School Safety Architecture – How to Measure Perceptions of Safeness

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Introduction

Housing children during their school-going years has been a challenge for the longest of times. However, our society is changing and becoming increasingly volatile with shorter attention spans due to, amongst other causes, social media. The associated cost of juvenile delinquency because of children dropping out of school is hard to estimate, but nevertheless very unwelcome. In this period of economic crisis, some educational programs are facing severe cuts. This demands an even more precise insight into the hardware of education, that is, the physical buildings themselves. Being made of bricks and mortar, they are not subject to down-sizing once constructed.

A specific design (Primary and Secondary School with Child Day Care and Community Centre for the Caribbean island of Bonaire) is the basis of this research proposal and allows research to be carried out on how to optimize the spatial setting for providing basic education [1].

The hypothesis states that optimum physical surroundings, in combination with its program, will compensate for the sense of danger, or better put, enhances the feeling of being comfortable and at home [2].

Research questions

The questions to be considered are:

- To what extent can a virtual design model reflect the actual building constructed?
- How can access control be implemented without hampering a free flow of activities?
- To which degree does the orientation of the building with respect to its surroundings enhance a sense of safety?
- Does overview of activities (visibility) with respect to the building in all cases improve the notion of safeness?
- In terms of safety (and durability!), can functions be distributed and mixed in diverse ways throughout the building?
- To what extent does limiting the interaction between different age groups during class hours and breaks induce a sense of safety due to the limited number of pupils present?
- Does optimizing the situation require complete or partial separation of the children and therefore zoning the building into specific entities [3] and [4]?

Type of research

The research involved is empirical with an inductive approach. Based on specific observations of behaviour, an attempt will be made to deduce general rules, on the one hand. On the other, it is assumed, as a deductive hypothesis, that clever separation of school-going children will enhance their feeling of safety. Also, overview in spatial surroundings generally seems to be appreciated.

The research will consist of questionnaires filled in at specific intervals, while subjects (children of various age groups) explore the virtual environment. A survey will therefore be combined with a case study in order to test

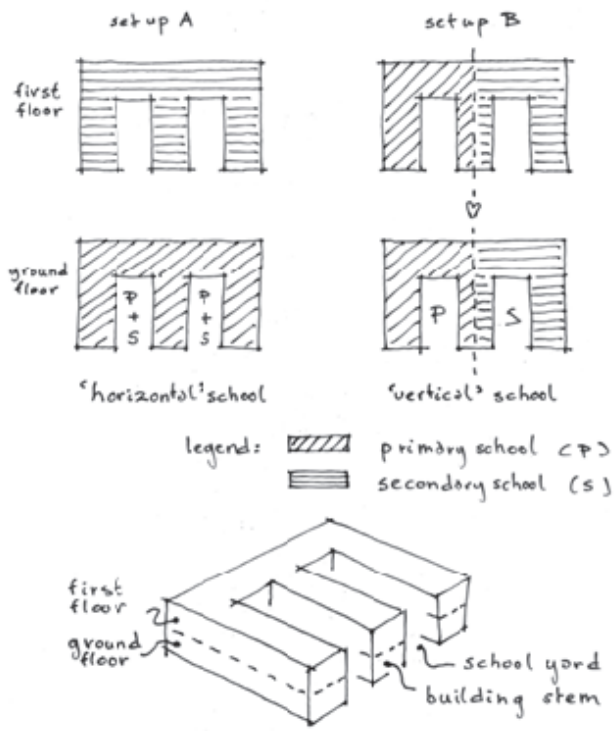


Figure 1. Distribution of classes to be examined.

the hypothesis. For instance, subjects will have to fill in forms on how safe (on a scale of five) they judge the space they virtually wander trough. Or how they appreciate having access to just one half or just one floor of the building. Recording of behaviour during the simulated process of passing through and exploring the virtual architectural space will provide an insight into the psychological perception of spatial information. In this process the subjects physical condition, that is, their eye movement, perspiration and heart rate are measured to register a corresponding level of anxiety. Depending on the number of measurements, the research will primarily be qualitative in nature in the sense that no absolute values can be determined. Only limited statistical calculations will therefore be necessary.

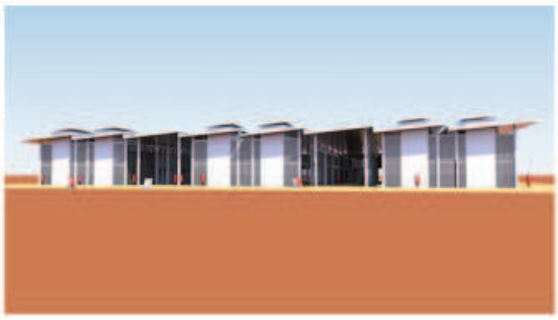
The objective is, of course, to achieve a neutral result by applying an appropriate methodology and precise focus.

Research methodology

Precise measurements can be achieved by working with distinct groups. The subjects will consist of:

1. Children attending primary school.
2. Children attending secondary school.
3. Children and teacher at primary school.
4. Children and teacher at secondary school.

Within a given timeframe, subjects within a group will explore the virtual models of the school and respond to specific questions put to them. Set-ups A and B will be investigated and then compared.




Figures 2 and 3. Draft school design including community centre (2549 m2).

Set-up A, the *horizontal* school: the horizontal first floor separates the school into Primary and Secondary sections. There will be no interaction between the two age groups during class. During the breaks both inner school yards are used by both groups, and all children have the possibility of interacting.

Set-up B, the *vertical* school: a vertical separation along the alley of the inner stem divides the school into the two age groups. In the stem, it is inevitable that a limited amount of interaction will take place during changes of class. During breaks the two age groups have their own square to themselves.

All subjects will work alone first and then together (with their teachers) during the test. It may be necessary to combine the different groups but this will depend on the results of the initial tests. Moreover, relevant questions will be put regarding comfort and orientation – i.e. the mental condition of subjects before and after the tests – with the answers being compared with the actual behaviour of the subjects [5] and [6].

Naturally, parents of young children will have to consent with the latter participation in this project.

Implementation of research

The present architectural Preliminary Design (see below) will be further converted into a semi-realistic environment using advanced visualization and gaming techniques, including sound characteristics of the visited artificial space.

Subjects will explore the interior environment – either individually or in groups – by means of computer interfaces. They will interact with computer screens while sitting on specially wired chairs at gaming consoles. This can be done, for instance, at the advanced gaming facilities at University of Twente (T-Xchange).

This method (registration of mental decisions and physical condition) will make it possible to measure the mental process of safety assessments.

General constraints

A realistic model is at stake, where the yet to be made Final Design will be converted into a real-life visualization;

A representative measurement (large enough number and appropriate groups of subjects) is required to establish sufficient accuracy;

Applicability should also be part of the outcome, i.e. the results must be convertible into a usable protocol for professional architects.

Keywords. architecture, school safety, comfort zones, privacy, children's behavioural dynamics, orientation, perception, space

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