, printers, internet, and computers.

- An accessible and current teachers' library may also be incorporated into the lounge.

- The lounge must be located and easily accessible from the main entrance. Preferably it should allow for supervision of the main playground (Department of education).

- There should be a minimum of 2 external landlines in addition to the various building service lines. Extensions should be provided in all the rooms (Department of education).

- The furniture should allow for work spaces and to relax during their breaks by providing home-style comfortable furniture such as sofas and coffee tables. Colours can also be used to enhance the ambience.

- In offices where concentration is required, cool hues are preferred however; in general the choice of warm or cool hues depends on preference. Recommended colours could range from soft yellows, sandstone, pale gold, pale orange, pale green or blue-green (Barret and Zhang 2009).

7.5.3 Toilets and personal care

Students felt that the toilets were unhygienic, unpleasant to use and aesthetically poor.

- Toilets should be decorated with a home-style atmosphere and preferably en-suite to allow the child to feel safe.

- A need for accessible WCs or consider the reorganisation of toilets in order to provide on accessible WC (size 2200 x 1500mm) (DfES Building Bulletin 99). For religious requirements, considerations should be made including orientation and ablutions.

7.5.4   Assembly

- Screens and projectors need to be placed to allow for pictures and demonstrations to be shown to students as 62% of students said they could not see the pictures or objects being shown during assembly.

- More exits need to be created for easy entry and exit

7.5.5   Soft play areas and outdoor classrooms

The schools assessed lacked green areas and several teachers complained of the unfriendly ambience felt on entry.

- Trees, fences, hedges, fields, grass, arcades, walkways need to be integrated into the school grounds to allow students to sit and socialise.

- A planting framework should be provided which integrate the various outdoor spaces, define and control access, and provide an atmosphere that is conducive to both work, imagination and play. To offset the building and enhance the sense of arrival, more formal colourful shrubs should be planted (Department of education 2009).

- A specific area should also be allocated for outdoor education. This should be partially paved and located in a sunny, quiet, sheltered position easily accessible from the building. Sloping sites may offer the opportunity to create a modest amphitheatre.

7.5.6   Quiet reflective outdoor areas

Children need quiet outdoor areas where they can read, eat their lunch or quietly play in small groups. These areas also have to be easily supervised but yet maintain a certain level of privacy for those who choose to be on their own.

7.6 Specialized learning spaces

7.6.1   Library

- The library needs to be enlarged to allow for walk-in students to use as they please. It is inadequate in size, aesthetics, furniture, layout and capacity.

- There needs to be more tables and chairs to cater to the large student enrolment. The library must have a sufficient amount of good natural light with additional full spectrum lighting and spot lights to highlight display

- Moveable screen dividers should be installed to allow for flexibility in arrangement and can provide surfaces for more display.

- Furniture needs to be adjustable and should be flexible to accommodate any arrangement. The library must incorporate quiet individual reading areas and provide soft furnishings such as sofas, padded chairs, floor cushions or rugs.

- The total area should be 10m2 plus 0.05m2 for every pupil (DfES Building Bulletin 99). All equipment and furnishings have to be replaced or renovated.

7.6.2   ICT suite

- All ICT suites need to be enlarged with a minimum of 30 desktop computers. The layout can be perimeter based layout with a central 'free' area for demonstrations, notes and discussions or a peninsula based layout where teaching and demonstrations can be done at ICT tables.

- All furniture and equipment must be adjustable to accommodate the various sizes and ages of the students.

- Tables should be extendable to allow for more work surfaces when needed. Such as taking notes tests and writing.

- Exposed cables and sockets need to be secured. Pin-up boards for procedures, announcements and safety rules need to be installed.

7.6.3   Music room

- Walls, ceilings, and floors need to be replaced with sound absorbing materials and all equipment must be replaced.

7.4.4 Art room

- All supplies need to be located nearby for easy access. The art room must extend into an outdoor area for messy projects and to allow students to draw and observe nature.

7.6.4   Science labs

Science labs need to be provided for as it was observed that none of the schools had one. This area needs to have a wet area, a kitchen and a store room for toxic materials and chemicals. The room must also have a specialist teacher supervising the students at all times.

Appendix F3: Recommendations

Recommendation for AISJ School

7.1 Academic Learning spaces

7.1.1 Classrooms

7.1.1.1 Furniture:

POE results revealed that furniture was inadequate.

- Schools need to purchase new furniture which is age appropriate and to set up a maintenance department for its upkeep as teachers and students complained of old and damaged furniture.

- Provide soft furnishings to create a cosy home-style ambience as it greatly impacts learning, productivity and creativity (Heath 2008).

- The furniture should include adjustable chairs and tables, padded chairs, lounge chairs, bean bags, couches and coffee tables (Building Bulletin 99).

- Furniture should also accommodate different types of environments within learning studios such as collaborative activities or individual work (Lueder and Rice 2008). For example, couches and coffee tables for small group meeting areas, desks and chairs for larger group instruction, bean bags and book corners for quiet reflective or individual learning (Heath 2008; Building Bulletin 99)

7.1.1.2 Lighting

Teachers and students mostly complained that the fluorescent lighting was dull and sterile.

- All classrooms should incorporate full-spectrum lighting and natural light with individual control to adjust to the needs of the classroom.

- There should be a variety of light settings. Directional spot light should be used to highlight areas such as display or the library corner.

- Group areas and work areas should also have drop lights to help create a sense of place and to highlight the task below.

- It was observed that a majority of classrooms had minimum windows and in many instances no windows. Classrooms require glazing to allow for natural light and extended views to the outside. The recommended glazing ratio (glazing area/wall area) should be 40% for the south side and 55% for the North side which also allows for a more evenly diffused day lighting effect (Frumkin, Geller, Nodvin, 2007).

- Installing clerestory windows admits light deeper into the back of the class. (Frumkin, Geller, Nodvin, 2007) (**Figure 4**). In addition windows should also have shades or louvers to control glare and direct sunlight (Frumkin, Geller, Nodvin, 2007)

7.1.2.8 Temperature

Poor classroom temperature was a consistent problem for both teachers and students. A temperatures range of 67F to 73F needs to be maintained and more importantly to be individually controlled to maintain comfort.

- Due to solar heat gain through surfaces, classrooms in Saudi Arabia should avoid being placed on the south side as it has considerable heat gain and maximum exposure to the sun.

- North side is preferable as it does not receive direct sunlight or heat most of the day (Barret and Zhang 2009)

- An important note should be added although abundance of natural light is preferable but large windows should be avoided as heat gain increases (Barret and Zhang 2009).

7.1.2.9 Acoustics

Students complained that their class was noisy and it was disturbed by external noise.

- The first step is that all sound related or noisy activities such as music rooms, play room or mechanical systems should be located away from learning spaces. (Frumkin, Geller, Nodvin, 2007; Lueder and Rice 2008; Barret and Zhang 2009)

- These spaces can be further protected by using sound insulation materials, heavy weight walls, or floating floors.

- A secondary option would be in carefully placing the sensitive areas near toilets, storage and corridors to act as a buffer for further noise protection and it also provides good separation (**Figure 5**).

- Within classrooms sound absorbent materials or double glazing can be used to change the sound characteristics of the space, particularly if used on ceilings and floor to control unwanted sound reverberation or transfer (Frumkin, Geller, Nodvin, 2007; Heath 2008; Barret and Zhang 2009).

- Installing acoustic tiles on the ceiling or carpets made of woven wool or tufted long pile can cover 60% of the surfaces drastically reducing reverberation (Smith 2002; Monk 2006; Lueder and Rice 2008) or by simply angling walls five degrees out of the parallel plane (Monk 2006).

- Wall treatments can be achieved by installing bookshelves, dividers, acoustic or plywood panels, gypsum boards and draperies to absorb more sound (Smith 2002; Lueder and Rice 2008).

- To assist in blocking exterior playground noise suspended ceilings, door and window seals and noise reduction windows are good solutions (Lueder and Rice 2008).

7.1.2.10 Air Quality

Teachers and students complained of various health problems due to poor ventilation such as asthma, allergies and headaches.

- Air ducts need to be cleaned regularly and if the building is old, air purifiers should be installed to counter the effects of poor mechanical systems. Mechanical ventilation systems need to be installed and CO_2 needs to be monitored in occupied areas (Department of education 2009)

- Windows in classrooms should have ventilation options such as small windows placed high on the wall to allow for control of high wind or small windows placed at bench height to cater to general ventilation throughout the year (DFES 2003).

- Ideally windows in classrooms should have various ventilation options to accommodate climate changes during the year.

-

7.1.2.10   Flexibility and variety

Classrooms make up the main body of school buildings. It was observed that classroom layout was restrictive and did not allow for various activities required to create a healthy learning environment.

- To maximize the flexibility of instructional clusters it is important to focus on creating a learner- centred classroom, allowing for multiple teaching and learning activities with flexible furniture arrangements (Monk 2006; Lueder and Rice 2008). To achieve this, a Learning studio or open plan model is a good solution.

Open plan classrooms and Learning studios:

Classrooms must provide for a variety of groups varying from small groups of 1-2 individuals, 4-6 members or the entire class of 20-25 students (Fielding and Nair 2005; Lueder and Rice 2008; Barrett and Zhang 2009).

- It is vital to have a third option for break-out sessions (Weinstein1979; Sanoff 2001).

- Open classroom should also have their own home-style toilets, kitchen area, generous range of storage, sink area, ICT and wireless, and a strong link to external areas (Dudek 2000, Fielding 2005 and Nair; Heath 2008).

- To maximize flexibility, moveable screens or furniture can be used to create different layouts allowing for a variety of activities to take place. Sliding partitions between rooms is also a good solution allowing team teaching provided they are acoustically effective (DfES Building bulletin 99)

7.1.2.11   Colours and aesthetics

Teachers stated that colour was important in providing inspiring interiors and complained of the dull and sterile atmosphere.

- Colours and interiors need to be child friendly and visually pleasing. Nursery and elementary require warm and bright colour schemes as it complements their extrovert nature (Engelbrecht 2003), reducing tension, nervousness and anxiety (Barret and Zhang 2009). Light salmon, soft warm-yellow, pale yellow-orange, coral and peach are preferable where colours of opposite temperatures should be introduced as accents (Barret and Zhang 2009).

7.1.2.12 Responsive classrooms and learning clusters

As stated in the literature review, interior-exterior connections are an important design pattern for classrooms.

- All classes must extend into outdoor areas as seeing things in real life outside of class are more effective (Dufult, Dyck, Jackson 2008).

- In order to create ideal Learner-centred environments and responsive to the needs of the students, all classrooms should be adjacent to science labs, toilet facilities, breakout areas, shared areas, collaboration spaces and lockers. (Sanoff 2001, Dufult, T., Dyck, J., Jackson, J., 2008).

7.1.1.9 Classroom size and layout.

1/3 of the students and almost 50% of the teachers both complained of small and crowded classes leading to noisy, aggressive and cramped classrooms. An ideal capacity is 15-18 students per class.

- Classrooms with 22-25 student capacity need to be enlarged between 95.7 to 135 square meters (Building bulletin 82).

7.1.1.10 Storage for student bags and personal belongings

Teachers and students complained of not enough space for bags and student belongings. They considered it a safety hazard as bags were placed in main circulation areas creating tripping accidents. It is important to provide appropriate storage facilities such as hooks or cubby holes within the classroom or at the entry for quick and easy access. An allocated area of 15 square meters must be allocated for this purpose.

7.1.1.11 Display

Teachers complained that the display boards were not enough and that it was difficult to keep work on the walls as they were required to use tape.

- A good solution is to eliminate framed display areas and install floor to ceiling height soft chip boards. This ensures that teachers and students can pin-up work efficiently, independently and within a minimum amount of time.

7.1.1.12 Resources and technology

- All classes must have integrated technology with at least two desktops computers, laptops or tablets for research.

- Wireless network access should be installed as it allows for more flexibility in classes.

- Interactive smart boards should also be installed for students and teachers (DfES Building Bulletin 99).

7.1.1.13 Barrier-free

Classrooms need to consider wheel-chair users as 2/3 of the schools did not provide barrier-free classrooms.

- Wide doors must be installed with vision panels from a height of 500mm to enable wheelchair users to see and be seen and that desks and location are adjusted to accommodate wheel chair users.

7.1.3   PE and sports changing rooms

- Suitable safe paving should be provided with markings for physical education play. Indoor sports facilities need to be well stocked with sports equipment located nearby for easy access.

- Changing rooms must be provided for and located nearby with separate stalls to ensure privacy for the students with curtains or doors.

- Girls and boys changing rooms should be separate.

7.2 Building features

7.2.1 Building Scale

A child-oriented environment can be successfully created by lowering the heights of the windows to bench height of the children (Barret and Zhang 2009) reducing door heights, adjust door handle height, shelf heights and dropping ceiling heights to 2.9 meters. Other considerations can be stairs, railings and furniture.

- Appropriate size and scale of buildings, its exterior elements and interior spaces, make it possible for pupils to use spaces independently and enhances ownership (Barret and Zhang 2009).

7.2.2 Attractive and visually pleasing school

A common complaint by students and teachers were the dull and uninspiring interiors and exteriors.

- Building facades may be painted strong colours from warm to hot paired colours to negate the negative effects of the hot humid weather (Barret and Zhang 2009).
- Other design features that can be used to create diversity and involvement are canopies to play under, pathways for circulation, courtyards, bridges, fountains, or simply using contrasting materials such as glass and wood (Barret and Zhang 2009).
- Other solutions to be considered; uniform texture or distinctive repetitive elements and replication of facade features like timber arches throughout the building as a motif or large glazed windows as a main feature (Barret and Zhang 2009).

7.2.3 Barrier-free

Majority of the schools assessed did not make any considerations for special needs or disabled children.

- The school must provide access to the buildings from point of entrance with a convenient vehicle setting-down point with dropped ramped footpath kerb and level access at the main entrance to the building (Department of education 2009).
- All buildings should be installed with an elevator to provide access to each floor.
- Raised pathways and steps must have an alternate ramp provided and thresholds should either be removed or sloped.

7.2.4 Signage and information

It is important that every facility and room is appropriately labelled. Signage to assist in directing visitors and new students to the necessary areas such as administration, auditorium, sports area and classrooms must be incorporated.

7.7 Support spaces

7.7.1 Corridors and hallways

Although many of the corridors and hallways were sufficiently wide but were ineffectively used.

- Hallways should allow for personal spaces, display boards, book shelves and notice boards. Colour schemes should be applied to make hallways attractive and offer the school a distinctive personality (Engelbrecht 2003).

- The hue maybe lively where each floor can be differently treated or complementary colour schemes of light orange walls offset by blue doors or light-green wall with lower chroma red doors (Barret and Zhang 2009).

7.7.2 Student dining

Student dining and casual eating areas need to be renovated as students considered it a poor place to eat and that there was not enough place to sit comfortably. It was also considered extremely noisy, uncomfortable and dirty.

- The school needs to enlarge the dining area and create a variety of seating arrangements and furniture styles; Built-in banquettes and moveable tables and chairs for formal eating or comfortable soft furnishings for casual snacks and drinks.

- The dining areas can offer more seating areas by extending it into an outdoor area with shaded picnic tables.

- Soft furnishings, rugs, acoustic tiles on the ceiling, vinyl floating floors, and textured walls can be used to absorb some of the noise levels. To block sound of dragging furniture, rubber pads should be placed on all table and chair legs.

- Interiors should be based on cafe style ambience with attractive colours. It can be intense, aggressive and brighter than the other spaces. Light red-orange, pale-yellow, warm-yellow, apricot, or pale green are good dominant wall colours and blue, blue-green are strong colours for accents. Laminated table tops maybe in wood grain or colours that may stimulate appetite such as warm red, oranges, warm yellow or clear green. Floors should be light for cleanliness purposes (Barret and Zhang 2009)

7.7.3   Teachers lounge

Teachers complained that their lounges were inadequate, uncomfortable and without enough resources.

- This space must allow teachers to function as professionals by providing phones, fax machines, printers, internet, and computers.

- An accessible and current teachers' library may also be incorporated into the lounge.

- The lounge must be located and easily accessible from the main entrance. Preferably it should allow for supervision of the main playground (Department of education).

- There should be a minimum of 2 external landlines in addition to the various building service lines. Extensions should be provided in all the rooms (Department of education).

- The furniture should allow for work spaces and to relax during their breaks by providing home-style comfortable furniture such as sofas and coffee tables. Colours can also be used to enhance the ambience. In offices where concentration is required, cool hues are preferred however; in general the choice of warm or cool hues depends on preference. Recommended colours could range from soft yellows, sandstone, pale gold, pale orange, pale green or blue-green (Barret and Zhang 2009).

7.7.4   Toilets and personal care

Students felt that the toilets were unhygienic, unpleasant to use and aesthetically poor.

- Toilets should be decorated with a home-style atmosphere. A cleaning crew must be hired for regular cleaning and maintenance.

- More restroom facilities need to be added. One toilet for every 20 pupils aged 6-11 and washbasins should equal the number of sanitary fittings.

- A need for accessible WCs or consider the reorganisation of toilets in order to provide on accessible WC (size 2200 x 1500mm) (DfES Building Bulletin 99).

- There should be two staff toilets for the first 25 full-time staff members and one for every further 25 (DfES Building Bulletin 99). For religious requirements, considerations should be made including orientation and ablutions.

7.7.5   Assembly

An assembly area needs to be provided for students to enable large scale congregations.

* It should be large enough to cater to 400 students.

* It should be provided with a projector and large screen to allow all the students to see images and demonstrations

* It needs a good sound system so that children can easily hear announcements

* Acoustical treatment will also need to be provided. Preferably carpet tiled floors, soft furnishings, acoustic tiles on the ceilings and soft wall treatments.

7.7.6   Hard play surfaces and Playground

* For every 5 classes there needs to be 2 paved spaces at 350 square meters for healthy and active play.

* These spaces should have a smooth durable, non-slip surface with adequate drainage, reasonably informal and if possible located where there are no shadows from buildings.

* Furniture should be created through natural materials which blend into the landscape. There should be varied stimulating colours, texture, patterns, shapes and sizes (DfES Building Bulletin 71).

7.7.7   Soft play areas and outdoor classrooms

Several teachers complained of unfriendly ambience felt on entry.

* Trees, fences, hedges, fields, grass, arcades, walkways need to be integrated into the school grounds to allow students to sit and socialise.

* A planting framework should be provided which integrate the various outdoor spaces, define and control access, and provide an atmosphere that is conducive to both work, imagination and play. To offset the building and enhance the sense of arrival, more formal colourful shrubs should be planted (Department of education 2009).

- A specific area should also be allocated for outdoor education. This should be partially paved and located in a sunny, quiet, sheltered position easily accessible from the building.

7.7.8 Resource areas

Where possible, classrooms should be extended to provide for small resource areas for various activities such as watching videos, using computers, slides and tapes.

- A cluster of classrooms may also share a common resource area. The recommended size is 40 square meters with a height clearing of 2.7 square meters. These areas should have at least two 6m2 storerooms for teachers' supplies and equipment.

7.7.9 Access and inclusion

Students with speech, language, learning difficulties, physical disabilities or SEN must be included into the mainstream schools.

- To ensure inclusiveness multi-purpose small group rooms for specialist teaching and student support must be added.

- Group sizes for children with severe to profound needs should range between six and eight with one teacher and can range in area between 200-400 square meters (DfES Building Bulletin 102).

- These classes must included learning aids, ICT and specialist furniture, fittings and equipment such as interactive whiteboards, adapted keyboards and touch screen.

- The interiors need to provide a calming background using colour, light, sound texture and in certain instances aroma therapy. Children with SEN can be easily distracted so location of the rooms must be placed in quiet areas (DfES Building Bulletin 102).

7.7.10 Quiet reflective outdoor areas

Children need quiet outdoor areas where they can read, eat their lunch or quietly play in small groups. These areas also have to be easily supervised but yet maintain a certain level of privacy for those who choose to be on their own.

7.7.11 Shared Areas and Activity Pockets

Students need to have shared areas and activity pockets where they can work in small groups for their projects. These areas also provide an opportunity for children to socialize and interact. Activity pockets also need to provided for as areas where children are free to use these spaces as they please to encourage ownership.

7.7.12 Quiet Areas

Students had no areas where they could be on their own. Quiet indoor areas are an essential component in effective learning environments where students can work at their own pace independently. These areas can be used for quiet reflection, reading, working or studying. They need to be placed in quiet zones away from high traffic areas but also need to be placed to maintain easy sightlines for supervision.

7.8 Specialized learning spaces

7.8.1 Library

The library must have a sufficient amount of good natural light with additional full spectrum lighting and spot lights to highlight display

- Moveable screen dividers should be installed to allow for flexibility in arrangement and can provide surfaces for more display.
- Furniture needs to be adjustable and should be flexible to accommodate any arrangement.
- The library must incorporate quiet individual reading areas and provide soft furnishings such as sofas, padded chairs, floor cushions or rugs.
- The total area should be 10m2 plus 0.05m2 for every pupil (DfES Building Bulletin 99). All equipment and furnishings have to be replaced or renovated.

7.8.2 ICT suite

- All ICT suites need to be enlarged with a minimum of 30 desktop computers.

- The layout can be perimeter based layout with a central 'free' area for demonstrations, notes and discussions or a peninsula based layout where teaching and demonstrations can be done at ICT tables.

- All furniture and equipment must be adjustable to accommodate the various sizes and ages of the students.

- Tables should be extendable to allow for more work surfaces when needed. Such as taking notes tests and writing.

- Exposed cables and sockets need to be secured. Pin-up boards for procedures, announcements and safety rules need to be installed.

- ICT pods also need to be provided throughout the school to assist students to research and work in small independent groups.

- Dispersed technology is a key component in effective learning environments such as wireless access, small ICT pods with at least 6 PCs, laptops and free entry computer stations that can be accessed freely by the students.

7.8.3 Music room

The room must be re-located to an isolated area so as not to disturb learning areas. Walls, ceilings, and floors need to be replaced with sound absorbing materials and all equipment must be replaced. Music rooms need to be well equipped with various instruments and small practice rooms for individual use.

7.4.4 Art room

- New equipment and supplies need to be purchased and old furnishings to be replaced.

- Furniture needs to be adjustable to accommodate the various ages and sizes of students.

- A wet area needs to be installed and maximum glazing is required to allow natural light to enter the space.

- All supplies need to be located nearby for easy acces. The art room must extend into an outdoor area for messy projects and to allow students to draw and observe nature.

7.8.4   Science labs

Science labs need to be provided.

- This area needs to have a wet area, a kitchen and a store room for toxic materials and chemicals.
- The room must also have a specialist teacher supervising the students at all times.

Appendix F4: Recommendations

Recommendation for MJIS School

7.1 Academic Learning spaces

7.1.1 Classrooms

7.1.1.1 Furniture:

POE results revealed that furniture was inadequate.

- Schools need to purchase new furniture which is age appropriate and to set up a maintenance department for its upkeep as teachers and students complained of old and damaged furniture.

- Provide soft furnishings to create a cosy home-style ambience as it greatly impacts learning, productivity and creativity (Heath 2008).

- The furniture should include adjustable chairs and tables, padded chairs, lounge chairs, bean bags, couches and coffee tables (Building Bulletin 99).

- Furniture should also accommodate different types of environments within learning studios such as collaborative activities or individual work (Lueder and Rice 2008). For example, couches and coffee tables for small group meeting areas, desks and chairs for larger group instruction, bean bags and book corners for quiet reflective or individual learning (Heath 2008; Building Bulletin 99)

7.1.1.2 Lighting

Teachers and students mostly complained that the fluorescent lighting was dull and sterile.

- All classrooms should incorporate full-spectrum lighting and natural light with individual control to adjust to the needs of the classroom.

- There should be a variety of light settings. Directional spot light should be used to highlight areas such as display or the library corner.

- Group areas and work areas should also have drop lights to help create a sense of place and to highlight the task below.

- It was observed that a majority of classrooms had minimum windows and in many instances no windows. Classrooms require glazing to allow for natural light

and extended views to the outside. The recommended glazing ratio (glazing area/wall area) should be 40% for the south side and 55% for the North side which also allows for a more evenly diffused day lighting effect (Frumkin, Geller, Nodvin, 2007).

- Installing clerestory windows admits light deeper into the back of the class. (Frumkin, Geller, Nodvin, 2007) (**Figure 4**). In addition windows should also have shades or louvers to control glare and direct sunlight (Frumkin, Geller, Nodvin, 2007)

7.1.3.3 Temperature

Poor classroom temperature was a consistent problem for both teachers and students. A temperatures range of 67F to 73F needs to be maintained and more importantly to be individually controlled to maintain comfort.

- Due to solar heat gain through surfaces, classrooms in Saudi Arabia should avoid being placed on the south side as it has considerable heat gain and maximum exposure to the sun. North side is preferable as it does not receive direct sunlight or heat most of the day (Barret and Zhang 2009)

- An important note should be added although abundance of natural light is preferable but large windows should be avoided as heat gain increases (Barret and Zhang 2009).

7.1.3.4 Acoustics

Students complained that their class was noisy and it was disturbed by external noise.

- The first step is that all sound related or noisy activities such as music rooms, play room or mechanical systems should be located away from learning spaces. (Frumkin, Geller, Nodvin, 2007; Lueder and Rice 2008; Barret and Zhang 2009)

- Further protection can be provided by using sound insulation materials, heavy weight walls, or floating floors.

- A secondary option would be in carefully placing the sensitive areas near toilets, storage and corridors to act as a buffer for further noise protection and it also provides good separation (**Figure 5**).

- Within classrooms sound absorbent materials or double glazing can be used to change the sound characteristics of the space, particularly if used on ceilings and floor to control unwanted sound reverberation or transfer (Frumkin, Geller, Nodvin, 2007; Heath 2008; Barret and Zhang 2009). Installing acoustic tiles on the ceiling or carpets made of woven wool or tufted long pile can cover 60% of the surfaces drastically reducing reverberation (Smith 2002; Monk 2006; Lueder and Rice 2008) or by simply angling walls five degrees out of the parallel plane (Monk 2006).

- Wall treatments can be achieved by installing bookshelves, dividers, acoustic or plywood panels, gypsum boards and draperies to absorb more sound (Smith 2002; Lueder and Rice 2008). To assist in blocking exterior playground noise suspended ceilings, door and window seals and noise reduction windows are good solutions (Lueder and Rice 2008).

7.1.3.5 Air quality

Teachers and students complained of various health problems due to poor ventilation such as asthma, allergies and headaches.

- Mechanical ventilation systems need to be installed and CO_2 needs to be monitored in occupied areas (Department of education 2009)

- Windows in classrooms should have ventilation options such as small windows placed high on the wall to allow for control of high wind or small windows placed at bench height to cater to general ventilation throughout the year (DFES 2003). Ideally windows in classrooms should have various ventilation options to accommodate climate changes during the year.

7.1.3.6 Learning neighbourhoods and communities

Classrooms need to be arranged and located in relation to year group. Year 6 classes should not be located near year 1. Random location of classes demoralizes students especially when a class that used to be used for year 1 is now being used by 6th

graders. Students need to feel a sense of achievement and accomplishment as the progress to the next level.

- Each year group needs to be located near to each other and form their own learning community preferably with their own resource area, shared areas, toilets, display and ICT pods.

7.1.3.7 Flexibility and variety

Classrooms make up the main body of school buildings. It was observed that classroom layout was restrictive and did not allow for various activities required to create a healthy learning environment.

- To maximize the flexibility of instructional clusters it is important to focus on creating a learner- centred classroom, allowing for multiple teaching and learning activities with flexible furniture arrangements (Monk 2006; Lueder and Rice 2008). To achieve this, a Learning studio or open plan model is a good solution.

c. Open plan classrooms and Learning studios:

- Classrooms must provide for a variety of groups varying from small groups of 1-2 individuals, 4-6 members or the entire class of 20-25 students (Fielding and Nair 2005; Lueder and Rice 2008; Barrett and Zhang 2009).
- It is vital to have a third option for break-out sessions (Weinstein1979; Sanoff 2001).
- Open classroom should also have their own home-style toilets, kitchen area, generous range of storage, sink area, ICT and wireless, and a strong link to external areas (Dudek 2000, Fielding 2005 and Nair; Heath 2008).
- To maximize flexibility, moveable screens or furniture can be used to create different layouts allowing for a variety of activities to take place. Sliding partitions between rooms is also a good solution allowing team teaching provided they are acoustically effective (DfES Building bulletin 99)

7.1.3.8 Colours and aesthetics

Teachers stated that colour was important in providing inspiring interiors and complained of the dull and sterile atmosphere.

- Colours and interiors need to be child friendly and visually pleasing. Nursery and elementary require warm and bright colour schemes as it complements their extrovert nature (Engelbrecht 2003), reducing tension, nervousness and anxiety (Barret and Zhang 2009).

- Light salmon, soft warm-yellow, pale yellow-orange, coral and peach are preferable where colours of opposite temperatures should be introduced as accents (Barret and Zhang 2009).

7.1.3.9 Responsive classrooms and learning clusters

As stated in the literature review, interior-exterior connections are an important design pattern for classrooms.

- All classes must extend into outdoor areas as seeing things in real life outside of class are more effective (Dufult, Dyck, Jackson 2008).

- In order to create ideal Learner-centred environments and responsive to the needs of the students, all classrooms should be adjacent to science labs, toilet facilities, breakout areas, shared areas, collaboration spaces and lockers. (Sanoff 2001, Dufult, T., Dyck, J., Jackson, J., 2008).

7.1.1.9 Classroom size and layout.

Teachers and students both complained of small and crowded classes leading to noisy, aggressive and cramped classrooms. An ideal capacity is 15-18 students per class.

- Classrooms with this capacity need to be enlarged between 95.7 to 135 square meters (Building bulletin 82).

7.1.1.10 Storage for student bags and personal belongings

Teachers and students complained of not enough space for bags and student belongings. They considered it a safety hazard as bags were placed in main circulation areas creating tripping accidents.

- It is important to provide appropriate storage facilities such as hooks or cubby holes within the classroom or at the entry for quick and easy access. An allocated area of 15 square meters must be allocated for this purpose.

7.1.1.11 Display

Teachers complained that the display boards were not enough and that it was difficult to keep work on the walls as they were required to use tape.

- A good solution is to eliminate framed display areas and install floor to ceiling height soft chip boards. This ensures that teachers and students can pin-up work efficiently, independently and within a minimum amount of time.

7.1.1.12 Resources and technology

All classes must have integrated technology with at least two desktops computers, laptops or tablets for research.

- Wireless network access should be installed as it allows for more flexibility in classes.

- Interactive smart boards should also be installed for students and teachers (DfES Building Bulletin 99) .

7.1.1.13 Barrier-free

Classrooms need to consider wheel-chair users 2 out of 3 schools did not provide barrier-free classrooms.

- Wide doors must be installed with vision panels from a height of 500mm to enable wheelchair users to see and be seen and that desks and location are adjusted to accommodate wheel chair users.

7.1.4   PE and sports changing rooms

Indoor and outdoor areas for physical education need to be provided.

- Indoor sports hall or gymnasium that is well equipped with provisions for gymnastics, exercise, stretching and endurance, located nearby for easy access.

- Suitable safe paving should be provided with markings for outdoor physical education play such as basket ball, football or volleyball.

- Changing rooms must be provided for and located nearby with separate stalls to ensure privacy for the students with curtains or doors. Girls and boys changing rooms should be separate.

7.2 Building features

7.2.1 Building Scale

A child-oriented environment can be successfully created by lowering the heights of the windows to bench height of the children (Barret and Zhang 2009) reducing door heights, adjust door handle height, shelf heights and dropping ceiling heights to 2.9 meters. Other considerations can be stairs, railings and furniture.

- Appropriate size and scale of buildings, its exterior elements and interior spaces, make it possible for pupils to use spaces independently and enhances ownership (Barret and Zhang 2009).

7.2.2 Attractive and visually pleasing school

A common complaint by students and teachers were the dull and uninspiring interiors and exteriors.

- Building facades may be painted strong colours from warm to hot paired colours to negate the negative effects of the hot humid weather (Barret and Zhang 2009).

- Other design features that can be used to create diversity and involvement are canopies to play under, pathways for circulation, courtyards, bridges, fountains, or simply using contrasting materials such as glass and wood (Barret and Zhang 2009).

- Uniform texture or distinctive repetitive elements and replication of facade features like timber arches throughout the building as a motif or large glazed windows as a main feature can be provided (Barret and Zhang 2009).

7.2.3 Barrier-free

Majority of the schools assessed did not make any considerations for special needs or disabled children.

- The school must provide access to the buildings from point of entrance with a convenient vehicle setting-down point with dropped ramped footpath kerb and level access at the main entrance to the building (Department of education 2009).

- All buildings should be installed with an elevator to provide access to each floor. Raised pathways and steps must have an alternate ramp provided and thresholds should either be removed or sloped.

7.2.4 Signage and information

It is important that every facility and room is appropriately labelled. Signage to assist in directing visitors and new students to the necessary areas such as administration, auditorium, sports area and classrooms must be incorporated.

7.2.5 Common Display areas

Common areas, halls, and public areas should accommodate student display.

- These displays should be used for student achievement, rules, current events, and work that is being done within the classrooms. It not only allows students a sense of pride but provides visitors and parents with information on the signature of the school and what is being achieved in class by their children.

7.9 Support spaces

7.9.1   Corridors and hallways

Although many of the corridors and hallways were sufficiently wide but were ineffectively used.

- Hallways should allow for personal spaces, display boards, book shelves and notice boards.
- Colour schemes should be applied to make hallways attractive and offer the school a distinctive personality (Engelbrecht 2003). The hue maybe lively where each floor can be differently treated or complementary colour schemes of light orange walls offset by blue doors or light-green wall with lower chroma red doors (Barret and Zhang 2009)

7.9.2   Student dining

Student dining needs to be provided to allow a comfortable place to have their lunch and an opportunity to socialize with their friends.

- This dining area can also be extended into an outdoor area with shaded picnic tables.

- Soft furnishings, rugs, acoustic tiles on the ceiling, vinyl floating floors, and textured walls can be used to absorb some of the noise levels. To block sound of dragging furniture, rubber pads should be placed on all table and chair legs.

- Interiors should be based on cafe style ambience with attractive colours. It can be intense, aggressive and brighter than the other spaces. Light red-orange, pale-yellow, warm-yellow, apricot, or pale green are good dominant wall colours and blue, blue-green are strong colours for accents.

- Laminated table tops maybe in wood grain or colours that may stimulate appetite such as warm red, oranges, warm yellow or clear green.

- Floors should be light for cleanliness purposes (Barret and Zhang 2009)

7.9.3   Teachers lounge

Teachers complained that their lounges were inadequate, uncomfortable and without enough resources.

- This space must allow teachers to function as professionals by providing phones, fax machines, printers, internet, and computers.

- An accessible and current teachers' library may also be incorporated into the lounge. The lounge must be located and easily accessible from the main entrance. Preferably it should allow for supervision of the main playground (Department of education).

- There should be a minimum of 2 external landlines in addition to the various building service lines. Extensions should be provided in all the rooms (Department of education).

- The furniture should allow for work spaces and to relax during their breaks by providing home-style comfortable furniture such as sofas and coffee tables. Colours can also be used to enhance the ambience.

- In offices where concentration is required, cool hues are preferred however; in general the choice of warm or cool hues depends on preference. Recommended colours could range from soft yellows, sandstone, pale gold, pale orange, pale green or blue-green (Barret and Zhang 2009).

7.9.4 Toilets and personal care

Students felt that the toilets were unhygienic, unpleasant to use and aesthetically poor.

- Toilets should be decorated with a home-style atmosphere.

- A cleaning crew must be hired for regular cleaning and maintenance.

- A need for accessible WCs or consider the reorganisation of toilets in order to provide on accessible WC (size 2200 x 1500mm) (DfES Building Bulletin 99).

- There needs to be separate toilets for teachers. Two staff toilets for the first 25 full-time staff members and one for every further 25 (DfES Building Bulletin 99).

- For religious requirements, considerations should be made including orientation and ablutions.

7.9.5 Assembly

- Screens and projectors need to be placed to allow for pictures and demonstrations to be shown to students as they could not see the pictures or objects being shown during assembly.

- The assembly area needs to be acoustically treated as it is the main source of distraction and disturbance due to echo and sound reverberation.

7.9.6 Hard play surfaces and Playground

Hard play surfaces and play ground need to be added to this school as it has not been provided.

- For every 5 classes there needs to be 2 paved spaces at 350 square meters for healthy and active play.

- These spaces should have a smooth durable, non-slip surface with adequate drainage, reasonably informal and if possible located where there are no shadows from buildings.

- Furniture should be created through natural materials which blend into the landscape. There should be varied stimulating colours, texture, patterns, shapes and sizes (DfES Building Bulletin 71).

7.9.7 Soft play areas and outdoor classrooms

No green areas have been provided at this school and several teachers complained of the unfriendly ambience felt on entry.

- Trees, fences, hedges, fields, grass, arcades, walkways need to be integrated into the school grounds to allow students to sit and socialise.
- A planting framework should be provided which integrate the various outdoor spaces, define and control access, and provide an atmosphere that is conducive to both work, imagination and play.
- To offset the building and enhance the sense of arrival, more formal colourful shrubs should be planted (Department of education 2009).
- A specific area should also be allocated for outdoor education. This should be partially paved and located in a sunny, quiet, sheltered position easily accessible from the building.

7.9.8 Resource areas

Where possible, classrooms should be extended to provide for small resource areas for various activities such as watching videos, using computers, slides and tapes.

- A cluster of classrooms may also share a common resource area. The recommended size is 40 square meters with a height clearing of 2.7 square meters. These areas should have at least two 6m2 storerooms for teachers' supplies and equipment.

7.9.9 Access and inclusion

Students with speech, language, learning difficulties, physical disabilities or SEN must be included.

- To ensure inclusiveness multi-purpose small group rooms for specialist teaching and student support must be added.

- Group sizes for children with severe to profound needs should range between six and eight with one teacher and can range in area between 200-400 square meters (DfES Building Bulletin 102).

- These classes must included learning aids, ICT and specialist furniture, fittings and equipment such as interactive whiteboards, adapted keyboards and touch screen.

- The interiors need to provide a calming background using colour, light, sound texture and in certain instances aroma therapy. Children with SEN can be easily distracted so location of the rooms must be placed in quiet areas (DfES Building Bulletin 102).

7.9.10 Quiet reflective outdoor areas

Children need quiet outdoor areas where they can read, eat their lunch or quietly play in small groups. These areas also have to be easily supervised but yet maintain a certain level of privacy for those who choose to be on their own.

7.9.11 Shared Areas and Activity Pockets

Students need to have shared areas and activity pockets where they can work in small groups for their projects.

- These areas also provide an opportunity for children to socialize and interact.

- Activity pockets also need to provided for as areas where children are free to use these spaces as they please to encourage ownership.

7.9.12 Quiet Areas

Students had no areas where they could be on their own. Quiet indoor areas are an essential component in effective learning environments where students can work at their own pace independently. These areas can be used for quiet reflection, reading, working or studying.

- They need to be placed in quiet zones away from high traffic areas but also need to be placed to maintain easy sightlines for supervision.

7.9.13 Centrally located Administration

A centrally located administration area must be provided. The head teachers, deputy head teachers and assistants and other offices need to be located near the entry for easy access for visitors and students.

7.9.14 Centrally located Reception

A reception area must be provided and centrally located as the first contact for visitors.

- The reception area must have at least 2 external landlines and 1 internal line.
- Equipment such as printer, fax machine and photocopier should also be placed nearby.
- A small storage area for the employees belongings and other storage requirements.

7.10 Specialized learning spaces

7.10.1 Library

An independent library for key stage 2 children needs to be provided.

- The library must have a sufficient amount of good natural light with additional full spectrum lighting and spot lights to highlight display.
- Moveable screen dividers should be installed to allow for flexibility in arrangement and can provide surfaces for more display.
- Furniture needs to be adjustable and should be flexible to accommodate any arrangement.
- The library must incorporate quiet individual reading areas and provide soft furnishings such as sofas, padded chairs, floor cushions or rugs.
- The total area should be 10m2 plus 0.05m2 for every pupil (DfES Building Bulletin 99). All equipment and furnishings have to be replaced or renovated.

7.10.2 ICT suite

The ICT suite must have internet access with access to printers and screens for demonstrations.

- At least 30 PC should be provided for so no two students are required to share.

- All furniture and equipment must be adjustable to accommodate the various sizes and ages of the students.

- Tables should be extendable to allow for more work surfaces when needed. Such as taking notes tests and writing.

- Exposed cables and sockets need to be secured.

- Pin-up boards for procedures, announcements and safety rules need to be installed.

- Teachers require storage for resources and supplies.

7.10.3 Art room

- New equipment and supplies need to be purchased and old furnishings to be replaced.

- Furniture needs to be adjustable to accommodate the various ages and sizes of students.

- A wet area needs to be installed and maximum glazing is required to allow natural light to enter the space.

- All supplies need to be located nearby for easy access.

- The art room must extend into an outdoor area for messy projects and to allow students to draw and observe nature.

7.10.4 Science labs

Science labs need to be provided for as it was observed that none of the schools had one.

- This area needs to have a wet area, a kitchen and a store room for toxic materials and chemicals. The room must also have a specialist teacher supervising the students at all times.