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ARTIGOS

A briefing game for school building design [1] [2] [3]

Um jogo para dar suporte ao processo de projeto de edificações escolares

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Abstract: The architectural design process is complex, as new technical, social, environmental and economical requirements are introduced, and this very scenario is applicable for school buildings. The quality of a school building depends on known design criteria, professional knowledge and feedback from building performance assessments. To attain high performance school buildings, the design process should add a multidisciplinary team via an integrated process. This article presents a design tool to structure a school building design briefing process. A participatory architectural programming phase is advocated and tested through a focal group, supported by a game called "Shuffle the School Building Design Deck" (SSBDD). The content of SSBDD and application procedure are based on known facts, needs and global concepts for learning environments in the twenty-first century. The briefing game considers the specific context of Brazil. Validation tests show positive results for productive architectural programming for school buildings. SSBDD has potential for global contexts, including translations for other building types.

Keywords: Design games, design support tools, architectural program, school building design, participatory design process, focal groups.

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Resumo:
O processo de projeto em arquitetura é complexo, à medida que novos requisitos técnicos, sociais, ambientais e econômicos são introduzidos. Este cenário também está presente no projeto de edificações escolares. A qualidade da arquitetura escolar depende de critérios de projeto, conhecimento profissional e feedback *de avaliações-pós-ocupação. Para projetar escolas de alto desempenho, uma equipe multidisciplinar deve atuar por meio de um processo de projeto integrado. Este artigo apresenta uma ferramenta de projeto para estruturar um processo de* briefing *para edifícios escolares. Um processo participativo é recomendado e testado através de grupos focais, apoiado por um jogo chamado "O Baralho da Escola" (*Shuffle the School Building Design Deck - SSBDD*). O conteúdo do SSBDD e as regras do jogo tem como base fatos, necessidades e conceitos para ambientes escolares no século XXI. O jogo considera o contexto específico do Brasil. Testes de validação mostram resultados positivos e produtivos para desenvolver um programa arquitetónico de edificações escolares. O SSBDD tem potencial para contextos mais amplos e a estrutura do jogo também possibilita traduções para outros tipos de construções.*
Palavras-chave: *Jogos, Design Games, ferramentas de apoio ao projeto, programa de necessidades, arquitetura escolar, processo de projeto participativo, grupos focais.*

Introduction

In developing countries, like Brazil, investments in education are important to improve economic and social indicators. A recent Brazilian education census showed that student achievement rates are low in comparison to many countries, including others in Latin America (National Institute for Educational Studies and Research Anísio Teixeira/National Institute for Educational Studies and Research, 2016; Brasil, 2014). Education, as a system, thus needs to improve (Bruns, Evans, & Luque, 2011). The debate on how to reach higher student achievement rates is complex, based on multidisciplinary factors, and the quality of the physical school environment must be part of improvement plans. In many parts of Brazil, new schools are still necessary, and the existing stock of buildings must be refurbished and brought up to date to embrace the dynamics of education.

Studies show a direct relation between productivity of users and the quality of the built environment. For schools, the quality of their architecture and general available infrastructure can be directly related to students' learning rates (Barrett, Davies, Yufan Zhang, & Barret, 2016; Williams, Hong, Muvomic, Taylor, 2015; Upitis, 2010; Martin, 2006; Higgins, Hall, Wall, Woolner, McCaughey, 2005; Tanner, 2000). To improve the school environment, specific and detailed reflections are necessary during the design process of a new building or the renovation

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of an old one (Cleveland & Fisher, 2014; Azevedo, 2012; Kowaltowski, 2011; Sanoff, 2011; Nair, Fielding, Lackney, 2009; Taylor & Enggass, 2009; Dudek, 2008; Fisher, 2007). Several variables must be examined in this process. Technical, functional and environmental comfort, as well as economic aspects must be considered in design solutions. Subjective, psychological, cultural, social and pedagogical questions must be addressed in the case of teaching and learning spaces.

The analysis of facts, concepts, desires, opinions and ideas should determine architectural necessities during the programming phase of a design process (Peña & Parshall, 2012). Participatory design processes are recommended to stimulate a briefing debate (Hofmann, 2014; Sanoff, 2011; Lee, 2008; Luck, 2003). Engagement in planning and design issues is increasingly relevant, and viable communication between design professionals and users is necessary (Uglione & Azevedo, 2017). Poorly planned participation may lead to misunderstandings of ideas and false commitments. Trust between participants should be fostered (Woolner, 2009).

This article presents a tool, in the form of a design game, to support a participatory programming debate for school building design. The game is called "Shuffle the School Building Design Deck" (SSBDD) and was developed as part of on-going research on school architecture by the authors. The origin of the game is the specific context of state schools in São Paulo, Brazil, managed by a government agency called *Fundação para o Desenvolvimento da Educação* (Foundation for the Development of Education – FDE). Results of the application of the support tool show that its format (game) and content (debate issues) can stimulate the discussion of essential aspects of school building design at the programming phase (Deliberador, 2016). Professional and teaching design studio processes can profit from the application of the game.

School architecture and the design process

The literature on school buildings emphasizes the meaning of what constitutes good architecture for the teaching/learning environment and how to achieve quality solutions. This literature is vast, and discusses tendencies in education and the architectural response to new teaching methods and necessary infrastructure support (Bradbeer, 2016; Fisher, 2016; Barrett et al., 2016; Azevedo, Faria & Pereira, 2015; Deed & Lesko, 2015; Uduku, 2015; Walden, 2015;

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Williams et al., 2015; Dovey & Fisher, 2014; Kowaltowski, 2011; Gislason, 2010; Lippman, 2010; Perkins & Bordwell, 2010; Woolner, 2014; Fisher, 2007; Taylor & Enggass, 2008; Nair, Fielding, & Lackney, 2009).

Discussions on general building design demands exist, as well as on high-performance schools based on the principles of sustainability. Many authors consider school buildings to be the "third teacher" in supporting the educational environment, composed of excellent teaching staff, school material and equipment, as well as the application of a responsible curriculum and creative pedagogy (Design, Furniture, & Design, 2010; Nair et al., 2009; Fisher, 2007).

Post-Occupancy-Evaluations (POE) of school buildings are important sources to identify environmental quality, building performance pathologies, and human response measurements. Data from such studies should be incorporated into the school design process to avoid the repetition of errors and add evidence-based research to architectural design knowledge (Martins, Oliveira, Rheingantz, Azevedo, & Tângari, 2011; Lippman, 2010; Ornstein & Moreira, 2008). Professionals with good past experience and a multidisciplinary team must be called for to conduct a collaborative design process with various evaluation stages.

In addition to comfort aspects, school buildings must address wider architectural quality issues to make the school community feel at home and stimulated. Sanoff (2001) emphasizes the image of a school as a priority and presents principles of school building design in his methodology. Schools should have stimulating environments through: places for group learning; linked outdoor and indoor places; enriched circulation spaces (corridors, entrance halls, etc.); safety; spatial variety; flexibility; rich access to resources; active and passive spaces; personal space; and, finally, extension of the school environment to the community as a learning place.

School architecture is also related to its specific setting, to its historical, social, cultural and symbolic factors. These aspects must be adjusted to local conditions for effective proposals in a new building process. The analytical phase of a design process is a crucial moment to gather information on facts, opinions and desires, as well as to define concepts (quality) and necessities (quantity) to be documented in a detailed architectural brief. A rich debate between the many actors of a school environment should be fostered to develop such a document. Students, teachers, administrative and service staff, parents, community representatives, education specialists, psychologists and technical consultants should have a voice to support the design

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professionals involved in a new building project. In many cases, participatory design methods rely on the representation of types of users because the actual future school community is not known during the planning and design phase. To foster debate between participants of different disciplines, backgrounds and interests, briefing sessions are more productive when focused and structured, but open and flexible enough to embrace the current issues and dynamics of the school environment (Woolner, 2009).

The design process of public schools depends on the political structure of the education system. The public[4] school building design process in the state of São Paulo, Brazil, was characterized and shown to be linear and lacking essential feedback from analytical and evaluation phases (Kowaltowski & Deliberador, 2014). As part of the characterization study, architects involved in these school projects indicate that the process is too rigid, and that participation of school community members could enrich their design solutions. These designers see their involvement in public school projects as their special social interest contributions and support the adoption of participatory design processes – aware of their complexity and cost (time, operation and control). FDE, as the manager of this process, accumulates data from previous examples, and such data is translated into technical design requirements (FDE, 2010); however, FDE is however not involved in the elaboration of the brief and these technical requirements will only become effective as criteria for the analysis of proposals of a new school building process. Productive communication is lost and the results of this type of process are school buildings that change little over time in their overall layout and architectural concepts. The typical school building is based on the traditional classroom with fixed dimensions (7 m x 7 m) placed along long narrow corridors with the addition of two or three special rooms (laboratories and a reading room, or library). A sports gymnasium is added, as well as a cafeteria and a covered play area. The school building will have service areas (restrooms, kitchen, cleaning and storage closets) and a small administrative sector. Schools in urban areas usually have small sites and the grounds consist of a yard for recreation, a small entrance plaza, but few landscape elements.

[4] In Brazil primary and lower secondary education, called Fundamental Education, is free and compulsory for children between the ages of 6 to 14, whereas upper secondary education for the ages 15 to 18 is also free but not compulsory (Brasil, 1996). The free, government funded, and regulated education system is called Public Education in the country.

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POEs of such buildings show that these are robust, using pre-cast reinforced concrete structural elements, concrete block walls and steel frame louvered windows (Kowaltowski, 2011; Mueller, 2007). Recently some important design improvements were added, such as acoustic ceilings and external sun-shading elements for classrooms, however many environmental problems persist. Shading is not always efficient. Sports areas generate acoustic problems throughout the building and cross ventilation (important in the predominantly subtropical climate in the state of São Paulo) is absent in double loaded classroom type buildings. Flexibility in the use of spaces is hampered by standardization. However, education is constantly changing, and new teaching methods demand new spaces with a dynamic use according to learning modalities (Dovey & Fisher, 2014; Nair et al., 2009).

To bring about change in school buildings and their capacity to embrace the increasingly varied educational world, the design process must analyze the complexity of new demands. A school design process thus needs reflections and debates, and participatory briefing is recommended. The administration of participation adds complexity to this process, especially in the professional environment where efficiency and productivity are paramount. Support tools are sought to structure and guide briefing when widely different viewpoints are possible.

Support tools for participatory design processes

Support tools for the programming phase of an architectural design process have been developed since design methods became a specific research area, with Studer & Stea (1966) leading the way. The "Problem Seeking" method is widely used to structure the briefing debate (Peña & Parshall, 2012). The literature on architectural programming presents other support techniques such as brainstorming, checklists, data banks and value sets (Hershberger, 1999; Kumlin, 1995; Preiser, 1985). With the introduction of Building Information Modelling (BIM) new efforts are made to represent (model) knowledge for the briefing phase (Hassanain & Juaim, 2013).

Group dynamics techniques were suggested early on to overcome participatory planning and design hurdles (Bion, 2013; Trist, 1959). Group dynamics and decision-making are supported by well-known methods like brainstorming, and games have also been explored, especially in the corporate world (Delbecq, & Ven, 1975; Duke, 1974; Wölfel & Merritt, 2013).

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Games, as social facilitators, were added to the list of architectural programming support tools. These design games rarely depend on the mathematical models that underlie decision-making conflicts, but are, in general, based on a structured issue-based debate (Sanoff, 1979). Cards, boards and tokens can be used to register consensus and solutions, thus supporting the discussions. The assumption – in favour of gaming techniques – supported by important design firms is that designing has a social dimension and is influenced by the way involved parties interact (Habraken & Gross, 1988; Wölfel & Merritt, 2013).

Most games are based on competition, with winners and losers. Role-playing, card, logic and board games are the types of games more often found in the literature to support the design process, and simulation games help to assess the impact of proposals during decision-making. The important goal in design games is to explore scenario-based techniques and to engage different stakeholders in a collaborative, structured and productive dialogue with designers. This is especially important in the briefing phase of a design process. Games are no longer only competitions or entertainment but can assist design by effectively asking the "What if?" questions. Different games can be devised and applied for each design phase and situation (Brandt, 2006). Dialogues are focused by rules, but without restricting the creativity of participants. An element of spontaneity and intuition is important in such debates, so that subconscious ideas can be brought to light (Hofmann, 2014).

In general, design games do not demand special skills or training of players. The informality of gaming helps to make people feel more at ease, increasing participation in the analytical and creative process. Evaluation phases can profit from gaming techniques as well, avoiding lengthy questionnaire applications and flashcards, bearing a set of information that can help to extract focused responses from users (Bjögvinsson, Ehn, & Hillgren, 2012; Kowaltowski & Deliberador, 2018).

Even in the age of computer games, board or card games are still considered efficient (Wölfel & Merritt, 2013). They create physical cohesion and can improve group dynamics around the game board. Role-playing can be supported by tokens, with players identifying with the specifics of a given role with increased commitment to go by the rules and to complete the rounds.

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A school design process

The literature on participatory design processes shows that user involvement during the programming phase is of prime importance (Hofmann, 2014; Peña & Parshall, 2012; Woolner, 2009). A participatory process gives users the opportunity to identify with places, spaces and buildings, enhancing its utility beyond mere functionality. This identification can contribute to a sense of well-being, which in the example of schools, results in added pedagogical values and improved social relationships. Buildings that respond to demands can potentially lead to a more careful use of spaces and thereby reduce repair and renovation costs. However, viable communication between design professionals and users is crucial to avoid token participation, reduce misunderstandings and reveal facts and hidden agendas about reality. This study presents a support tool for the briefing debate of a school design process in the form of a briefing game, called "Shuffle the School Building Design Deck" (SSBDD) (Deliberador, 2016).

Briefing game development research method

The game development is based on a literature search on types of games and on school architecture. Validation is based on exploratory tests to evaluate content comprehension (design parameters for school architecture) and the effectiveness of the tool in stimulating debates at the programming stage of a school building design process. Public school buildings of the state of São Paulo, designed and managed by FDE, were chosen for testing and primary and secondary schools are detailed in the design parameters. The development of this design process support tool is based on the following research steps:

Definition of the type of support tool: An investigation of design games indicated the effectiveness of tools for pre-design analysis and architectural programming decision-making. A card game, divided into suits of 4 cards, was chosen to respond to tool needs and goals. The definition of four cards is based on cognitive limits related to human memory and rules are based on simple procedures for Focal Groups (Weinschenk, 2011; Morgan, 1997). An extensive literature search determined the set of design parameters of each playing card.

The set of parameters was transcribed to the format of the card game, as indicated by Alexander, Ishikawa, & Silverstein (1977). Accordingly, a design parameter should express a

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concept through an argument (text with references), illustrations (drawings, diagrams or photos) and a descriptive, as well as clear title. Each card belongs to a topic set of four cards, distinguished by its title, an illustration is added, and keywords improve the understanding of a specific concept and should stimulate discussion.

The definition of the type of illustrations for the 15 suits was based on the specificity of each concept, and research on the visual display of information (Tufte, 1990). Conceptual suits have symbols. Cards that represent architectural space have drawings (floor plans, elevations, sections or perspective sketches) and cards with objective data are illustrated by formulas, numbers, etc. Support material was developed for the application of the briefing game, in the form of manuals and forms, as well as boards to register decision-making of Focal Groups (Deliberador, 2016).

Exploratory research was applied to verify the comprehension of each card, the concept under discussion and its representation through title, illustration and keywords. The following tests were conducted:

Test I: An illustration specialist (cartoonist and designer) was invited to analyze the card game. The adequacy of the visual representation of parameters (diagrammatic clarity) and the corresponding precision of supporting keywords were assessed.

Test II: Groups of professionals involved with primary and secondary education and their school environment (designers-architects, engineers, education specialists, pedagogues, teachers) participated in test workshops. Prioritization of parameters was tested and recorded on a form (Figure 1). Participants evaluated each card (comprehension of illustrations, concept and keywords) and the tool, as a stimulus for school programming discussions.

Test III: The capacity of the game to support the development of a school building brief was evaluated. Architecture students of two universities tested the game during design studio classes to develop a full brief for their specific school design proposals. A theoretical class on architectural programming preceded the application of the game in each test. New support forms were made available to support this academic test. The Problem Seeking method (Peña & Parshall, 2012) underpinned the design exercise through theoretical content.

Test IV: To test the final version of the game, Focal Groups were developed (Morgan, 1997). The composition of a Focal Group should be: 6-8 participants (in this case, possible

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school users); a section observer (whose function is to record the development of the work, difficulties encountered and level of participation of users, etc.); and a mediator or facilitator of the discussion. Unlike other discussion techniques, the goal of Focal Groups is to produce decision-making through consensus after a structured debate. A facilitator is an important member of a Focal Group to assure that all issues are discussed and resolved, and that the dynamics of the group are not only efficient but also cordial. Discussions should be preceded by other participatory activities such as wish poems, walkthroughs, visits and simulations to stimulate ideas and concentrate debates on issues for decision-making. These processes are crucial and in the case of schools, children and young adults should have their voices heard and views known. Decision-making sessions can become lengthy and in some cases these users may be excluded from a final Focal Group, but they need appropriate representation in the programming process.

Game description

SSBDD is not a game in so far that rounds are played, but it is a tool to structure programming sessions of a school building design process for decision-making. The game may be used in various forms. As a checklist, the game's structure and content can be applied during a school design process. Priorities can be defined for further in-depth discussions. In an introductory round the facilitator presents the suits and a priority card is chosen for each suit. A second round can indicate which themes should be further debated. These rounds should be tallied on a scorecard as shown in Figure 1.

School design issues are categorized by theme in SSBDD. After various tests, 15 themes were included as suits of cards with their four subthemes under the titles: pedagogies; teaching/learning modalities; urban context; users/target population; teaching/learning spaces; schoolyard and playground; laboratories and special learning spaces; support spaces/administrative and service areas; service areas and facilities for students; socialization areas; environmental comfort; circulation areas; environmental psychology; vital design concepts; behavioral issues related to schools.

Figure 2 presents the whole deck of 60 cards of the game. The order of the suits is in accordance with decision types. First, the basic information, such as pedagogies, number of

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students, learning modalities, is systematized. Following, questions on the spaces like classrooms, schoolyard and special spaces, like laboratories, are addressed. Technical requirements in relation to circulation spaces and environmental comfort gain their separate definitions and sustainability, accessibility and humanization of architecture are grouped under design concepts. Card titles are defined by subthemes. In the suit regarding psychological aspects of a school environment, for example, these titles are: safety/security; territoriality; density and privacy (Figure 3).

The neutrality of interpretation of various forms of illustrations was tested. Pictograms, icons and photos were tested, however, misunderstandings occurred, and representational uniformity of the game was reduced. The final tested version of the 60 cards gained free-hand drawings by the authors. Themes relating closely to design issues, such as learning spaces and environmental comfort for instance, are represented through plan or section drawings. Principles of visualization of information emphasize the content of data and stimulate understanding of concepts (Tufte, 1990; Gombrich, 2000). To create graphics that people understand, Malamed (2011) recommends to: organize for perception; direct the eye; reduce realism; make the abstract concrete and clarify complexity; connect to emotion and use metaphors, novelty, and humor. Added keywords can also increase understanding.

The SSBDD Manual (Figure 4 presents an example page) was created as support material. It is in the form of "patterns" (Alexander et al., 1977; Nair et al., 2009) with a short description, outline of the impacts on design solutions and references for further consultations.

Six game boards, to register decisions and support the efficiency of group dynamics were created. Decisions are recorded on white boards but can be erased if the discussion returns to a specific issue. The boards are made of sheet metal and specific subthemes are visualized with small decision magnets (Figure 5). Once the suits on a specific board have been discussed and decisions have been registered, a photo should be taken for safe storage of information and the next board and suits of cards are presented to the Focal Group by the facilitator. Prior to the presentation of the first board the members of a specific focal group should introduce themselves and the facilitator should detail some specifics of a new school design project. A client, for instance, representing the local education board, may have defined these prior to a participatory programming debate. Typically, the school building site is already known, the total number of students and the student age group may have been determined, and the pedagogy is

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often chosen. Other data, such as neighbourhood characteristics, should be briefly presented. The first board (Figure 5) supports the discussion of the first four suits of cards. Decisions on pedagogies and learning modalities are defined through magnetized tokens. The suits on urban site considerations and users will lead to discussions on the problems and opportunities relating to the location of the school. School grounds are usually fenced in Brazil, and ways of solving the security and responsibility problem should be brought to the table, as well as the challenge of keeping the school entrance friendly. Special desires and necessities of the main types of users are defined at this stage.

The second board supports the discussion of teaching spaces (classroom configuration), the schoolyard and playground, as well as laboratories and special learning spaces (Figure 6). The Focal Group will express specifics of such spaces by placing magnets and the recording of their detailed characteristics. The same procedure will follow for the third board to discuss administrative and service areas, facilities for students and socialization areas. The fourth board supports discussions on environmental comfort, circulation spaces and their design elements. These subjects are more technical and often are not part of an architectural brief, as they are understood to be of professional responsibility. In the case of school buildings, circulation spaces are important not only to organize the layout and improve wayfinding, but they provide places for socialization of a school population. Opportunities for positive interactions must be detailed, and vandalism and bullying must be discussed. Such questions continue to be raised with the 11th and 12th suit on the fifth board. Essential design concepts of suit 12 are: humanization of architecture, sustainability, accessibility and technology and its efficient distribution. Subjects of this suit should be expressed through goals and design solution ideas. The final board returns to behavioral questions that, in school building design, need profound reflection to avoid school disciplinary problems. The brief should indicate the known location of occurrences of such problems and outline design proposals. Programming also needs to address zoning questions that can be expressed as bubble-diagrams and flowcharts, and the sixth board leaves room to express attempts to organize the functional sectors of a school program. Care must be taken to review many of prior subjects discussed, such as acoustic interferences for instance, when considering zoning of activities.

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Figure 1. Scorecard to document the first rounds of discussions and to establish priorities

Naipe 1: Pedagogia: definido previamente		
	Prioridades Etapa 1	**Prioridades Etapa 2**
Naipe 2: modalidades de ensino		
Campfire		
Cavespace		
Ensino por Projetos		
Watering Hole		
Naipe 3: Inserção urbana		
Localização no bairro		
Entrada Convidativa		
Fechamento		
Assinatura Local		
Naipe 4: Público Alvo		
Alunos		
Professores+Coordenadores+Diretores		
Funcionários		
Pais		
Naipe 5: Espaços de Ensino		
Sala de Aula Convencional		
Sala de Aula "Z"		
Sala de Aula com terraço		
Sala de Aula com núcleo comum de estudo		
Naipe 6: O Pátio Escolar		
Pátio Aberto		
Pátio Coberto		
Pátio "Coringa"		
Pátio como extensão da sala de aula		
Naipe 7: Ambientes Especiais		
Biblioteca		
Sala de Música+Artes+Auditório		
Laboratório		
Espaços para Atividade Física		
Naipe 08: Ambientes de Apoio		
Administração		
Cozinha		
Sala de Professores		
Depósito		
Naipe 9: Espaços de Serviços Alunos		
Sanitários		
Guarda volumes		
Espaços de Descanso		
Enfermaria		
Naipe 10: Áreas Sociais		
Espaços de Exposição		
Nichos de Estudo		
Espaços de alimentação		
Grêmio		

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Naipe 11: Conforto Ambiental		
Funcionalidade		
Conforto Térmico		
Conforto Acústico		
Conforto Luminoso/ Transparência		
Naipe 12: Espaços de Circulação		
Corredor		
Escada		
Rampa		
Elevador		
Naipe 13: Psicologia Ambiental		
Densidade		
Segurança		
Territoriedade		
Privacidade		
Naipe 14: Conceitos		
Humanização		
Acessibilidade		
Tecnologia Distribuída		
Sustentabilidade		
Naipe 15: Aspectos Comportamentais Típicos do Ambiente Escolar		
Vandalismo		
Timidez		
Bullying		
Uso de Drogas		

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Figure 2. The deck of cards of the SSBDD game

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Figure 3. Example of a suit of cards of the SSBDD game, representing aspects of environmental psychology

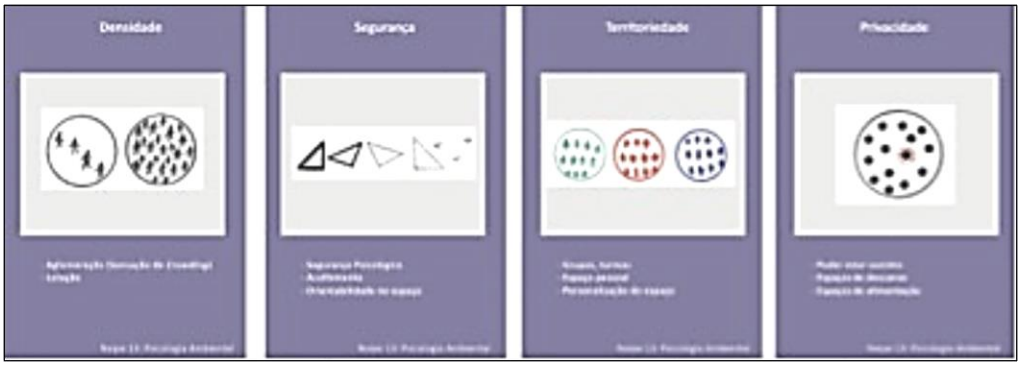

Figure 4. Example of a page of the concept manual

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Figure 5. First game board with decision register

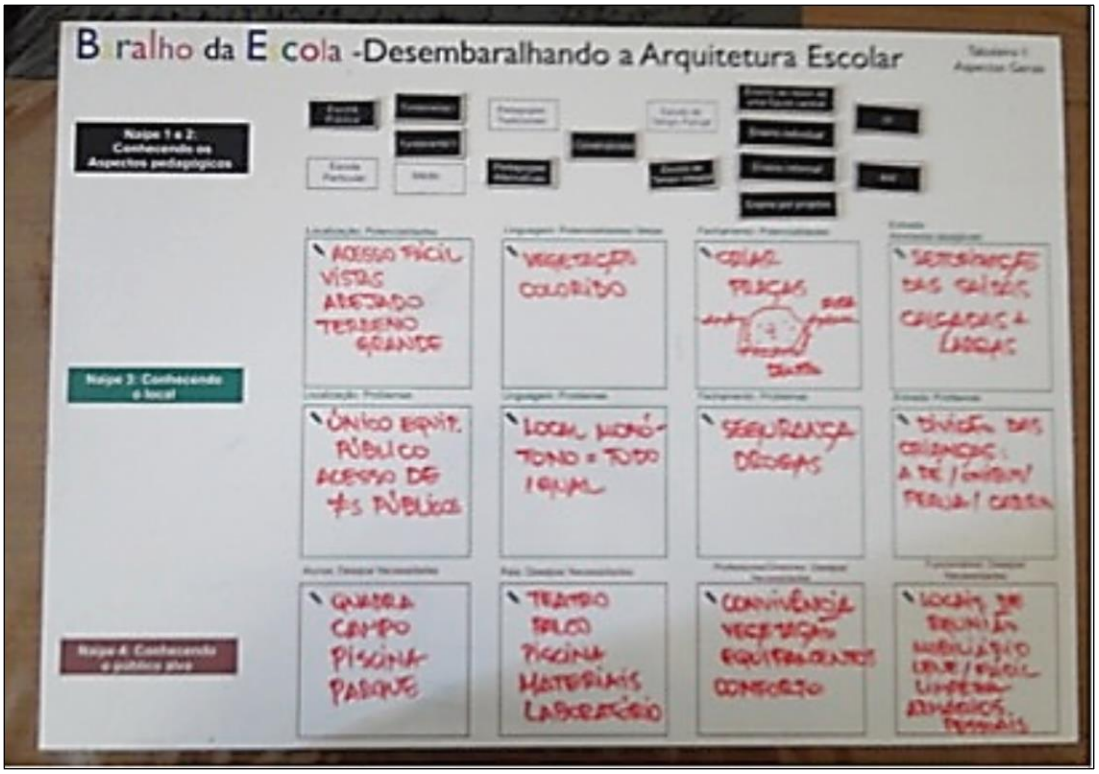
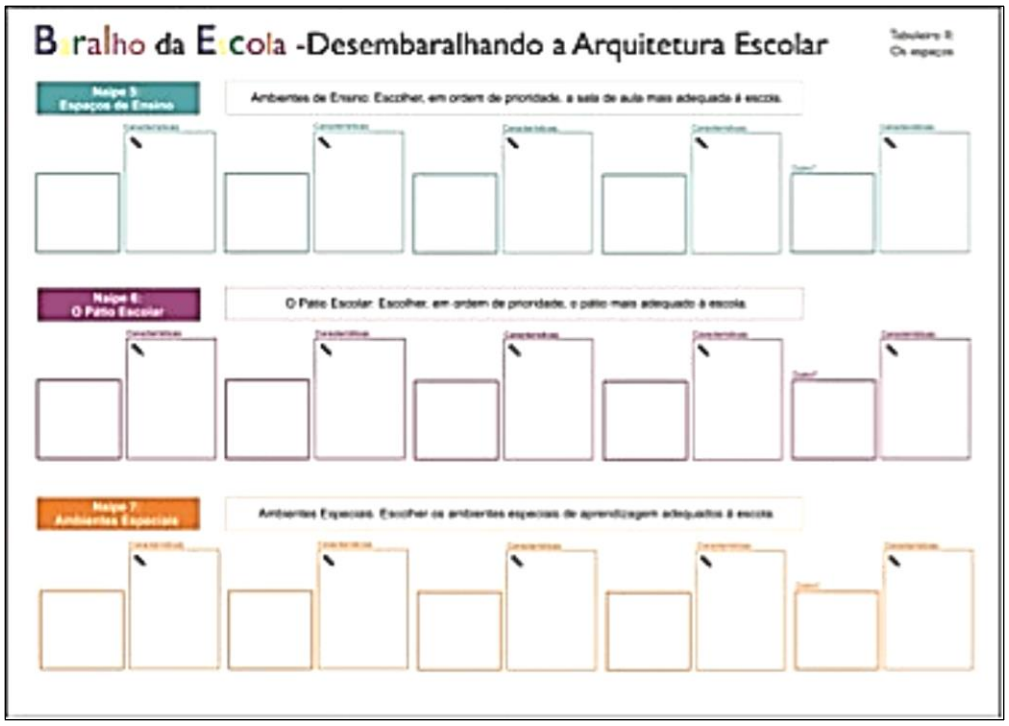


Figure 6. Second discussion board



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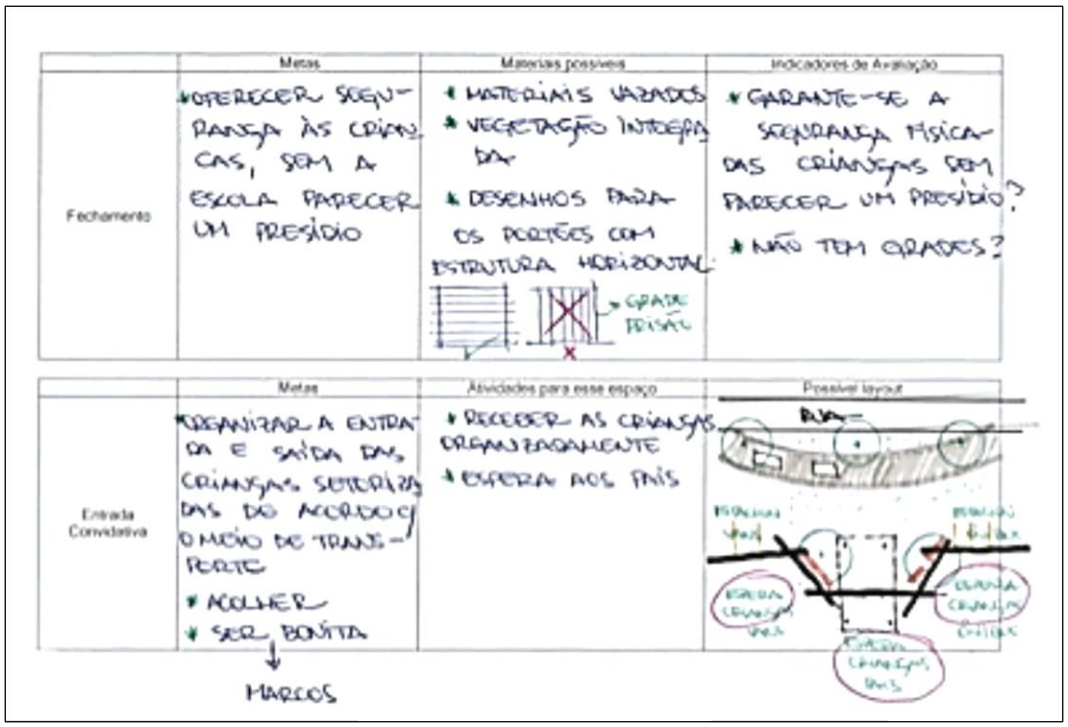
After a Focal Group closes the debate, the decisions documented on the game boards should then be transformed into an architectural program. The facilitator and the responsible architect for a new project will engage in this task. The brief should detail goals, qualitative and quantitative description of necessities, and evaluation indicators. Figure 7 shows an example of the possible synthesis representation of a program, in relation to the second suit of cards.

Figure 7. Example of part of an architectural school building program



Results and discussion

The SSBDD game was tested through various applications. Students developed their architectural program with the game in a teaching design studio. Learning occurred via the discussion of important school design issues represented by the 15 suits of the game. The additional reference material helped decisions on goals, necessities, layouts, quantities and indicators. Students perceived the importance of the analytical and programming phase of a design process. Graphic representation of information was practiced, and space adjacency diagrams created. A first design definition exercise followed, during which students translated their brief into mass models and diagrams and justified these through goals and concepts. This

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studio activity increased student's confidence in the development of design proposals (Gomes da Silva, Kowaltowski, & Deliberador, 2016).

The tool was further tested in six different versions through Focal Groups. A final Focal Group with nine participants and one outside observer simulated an actual school building design process. The principal of a local architectural firm was called to conduct the programming discussion. One of the authors of this article structured the debate as facilitator. Students – children and young adults – did not participate in this test but should be represented through prior involvement in the design process of a new school via other activities such as wish poems, model-making and shorter rounds of the SSBDD game. The actual participants of the Focal Group were: a director of a local public school, a teacher from the same school, a teacher with impaired mobility, an academic (pedagogy/education specialist), a parent representative, an engineer in charge of a public school building project under the auspices of FDE, and an observer.

The facilitator presented the school site and preliminary decisions were made on a total student population of 500 children for primary or secondary education, aged from 6–12 years. Pedagogical considerations defined the learning modalities. After such initial decisions, the facilitator introduced all the other suits of cards to give an overview. Once this was achieved, decisions were reached on each suit of cards on the game boards. Some subjects tended towards extended discussions. The presiding architect indicated specific interest in design solutions associated to particular concepts such as flexibility. The discussion on classroom configurations tended towards political, pedagogical and school administrative debates. The Focal Group proceeded from one set of cards to the next through the facilitator's guidance. All the 15 suits were discussed, and the architect actively explained the importance of a thorough analysis of both the site and school activity zoning before a brief can be completed. A preliminary space adjacency diagram was drawn by this presiding design professional.

All participants of the programming Focal Group evaluated, through questionnaires, the group dynamics and the game. The discussion was considered well focused with attention given to the main aspects of school design. All participants indicated that the issues brought to the discussion table are rarely part of the local school design process and of prime importance to improve teaching, school administration, and education as a whole. The interaction of the multidisciplinary debate team was praised. The Focal Group was considered a productive

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brainstorming session with good exchange of ideas. This positive response was directly linked to the game that enabled structured and focused decision-making. The facilitator and presiding architect considered the session positive in relation to the efficient development of an architectural brief for the new school project. The professional designer stressed that decisions could be reached on primary issues for the conceptual phase of a design process. This attitude demonstrates a real willingness and desire to enrich this process and contribute positively to improve schools as quality places for learning. The more technical issues (layouts, area calculations, quantities and specific performance indicators) were added by the facilitator of the test study, further demonstrating the importance of the presence of design professionals in the application of the game. The presiding architect also considered the brief a "contract" between client and users. Accordingly, collective learning occurred, and participating design professionals expect that, by using programming tools like SSBDD, clients and future users will better understand design proposals. In turn, this should stimulate educationally richer uses of the spaces of a future building.

Conclusion

Based on low student achievement rates many counties discuss education as a system, and strategic improvement plans should include the physical environment. This article presents a design tool to support a structured school building design briefing process. A participatory architectural programming phase is advocated and tested via discussions of Focal Groups, supported by a game called Shuffle the School Building Design Deck (SSBDD) to guide debates. The content and the application procedure of SSBDD are based on known facts, needs and global concepts to support a quality architectural design process. The briefing game was based on the literature on school building design and developed for the context of state schools in São Paulo, Brazil.

Tests in both teaching and professional environments measured the impact of both content and application procedures of SSBDD to produce a quality architectural program. A final Focal Group simulated a briefing phase of a school building design process. Different stakeholders with interests in improving schools participated. A multidisciplinary team is advocated and should consist of specialists in education, design professionals and consultants

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in various fields, as well as administrators, public officials and neighborhood representatives, teachers, students and parents. Tests in a design teaching studio environment showed that students gained confidence in developing their own design briefs efficiently. Real engagement of multidisciplinary participants of the final Focal Group was observed and the game facilitated a comprehensive decision-making process.

The overall result of the various validation tests of SSBDD showed that the method (game) is efficient as a stimulator of structured school building design discussions. SSBDD can be considered an effective contribution to improve the increasingly complex architectural design process, both specifically for schools and as a design method. Future research developments in this area must consider the dynamics of education with impacts on the learning environment. The structure of SSBDD permits potential use for wider contexts, including translations for other building types. Further investments call for the development of appropriate Information Technology for this process, transforming SSBDD into a digital game, for instance. Adoption of the game as a public policy is advocated and should be tested to measure both professional and community long-term engagement in school design issues. As a result, the briefing game contributes to the design and construction of safe, healthy, accessible, sustainable, friendly and inspiring school environments, thus supporting a better education system, especially in developing countries.

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