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A conceptual model for children's participation in the architectural design process: exploring deep participation

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ABSTRACT

Nowadays, architectural designers interact with children to better understand their demands so that to improve the emotional connection between the child and the architectural space. The present study mainly aimed to find contributing factors to improved architect-children participation in the architectural design process for children. The procedures of this research were based on the meta-synthesis by Sandelowski and Barroso. The data were collected using desk research and then coded and classified in MAXQDA 10. The validity of the codes was evaluated by the Glynn tool, and the extracted concepts were also prioritized in Excel 2010. The findings indicated that common methods of participation depend on the architect's ability to use participatory and design theme tools. However, the new definition of participation (i.e. deep participation) does not rely on these factors and emphasizes the presence of children during the design process and their role as the main ideator. The depth of participation (i.e. improving the quality of architect-children participation) is determined by the degree to which children's most genuine wishes about the design theme are understood well. Contextual, proactive, motivational, and architecture-focused components help increase this depth. The relationship between these components was presented as the conceptual model of deep participation.

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KEYWORDS

Participation; child; architecture for children; meta-synthesis; conceptual model

Introduction

Nowadays, participation with children in intended architectural design processes for this age group has attracted the attention of many architectural designers. The children's participation allows them to contribute to creating child-specific architectural works and make the characteristics of the architectural work closer to those of the children-favored architecture (Ezzatian, 2017). Therefore, the main problem of this research is to find factors affecting the quality improvement of architect-children participation.

Children's higher participation in building construction leads to their further trust in the project (Leverett, 2008). In other words, participation with children helps the designer to design spaces with which children can further communicate (Driskell, 2008) since such spaces are considered efficient environments due to children's participation (Sutton & Kemp, 2002). In addition, children's participation enables them to better use an architectural space (Behnia, Kheirollahi, Sahragard, & Soltanifar, 2021).

Experts believe that children's genuine participation in designing can be translated to their ability to express their opinions at the same level as the architecture (Chawla & Heft, 2002). Thus, addressing

the research problem, finding effective factors in improving the quality of children's presence besides the architecture, and providing more opportunities for children to express their opinions about the project during the designing process are of great importance.

Various studies have addressed factors affecting the quality improvement of architect-children participation. Several factors can improve the quality of participation, including developing the language of architect-children conversation (Kamel Nia, 2009) and enhancing the architect's skills in participation with children (Haghighi Boroujeni & Feizi, 2011). Other factors are increasing children's awareness of the importance of their statements (Ezzatian, 2017), delegating project responsibility to children (Driskell, 2002), giving children the freedom to express their views (Read, Fitton, & Horton, 2014), and using the designer's parental help to convey their ideas to children (McNally, Louis Mauriello, Guha, & Druin, 2017).

Most of these studies, which have focused on the effect of designer-child relationship quality on participation product quality improvement, are atomistic and their results point to a specific factor that can improve the quality of children's expression in participatory processes. Although these factors are used as components for enhancing the quality of the architect-children participation, the main factors facilitating the definition of the overall structure of an effective participation process are unknown aspects that have not received much attention.

The authors have attached great importance to study these unknown aspects because identifying the underlying foundations of an efficient participatory process is the main step toward improving the quality of architect-children participation. Further, establishing more efficient participatory processes in the future is possible if these foundations are identified and introduced to other architectures.

According to the authors, the most important research gap is not focusing on identifying the main factors forming the basis of the architect-children relationship structure, paving the way for the following research questions:

- (1) Which components affect the quality of architect-children participation in the architectural design process for children?
- (2) What is the degree to which one can increase or develop factors affecting the quality improvement of architect-children participation?

Children under the age of 8 benefit from a non-compensatory decision-making structure and those over the age of 15 take advantage of systematic thinking based on school education, including environmental barriers to creativity (Karami & Seyed Javadin, 2007). Therefore, the word child in this study refers to children aged 8–15 years. The meta-synthesis method was used to answer the research questions. The most important findings of this study include defining the concept of deep participation, identifying components and sub-concepts of this type of participation, and presenting a conceptual model with instructions for its use.

Literature review

Kevin Lynch formulated some theories about children's participation in the design of urban spaces and highlighted that children's participation in designing spaces exploited by themselves was of great importance. This thinking was promoted by Hart and Chawla. Lynch was a pioneer in recognizing the right of children for participating in co-design¹ processes, and Moore and Ward (as cited in Shahab Zadeh, 2015) later expanded on Lynch's ideas. In general, four principal approaches exist for children's participation. The first and second approaches underline the significance of academic research on using children's opinions and the importance of the increased role of children in decision-making, respectively. The third and fourth approaches emphasize the significance of familiarizing children with the concept of participation and the importance of children's initiatives in designing, respectively. The first to third approaches are ineffective in shaping the environment.

In the fourth approach, children are asked what they should do, and adults are simply facilitators who help children find solutions (Knowles-Yáñez, 2005). Following the fourth approach, the concept of children's participation was introduced in UNCRC in 1989 (Chawla, 2001). In the 1990s, designers were importuned to enhance the quality of children's spaces, making them more heedful of children's participation (Francis, 1999).

Therefore, the ground was prepared for conducting numerous studies on children's participation. Table 1 provides a summary of the results of some studies conducted from this date onwards aiming at reviewing and introducing the research gap. These articles were categorized based on their conclusions. The first category emphasizes the importance of respecting children's rights and their more realistic views and suggests a set of models and guidelines in this area. These studies are in accordance with the first approach and based on the importance of applying children's views on issues related to this age group. The second category highlights the position of children as powerful individuals who can be consulted in problem-solving. These studies conform to the second approach and seek to make the role of children predominant in decision making. In addition, the third category aims to discover practical ways to understand the wishes of children as much as possible. Studies of this group are in line with the first approach while attempting to make the most of children's viewpoints on issues related to them. The fourth category merely emphasizes the relationship between participation and improvement of the emotional bond between the child and the architectural space. These studies are consistent with the third and the fourth approaches. More precisely, they consider children's familiarity with the subject of participation and utilize their initiative in design as an effective factor for empowering the child's emotional bond and architectural space. Eventually, the fifth category examines the effectiveness of participation tools or engages with children to find design criteria for a particular architectural space. The last group of studies is in accordance with the fourth approach and aims at creating a space for a more active presence of the child in participation and initiative processes in addition to giving comments as much as possible on the subject of design by examining the effectiveness of participation tools.

Thus, studies have generally focused on the need for participation with children, a better understanding of children's needs, improvement of the emotional connection between the child and the architectural space, and criteria for designing a particular space with children's participation. Nevertheless, the authors demonstrated that none of the above-mentioned four issues addresses the general structure of architect-children participation. In other words, factors making up the core foundations of an efficient participatory process are not addressed in any of the above categorized studies. However, the efficiency of participatory processes can be enhanced by identifying and developing these factors, preparing the ground for future studies.

The study researchers believe that using participation tools in participation processes is an inevitable part of this process. Nevertheless, the architect can make the best, most complete, and efficient use of these tools by accurately and comprehensively identifying fundamental factors in the process structure since they strengthen the core foundations of architect-children participation. Therefore, the lack of a focus on understanding these fundamental factors and their sub-factors is the research gap and the challenge for researchers. Accordingly, meeting this challenge helps in improving the quality of architect-children participation and the children's position in the co-design process to the level of the architect's colleague (partner).

Research methods

As mentioned earlier, this study utilized Sandelowski and Barroso's meta-synthesis method (Figure 1). Meta-synthesis involves reviewing ideas, perceptions, approaches, results, and findings of the previous qualitative research to develop a theory or a conceptual model (Sandelowski & Barroso, 2007).

This study seeks to provide a conceptual model for architect-children participation based on the findings of previous qualitative research. Therefore, the researchers of this study only focused on finding the most important opinions of experts (qualitative data) on the research topic and then comparing and analyzing the obtained data in this regard.

Table 1. Research on architect-children participation.

Row	Research category	Year	Researcher/Thinker	Conclusion
1	Emphasis on the importance of respecting children's rights and their more realistic views	1992	Hart	Hart introduced the most reliable viewpoint on children's participation, known as the ladder of participation. The ladder of participation has eight steps: (1) Manipulation, where adults use young people to support causes and pretend that the causes are inspired by young people, (2) Decoration, when young people are used to helping or 'bolster' a cause in a relatively indirect way, although adults do not pretend that the cause is inspired by young people, (3) Tokenism, when young people appear to be given a voice but have little or no choice about what they do or how they participate, (4) Assigned but informed. This is where young people are assigned a specific role and informed about how and why they are being involved, (5) Consulted and informed. This happens when young people advise on projects or programs designed and run by adults. The young people are informed about how their input will be used and the outcomes of adults' decisions, (6) Adult-initiated, shared decisions with young people. This occurs when projects or programs are initiated by adults. However, the decision-making is shared with the young people, (7) Young people-initiated and directed. This step is when young people initiate and direct a project or program. Adults are involved only in a supportive role, (8) Young people-initiated, shared decisions with adults. This happens when projects or programs are initiated by young people, and decision-making is shared between young people and adults.
2001		Shier	Introducing the five-stage participation model: (1) Informing children, (2) Listening to children's opinions, (3) Examining children's opinions, (4) Applying children's opinions in decision-making, and (5) Children's understanding of the concept of participation.	
2002		de Backer & Jans	Defining the concepts of internal/external and direct/indirect participation: (1) Internal participation: children participate in their own work, (2) External participation: children express opinions on issues beyond their vineyard, (3) direct participation: unmediated participation, and (4) Indirect participation: a mediator between children and adults.	
2002		Driskell	Provide a definition for genuine participation: Genuine participation means that children take full responsibility for their own projects.	
2003		Fletcher	Children should not be on the lower rungs of the ladder of participation; Instead, they should be directed to the top rungs of the ladder of participation as the main ideators of their own issues.	

(Continued)

Table 1. Continued.

Row	Research category	Year	Researcher/Thinker	Conclusion
2	Emphasis on the position of children as powerful individuals who can be consulted in problem-solving	2006	Lowndes & Pratchett	Enhanced sense of participation in children leads to increased participation efficiency.
		2009	Driskell & Neema	Whenever there is a full understanding between children and adults, partnerships with children become effective.
		2020	Gurgel et al.	We need to make some fundamental changes to traditional ways of participating with children.
		2020	Ozdemir	The active presence of children in the participation process helps to improve the outcome.
		2006	Burton	Lack of theoretical research on co-design with children has declined the quality of participatory processes.
		2006	Sener	The architectural design for children by adults reduces the emotional bond between the child and the architectural space which is a matter of great concern.
		2009	Davies (as cited in Karsten, 2012)	The lack of integrated and universal theory about participation between children and adults in design processes is the main research gap in the field of architectural design for children.
3	Focus on discovering practical ways to understand the wishes of children as much as possible	2012	Karsten	Developing practical methods for participating with children is the most important factor for children's full participation in design processes so researchers need to do a lot of study on these methods.
		2017	Schepers et al.	Children must be allowed to choose their desire methods and tools for participation; this will increase the efficiency of the participation.
		2013	O'Kane	The best way to improve the relationship between children and architectural spaces is their direct presence in the design process of the spaces from which they will exploit.
		2014	Read et al.	Researchers should find ways by which children can choose to participate, besides, create the designer-child connection. These two factors play a key role in improving the quality of participatory processes.
		2016	Kleine et al.	The main reason for the failure in participatory processes is the lack of study on ways of communication with children.
		2017	Water et al.	Children's direct presence in a research is a key factor, accordingly, children should be allowed to decide and choose for themselves.
		2017	Birch et al.	The architect talking to the children about the features of her proposal is an important factor in improving the outcome of the collaborative process.
		2017	McNally et al.	Parents have better verbal communication with their child than others, therefore, considering parents as a link between the designer and children is an effective way for transmitting concepts between the designer and children.

(Continued)

Table 1. Continued.

Row	Research category	Year	Researcher/Thinker	Conclusion
4	Emphasis on the relationship between participation and improving the emotional bond between child and the architectural space	2018	Van Mechelen et al.	Conventional participation tools need to be replaced by modern tools but more efficient methods. Future research should therefore seek to find these tools and methods.
		2018	Sang and Kun-Pyo	The most important factor in improving the quality of children's architectural design is to understand how children perceive the environment.
		2020	Spiel et al.	In the participating process with marginalized children, the most significant challenge facing designers is the point of view through which the children look at the environment.
		2002	Francis and Lorenzo	Better urban environments will be created for children if appropriate participation models are developed.
		2002	Sutton and Kemp	The partnership between the architect and the child is the most important factor in improving the emotional bond between the child and the architectural space.
		2007	Day	The main way to realize the children's perspective of environment is to participate with them in all steps of the design process.
		2011	Haghighi Boroujeni & Faizi	Participating with children during the design process improves adults' understanding about how children perceive the environment.
		2014	Baharvand	Participating with children is the greatest factor for coordinating the facilities of the child's living environment with his/her wishes, also, improving the emotional bond between the child and his/her living environment.
		2015	Mozaffari et al.	The unattractiveness of architectural spaces for children can be mainly attributed to architectural design for children, without direct children's participation.
		2015	Drianda and Kinoshita	Children's participation facilitates the design of safe, friendly, and engaging spaces for children.
5	Examining the effectiveness of participation tools and practical partnerships with children to find design criteria for a particular architectural space	2020	Rodgers et al.	Co-design improves communication between children/youth and their living environment and strengthens participants' cultural relationships.
		2009	Kamel Nia and Hagher	Utilizing the group-discussion method, besides, drawing tools is effective to understand children's wishes in terms of green spaces. Their main wish is to have spaces for running and playing.
		2011	Hojjat and Ibn Al-Shahidi	Applying participatory drawing tools and questionnaires, and the analysis of the results show that the best way to reduce children's fear of medical spaces is to participate with them for the interior design of hospital rooms.
		2012	Oloumi et al.	Children can make constructive comments about urban spaces. In their view, security and clean air are the most vital criteria of desirable urban space, moreover, they consider themselves entitled to comment in this regard.

(Continued)

Table 1. Continued.

Row	Research category	Year	Researcher/Thinker	Conclusion
		2011	Ebrahimi et al.	Children have a high capability to comment on their desired urban spaces. They are interested in participating in the planning and design of urban spaces, furthermore, they work well with the design team throughout the participation process. They understand concepts such as security, the quality of urban space, and also, they have views about this issue.
		2013	Kashani Joo et al.	If children are given the opportunity to comment, they will make very interesting comments about the features of their desired urban spaces. Participation process helps the designer to consider the issues of their living environment through the view of children.
		2014	Khak Zand et al.	Intellectually disabled children are interested in participating and expressing their wishes about their desired medical spaces. According to them, the feeling of security is the most significant factor for the desirability of an architectural space.
		2016	Merter and Hasirci	Cooperating with parents and teachers as a link between children and the designer is effective in improving the quality of the participation process. The more the interaction with children, the greater the understanding of their needs is. Parents and teachers play a major role in this interaction.
		2019	Mokhtarmanesh and Ghomeishi	In the participatory process, first, the importance of participation must be explained to the children. The color and beauty of the school space is outstanding for children.
		2020	Behnia et al.	The effectiveness of participation depends on promoting children's awareness of the importance of their views. The use of participatory drawing tools showed that the facade of the hospital building, also, the interior design of the hospital room are very important for children.
		2020	Bluyssen et al.	Interviewing and drawing are two effective tools for participation process. The main criterion for children about their desired school is beautiful interior design of the classroom.
		2021	Manahasa et al.	Better results are obtained if children are allowed to choose a variety of participation tools.

Source. Authors.

According to the authors, experts' most important opinions are the ones that explicitly emphasize the factors, the practical application of which is effective in improving the quality of the relationship between the architect and children, as well as increasing the share of their creative views during the participation process.

After coding the desk research findings, the degree to which different experts emphasized a particular concept was quantitatively analyzed in step 7 by comparing the frequency of the extracted codes. More than 150 articles and 50 books were reviewed in the research process. These data were directly or indirectly related to the research topic including books and articles on child psychology to find essential information about the practices of establishing a relationship with children,

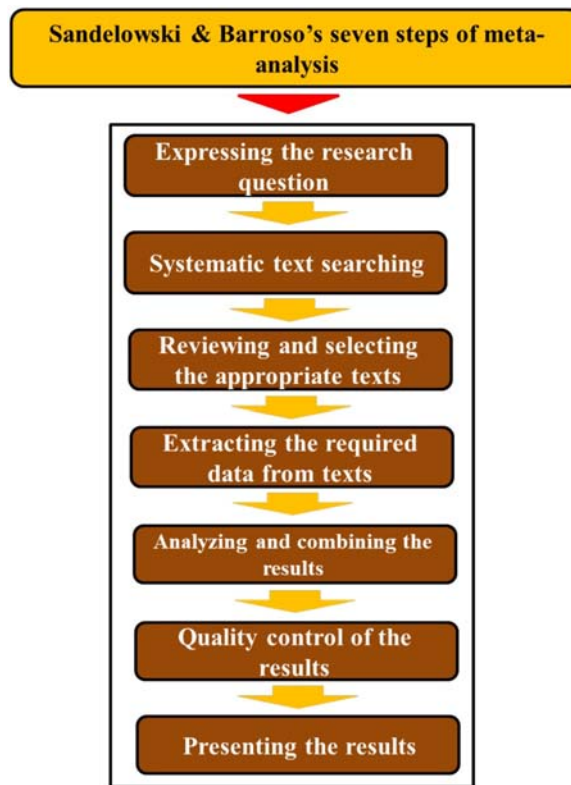


Figure 1. The seven stages of meta-synthesis. Source: Sandelowski and Barroso (2007).

understand their demands, converse with them, encourage them to do creative activities, and the like. The steps of the research process are as follows:

Step 1: expressing the research question

The first step in expressing the research question is to focus on what. More precisely, this study aims to examine the characteristics of the architect-children participation model, adjusted by answering the following questions:

- (1) **Who**, which indicates the characteristic of the studied society. In this regard, the study addresses databases, journals, and search engines.
- (2) **When**, which represents the time frame. The studied resources in this study were not limited to a specific time but included all studies in participation with children.
- (3) **How**, which demonstrates the methods or criteria, and sources are selected or removed from the meta-synthesis process accordingly.

Therefore, the main question arises as follows:

What are the distinctive features of the conceptual model of the participation of the architect and the child?

Step 2: systematic text searching

To find the main sources of the research topic, reputable scientific databases were searched, including the Web of Science and Academic Search Ultimate in addition to searching Google Scholar, SID,

and Civilica for other related articles. Then, they proceeded to extract and scrutinize the emphasized concepts or results in each source. Considering the purpose of this step regarding developing and completing desk research on the research topic, the authors essentially paid attention to any factor related to the main research topic, directly or indirectly (i.e. improving the quality of architect-children participation). This was because these factors were considered as clues to future searches and used as keywords to search for more resources, and the process was continued until reaching data saturation. Accordingly, a total of 39 key concepts related to the research problem (directly or indirectly) were found and used to complete the desk research (Table 2). Different researchers may have applied similar expressions for a single concept. Given that the authors have employed all expressions (even similar ones) as a clue for finding other materials, some keywords may seem identical.

Step 3: reviewing and selecting appropriate texts

The collected sources were studied, and note-taking was performed accordingly. Then, the notes were categorized into two groups of those directly related to the research topic and other notes.

Table 2. Applied keywords in desk research.

N	Keyword
1	Participation
2	Children's participation
3	Participatory design models
4	The participatory design process with children
5	Children's rights concepts
6	Problem analysis practices in children
7	How to communicate with children
8	Participatory architecture
9	Children's participation in architecture
10	Child and architect participation
11	Architectural design with children
12	Architecture with children
13	Participatory architecture
14	Children's problem-solving
15	Child problem-solving
16	Problem analysis
17	Children's understanding
18	Understanding in children
19	Children's participation
20	Child psychoanalysis
21	Child requests
22	Understanding the child
23	Children's perception
24	Creativity in children
25	Communication with children
26	Children's problem-solving methods
27	Children's problem-solving
28	Child problem-solving
29	Architecture for children
30	Child-like architecture
31	Child-like (naïve, puerile)
32	Problem-solving in children
33	Children's participation in the design
34	Participatory design
35	Architecture for children
36	Participatory models
37	Architectural design process
38	Problem-solving capability in children
39	Problem-solving

Source. Authors.

The note-taking process continued until adding new contents to the notes, and finally, 906 notes were prepared for evaluation.

Step 4: extracting the required data from the texts

The notes were recorded in MAXQDA 10, which is used in qualitative research and helps researchers with note-taking, note coding, code linking with common themes, code classification, and the comparison of the number of key points under a certain code with other codes. Next, the notes were reviewed, and key points were recorded on each note (the most important expert opinions on the research topic) as MEMO in the software. Then, the most important expert opinions were extracted from the notes based on the degree to which the content of each note (expert opinions) was related to the main research topic. For this purpose, two criteria were considered, including the main criterion (i.e. experts' explicit emphasis on the factor(s) contributing to improving the quality of architect-children participation) and the sub-criterion (i.e. experts' emphasis on other contributing factors for improving communication with children, understanding their demands, encouraging them to participate, paving the way for allowing children to express themselves maximally, and the like). It is noteworthy that these criteria were considered based on the direct or indirect relationship of experts' opinions with the main research topic. These steps of research were repeated until extracting all the key points of the notes.

Step 5: analyzing and combining qualitative results

In this step, a code was assigned to each key point, and then the codes were reviewed several times, integrated with common themes, and assigned a new code.

Step 6: quality control of the extracted codes

The validity of the codes was assessed using the Glynn tool, which was developed by the epidemiologist, Lindsay Glynn (Glynn, 2006). This tool is utilized to measure the validity of findings in various qualitative research methodologies (especially meta-synthesis) and is a checklist including questions on the source of a certain code. A checklist needs to be completed for each code, and the question should be answered with Yes (Y), No (N), Unknown (U), and Not Applicable (N/A), followed by calculating the value of $T = Y + N + U$. The validity of the intended code is approved if $Y/T \geq 75\%$ or $N + U/T \leq 25\%$. A checklist was completed for each code, and then invalid codes were removed, and finally, the valid codes were imported to the next step (Table 3).

Step 7: presenting the results

The roles were examined in a bottom-up manner. To this end, the codes were categorized based on the theme (sub-categories), and the sub-categories with a common theme were put in one category (main categories – concept). Eventually, the concepts with the same theme were placed in a larger category or component (Figure 2).

Components and their sub-concepts were prioritized in Excel 2010, and the abundance of the sub-code of each component or concept was observed in the MAXQDA environment. Then, the obtained numbers in Excel were recorded as separate tables (one table for each component or concept), followed by arranging the data in each table in ascending order and preparing various bar charts (based on the provided data in each table) using Excel features. Next, these concepts and components were compared and prioritized by applying the content of these charts. Then, the concepts were reviewed under each component, and the key theme underlying expert opinions was discussed as well. Finally, the infrastructures were classified in a bottom-up manner, and the conceptual model was proposed using the components and key infrastructures.

Table 3. List of codes with verified validity by the Glynn tool.

Code	Notes	T	Y/T	N + U/T	Code	Notes	T	Y/T	N + U/T
1	5	25	2.08	1.92	30	687–697	20	0.75	13.8
2	616–28–20	25	1.44	21.8	31	678–681	21	0.68	13.2
3	32–23–20	23	2.26	22.9	32	704–822–710–724	21	0.22	13.6
4	8–11–12–13–14–20–25–34–40 81–202–206–215–221–292 320–579–690	23	2.83	22.3	33	494–603	22	0.2	13
5	132–608–610–769–801–807	25	1.76	21.4	34	756	22	1.23	12
6	610–612	25	1.76	21.4	35	440–514	23	1.51	11.2
7	63–87–190–205–703	25	1.44	10.2	36	515–518	23	1.51	11.2
8	314–353–693–795	21	2.04	2.72	37	810–232	20	2	12.5
9	746	5	12	8	38	74–404–676–733	20	1.25	13.3
10	16–11–25–26	10	4	6	39	729	20	0.5	14
11	12	2	25	25	40	30–260–400–478–662–804	18	0.6	15.4
12	616–321	1	100	0	41	403–477	18	0.3	15.7
30	91–214–304–340–700	10	4	6	42	670–667–705–876	18	2.77	8.02
14	616–118	10	5	5	43	674–731–668–671–701–819–676	18	2.77	8.02
15	731	10	4	15	44	677	18	0.92	9.87
16	220	11	3.3	22.3	45	720–699–686	17	0.69	10.7
17	85–106–181–610	12	3.47	20.1	46	802–636–688	17	0.34	16.6
18	159–215–220–240–242–286–329 339–732–818	17	1.38	15.6	47	737	18	0.3	15.7
19	221–95	14	1.02	19.4	48	736–904	18	0.61	10.2
20	18–27–332–918–721–749	13	1.77	20.1	49	804	16	1.95	10.2
21	54–77–202–207–217–227–231 275–278–291–303–339–651–811	21	3.17	19.7	50	226	18	2.46	8.33
22	230	15	4.88	14.2	51	83	12	1.38	14.6
23	223–299–234	15	1.33	17.8	52	83	12	1.38	14.6
24	740–744	18	0.92	15.1	53	272	18	0.61	10.2
25	745	18	0.92	9.87	54	67–125–138–141–185–275 302–538	24	3.99	0.17
26	68–291–541–764–780–798–618	16	0.39	17.6	55	153	16	4.29	1.95
27	809	16	0.39	17.6	56	117	16	4.29	1.95
28	255	16	0	18	57	40–81–202–206–215–221 222–224–240–320–327–331 362–618–690–708–716	22	1.85	7.02
29	37–38–202–240–277–329 586–701–724–726	18	0.61	15.4					

Source. Authors.

Findings

Figure 3 summarizes the findings of seven research steps.

The order of the final findings was determined based on the studies performed in the seventh step of research. Each component contains a set of concepts, and each concept includes defined codes based on the opinions of experts and researchers on a common topic. Therefore, the frequency of the total sub-code of each component indicates the degree to which different experts emphasized the intended component. Each component was named by the authors, and the implications of its subset were explored as well. According to the research structure, each concept includes codes that collectively emphasize a factor influencing the quality of architect-children participation. Therefore, each component was named based on how it affects, namely, the role of concepts in improving the quality of participation (Figure 4).

Contextual components

These components include some of the most fundamental concepts that allow constructing a new form of children's presence in the co-design process if any. In other words, the architect

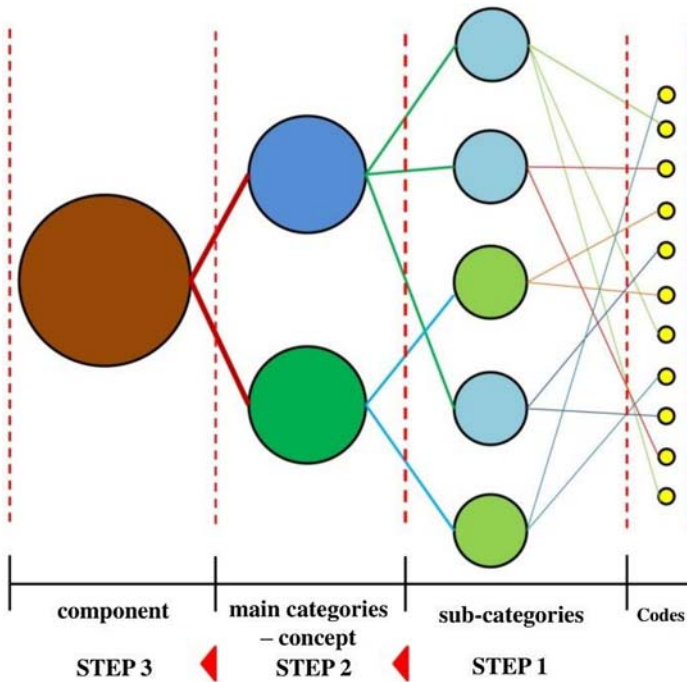


Figure 2. Author’s approach for code categorization. Source: Authors.

<i>Step</i>	<i>Finding</i>
Step 1	What are the distinctive features of the conceptual model of participation of the architect and the child?
Step 2	39 Keywords for desk research
Step 3	Collection of 906 notes by reviewing various sources
Step 4	Extract 90 basic concepts
Step 5	Summarize and integrate basic concepts and define 65 basic codes
Step 6	Extract 57 valid codes
Step 7	Categorize all code into four main categories (i.e., components) and sub-categories of each (i.e., main concepts)

Figure 3. Summary of the findings of the seven steps of the research. Source: Authors.

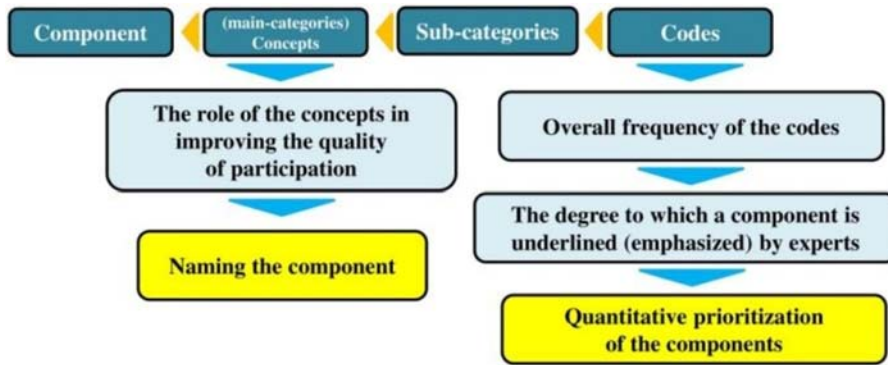


Figure 4. Schematic structure of component prioritization and naming. Source: Authors.

must focus on these concepts to increase the depth of participation, thus they were called contextual components.

Contextual components encompass four main concepts:

- *Children's presence in the architectural design process as a designer:* An ideal participatory model is formed when the child's position is upgraded from a pure respondent to a pure designer. Many researchers in the field of design for children are concerned with the child's character in participatory processes as a member who can contribute to the decision-making process.
- *Architect among children:* In the participatory model in which children as architectural designers are supposed to decide on their projects alone, the architect takes a different role and acts as a member of the design team alongside the children.
- *Group participation and maximum creativity:* A higher number of children consulting with the architect in the design process leads to a greater number of creative producers in the participatory process. As a consequence, the product of the process is evaluated in more child-like perspectives, rendering the end product more child-like.
- *Promoting the awareness of participating children:* One of the essential factors contributing to an increase in the efficiency of the participatory process is the promotion of children's awareness of their role in the process. This is because children show no willingness to express their opinions until they understand why they should express their views in the first place and ensure that their views are appreciated appropriately.

Proactive components

They include a range of concepts that help in advancing the participatory process in a forward path in which children can play a more decisive role. If the architect ignores these concepts, no progress is made for increasing participation depth even if the stage (i.e. contextual components) is set.

Proactive components have two key concepts as follows:

- *Architect as a facilitator of children's presence in the design process:* The architect should attempt to streamline the problem of architecture to facilitate children's active presence alongside the architect since children are less likely or unlikely to provide creative answers if they are not familiarized with the dimensions of the architectural problem or if these dimensions are beyond their understanding. They may refuse to proceed with their active presence in the design process due to the lack of an appropriate intellectual connection with the architecture problem. Accordingly, architects should set their pursued goals of participation with children and formulate a scenario for children's participation based on the intended goals. In this context, children play a key role

and are directed by the architect toward a targeted path to draw the required conclusions. They must utilize child-like literature to verbally connect to children and share the theme with them. The characteristics of the space in which children participate in group activities affect the quality of activities and their interest in participating in group activities. The establishment of a suitable place for children's participation is facilitated by fulfilling comfort conditions and providing appropriately tailored to the age of children to produce creative works.

- *Architect as the design process manager:* The architect functions as a driver, provides children with information on the project, awaits their creative views, and records what they indicate to be evaluated in the subsequent steps, leading to some bargains between the architect and children. Following the collection of children's ideas and views, the architect attempts to scrutinize children's answers and resurvey them. Given that children generally use the trial-and-error method for solving problems, and such behavior may likely derail the process, the architect, as a person who ranked the second for solving the problem, must target at controlling children's probable errors with their instructions. Accordingly, children's participatory activities are in parallel with the architect's opinions, and the architect plays the role of a design process controller. According to child psychology research, children quickly get tired (Faber & Mazlish, 2020), posing a challenge to the participatory problem-solving process. Thus, the architect must give children enough time to ensure their active presence and further exploit their deliberative faculty and imagination.

Motivational components

Once the groundwork has been laid to increase the depth of participation (i.e. the contextual components) and the components affecting the forward movement (i.e. the proactive components), the groundwork should be laid to motivate as many children as possible to express creative ideas and to make them more interested in accompanying the architect to the end of the process. Therefore, elements affecting the increase in children's desire to work with the architect and express more creative ideas during the participation process were named motivational components.

These components focus on paving the way for children to participate more actively and creatively in the participation process and include two concepts as follows:

- *Motivation as a sustainable participation factor:* Co-design presents children's understanding of the architectural problem instead of requiring their creativity to satisfy the architect. Children interpret their unrefuted ideas and statements as acknowledging them, leading to their increased motivation to develop more ideas and form a sense of usefulness in their minds. Moreover, children are encouraged to further express their opinions if they are allowed to express their views first and talk about different matters.
- *Using some techniques to encourage children to have more active participation:* The presence of an attractive intermediary (an object or a person) between the child and the architect promotes children's interest in being more active in the problem-solving process. A robot that speaks to children in a special tone doubles their interest in responding. In addition, parents can help their children understand the questions asked by the architect and provide the architect with their children's views. Further, asking a question instead of answering is another technique for encouraging children to think more and find more creative answers. This implies that the architect answers children's probable questions by asking what they think in order to force them to think more and develop new solutions. Thus, it would be ideal to give freedom of selection to children so that to encourage them to raise their level of participation with the architect. In other words, the architect should allow children to choose their desired tools for expressing their opinions. In this case, participation turns into an interesting game for children. What has been suggested is called technical motivation, which depends on the architect's initiative in extracting as many ideas, opinions, and responses as possible from children.

Architect-focused components

Some of the components increasing participation depth have several concepts that directly emphasize the architect's personality and behavioral and functional characteristics during and after the co-design process. Therefore, they were named architecture-focused components.

These components aim to standardize the product of the design process to be used by children. The architect should attempt various phenomena and problems through the eyes of children, namely, watching the work through the eyes of children. The possibility of watching the produced work through children's eyes is higher when the architects can further imagine themselves in their childhood. Accordingly, psychologists recommend strengthening the inner child. Thus, to standardize the product of participation, architects should have the designed participatory product filtered through their child-like imagination and express their views on the project as an exploiting child. They should then modify the participatory product based on the existing standards.

Studies showed that the underlying components and concepts were based on two foundations of children's thinking and their ideas. The comparison of the weights of concepts (the degree to which various experts focused on their underlying codes) in Excel (Figure 5) demonstrates that:

- (1) Children's thinking has the maximum weight in each of the four components.
- (2) These four components intend to help the architect better understand children's ideas on the design theme.
- (3) The weight ratio of the children's thinking to ideas is a (a constant number) in each of the four components. In other words, children's thinking and ideas play relatively the same roles in forming these components.
- (4) The dashed lines on the diagram are not horizontal, indicating that children's thinking and ideas have different weights in the four components. Therefore, the role of each component in paving the way for the further exchange of ideas between the architecture and the child and enabling children to come up with more ideas differs from other components (the four components seek to set the stage for enhanced architect-child idea exchange. However, they vary in the degree and type of the effect, as well as the ability to improve the quality of architect-child participation).
- (5) The dramatically reduced weight assigned to children's thinking in the architect-based components can be because this component focuses on the architect's characteristics. However, child-like thinking still plays a role in this component since the architect should think about the design theme in a child-like way and as a child.
- (6) The probability of achieving children's ideas and participation efficiency is lower when children's thinking is less effective in the design process (e.g. when children's participation is restricted to their response to several simple questions about the design theme).

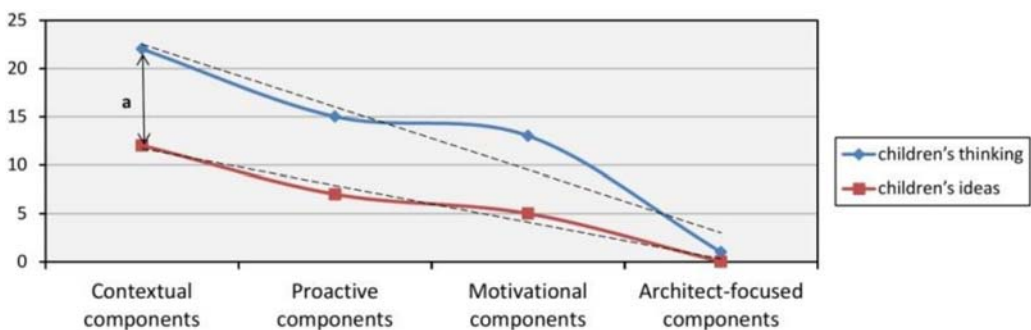


Figure 5. Comparison of the weight of macro-foundations in the four extracted components. Source: Authors.

- (7) There is a relationship between the weight of the red (ideas) and blue (children’s thinking) points. In other words, the higher number of children participating in the design process leads to higher degrees of child-like thinking helping the architect in achieving more children’s ideas.
- (8) Lower values of *a* demonstrate that the extracted ideas are more genuine. Under ideal conditions, the two graphs converge until reaching a coincidence. In this case, children’s mere thinking plays a key role and children are the architectures of their own projects, leading to the formation of the deepest kind of participation. Under these circumstances, the architect is solely the process manager.

Therefore, children’s thinking lays the foundation of the four above-mentioned components and is the key to connecting these components (Figure 6).

Discussion

The purpose of explaining the conceptual model of deep participation is to lay the groundwork for architect-children co-creativity. Therefore, deep participation seeks to provide a method of co-design in which children have a key role in ideation and decision-making.

The four components are defined based on the prominent role of thinking, creativity, and ideation of children in the process of architectural design for themselves thus these components seek to achieve a common goal (i.e. to provide the conditions under which children’s thinking is the main ideator in the co-design process). Each component has a different contribution to helping the architect to achieve this goal. None of the components alone are effective in this regard. Each component plays a different role, and the efficiency and effectiveness of each component depend on the

Analysis		Synthesis		
Component	Concept	Code	Key Infrastructures	
Contextual components	Promoting the awareness of participating children	Giving information to the child to get information from him	Child	Children's thinking
		Child mental organization	Child thinking	Children's thinking
	Group participation, maximum creativity	Describe the child's line of thoughts in the process	Child thinking	Children's thinking
		Children scrutinize each other's thoughts.	Child thinking	Children's thinking
		They seek the best answer to the problem through consultation.	Idea exchange	Children's thinking
		Verbal exchange leads the group to more discussion and thinking and more complete ideation.	Idea exchange	Children's thinking
	Architect among children	Collaboration is done with a group of children in order to benefit from more ideas and wider ideation.	Idea exchange	Children's thinking
		Children should be given priority for commenting and presenting their ideas.	Idea exchange	Children's thinking
	Children's presence in the architectural design process as a designer	Children's ideas, the result of their thinking about architecture, draw the path of ideation.	Idea exchange	Children's thinking
		Select the extent to which the child influences the participatory process based on his/her intellectual abilities	Child thinking	Children's thinking
Consultation and exchange of views between children		Idea exchange	Children's thinking	
Scrutinize each other's opinions through verbal communication and consultation		Idea exchange	Children's thinking	
Prioritize the collective wisdom of children over the individual wisdom of the architect		Child thinking	Children's thinking	
The child thinks and generates ideas and draws the design path		Child thinking	Children's thinking	
Proactive components	Architect as the design process manager	Promote children's ideas over architect's ideas	Child thinking	Children's thinking
		Communication between the architect and the architect throughout the process, not just at the beginning of the process.	Child thinking	Children's thinking
		The child plays a key role in ideation	Child thinking	Children's thinking
		The architect must guide the children's thinking in the desired and predetermined direction	Child thinking	Children's thinking
	Architect as a facilitator of children's presence in the design process	Children play a key role in generating creative ideas	Child thinking	Children's thinking
		The architect must scrutinize children's ideas	Child thinking	Children's thinking
		A group of children come up with ideas through consultation	Idea exchange	Children's thinking
		The architect guides the children in the direction of ideation in the design subject	Idea exchange	Children's thinking
		Children play a key role in solving the architectural problem	Child thinking	Children's thinking
		The architect simplifies the problem, the child solves the problem, and the architect scrutinizes the answer	Child thinking	Children's thinking
Motivational components	Motivation as a sustainable participation factor	The child is given basic information and children become the main axis of the process	Child thinking	Children's thinking
		Reassuring children of their constructive influence in solving the architectural problem and benefiting from their opinions	Child thinking	Children's thinking
	Using some techniques to encourage children to have more active participation	Goal setting by the architect to use the apparatus of children's thinking to solve architectural problems creatively	Child thinking	Children's thinking
		Providing a suitable space for children to think better and come up with better and more complete ideas	Child thinking	Children's thinking
		Providing the conditions for the presence of children as the main idea makers until the end of the process	Child thinking	Children's thinking
		Providing conditions in which children do not think in line with the architect, and express their thoughts	Child thinking	Children's thinking
Architect-focused components	watching the work through the eyes of children	The child should be the first to express his opinion so as not to be influenced by the views of the architect and to think in a self-directed manner	Child thinking	Children's thinking
		Approving children's ideas and opinions to encourage more ideation and creativity	Child thinking	Children's thinking
Design standards	Design standards	To extract more ideas, the architect aligns with the children by acknowledging their creative productions.	Child thinking	Children's thinking
		Encouraging children to think more and solve problems without the help of an architect during the design process	Child thinking	Children's thinking

Figure 6. The extraction of the key infrastructures of the four components. Source: Authors.

observance of its sub-concepts. Furthermore, the depth of the increased participation relies on the observance of all sub-concepts of all components. Therefore, deep participation can be described as follows:

- (1) It means direct exploitation of children's thinking throughout the design process. In other words, children attend the design process alongside the architect until the end and consult with the architect.
- (2) Children are considered as those who come up with ideas and creative producers in the design process.
- (3) The architect should take into account four key components and their underlying concepts:
 - Contextual components: They intend to pave the way for children to develop ideas throughout the design process.
 - Proactive components: They aim to set the stage for continuous architect-children participation during the design process (children collaborate with the architect throughout the design process rather than being only a part of the process).
 - Motivational components: Their purpose is to encourage children to think more deeply and hold more genuine views on the design process.
 - Architect-focused components: They seek to make the architects imagine themselves as an exploiting child at the end of the design process. They should then modify the project based on their knowledge and present the end product after consulting again with children (Figure 7).
- (4) Each of the four components is based on children's thinking, seeking to extract the highest number of participating children's ideas on the design theme.
- (5) The foundations of children's thinking and ideas are highly interrelated, implying that the architect achieves more ideas on children's desirable architecture when children think deeper and express their views more genuinely.
- (6) The deeper the architect understands children's demands, the higher is the depth of participation. Therefore, the depth of participation depends on the degree to which children's ideas on the design theme can be obtained by the architect.

Based on the findings, the conceptual model of deep participation was introduced as a sphere with children's thinking at its center and the surrounding four components (Figure 8). This is because the spherical geometry well illustrates the relationship between the components and their relationship to children's thinking and ideas symbolically. This conceptual model is built on the foundation of children's thinking as the center and is the basis for the formation of deep participation. In this model, the four above-mentioned components show different characteristics toward

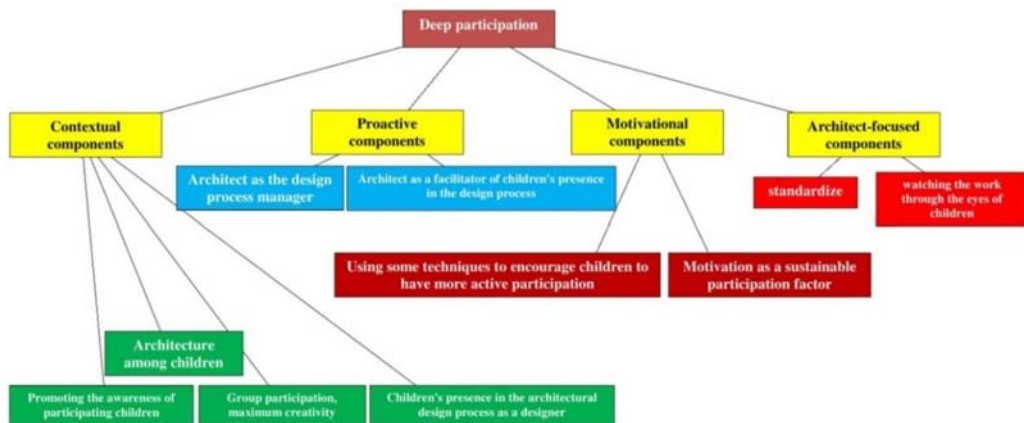


Figure 7. The four components of deep participation formation. Source: Authors.

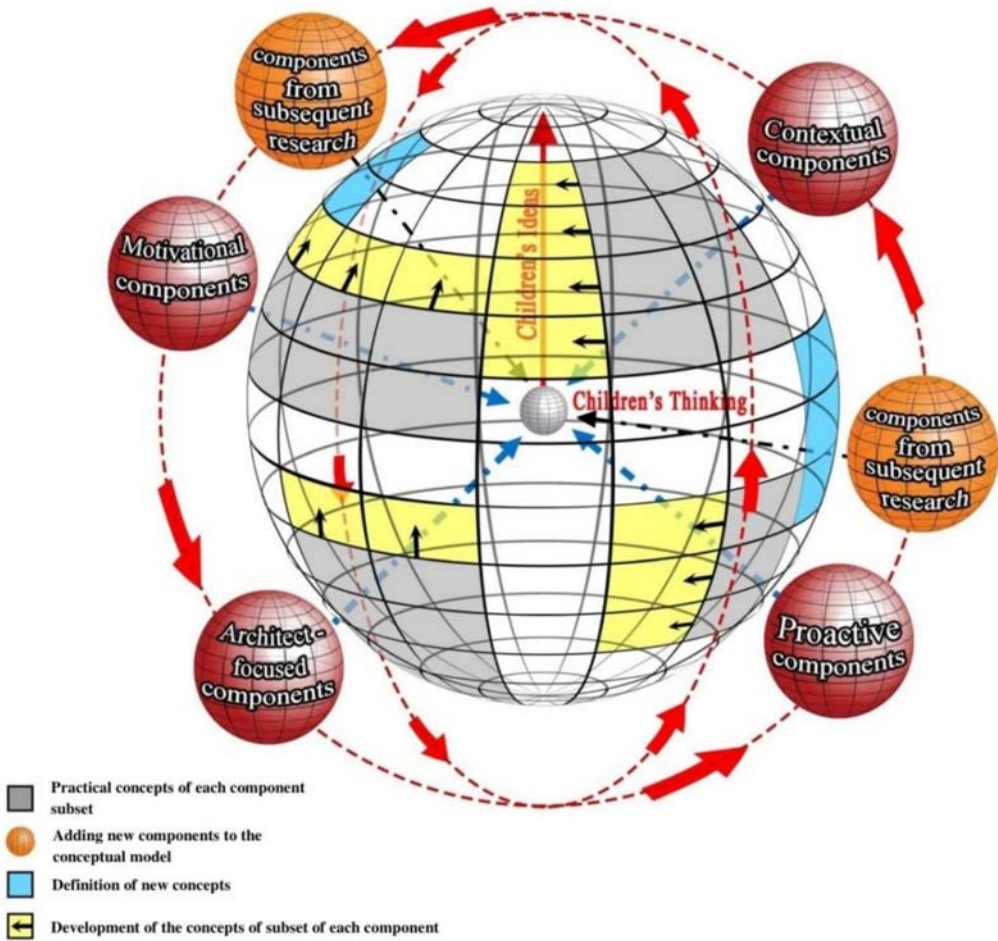


Figure 8. Conceptual model of deep participation. Source: Authors.

each other. However, all seek to provide the basis for discovering the most genuine demands of children regarding architectural spaces. The geometry of the conceptual model represents that:

- (1) Any other component, which can be formulated based on using children's thinking to extract their most genuine ideas about an architectural problem, can be added to this model (Figure 8, orange spheres).
- (2) Given that each component possesses a subset of practical concepts for architect-children participation, these concepts can be completed or scrutinized after conducting further research. The development of the content of each component leads to further coverage of the surface of the sphere, increasing the domination of different aspects of children's thinking and deep understanding of their demands for a desirable architectural space (Figure 8, yellow areas).

Figure 9 presents the instructions for using this model. Previous works possess four pillars depending on their conclusions:

- (1) Informing adults about children's ability to affect events happening around them and attaching importance to their civil rights (e.g. De Backer & Jans, 2002; Driskell, 2002; Hart, 1992; Shier, 2001).

Contextual components	
Goal : Providing grounds for maximum comment by children	
Concept	Proposed method
Expressing the importance of children agreeing with the architect	Tell the children you need to agree with them and that you alone cannot design a worthwhile project.
Quantitative development of participating children	The more children you have with you, the more ideas you will have.
Do not reject children's ideas and opinions	Rejecting children's ideas or opinions discourages them from commenting further in front of you.
Freedom to choose how to express opinions	Leave children free to choose how to express their opinions or ideas (draw, make a mock-up, write, or just talk to you about their idea, etc.).
Exchange	Allow children to exchange ideas, explore each other's ideas, and complement or refine their ideas together.
Grouping	Allow children to be divided into smaller workgroups. They will join the groups themselves based on their thinking and opinions.
Select a speaker	Let the children choose a child as their speaker. He will tell you the summary of the group's opinions that were accepted by everyone.

Proactive components	
Goal : The active presence of children from the beginning to the end of the design process	
Concept	Proposed method
Participate in a friendly atmosphere	The venue should not be "official." In informal settings, children feel more relaxed and comment without fear or worry.
Child fatigue and process cessation	Stop the process whenever you feel the children are tired. Children's boredom reduces the quality of their comments. The exchange of views will continue in the next meetings.
Simplify verbal communication with children	Use age-appropriate literature to talk to children. Let them consider you a friend or a groupmate. Your formal literature reduces the appeal of the participation process.
Participation as a hand-collective game	As much as possible, plan the process so that children feel involved in an engaging group game. Adjust the scenario of this game based on your goals.
Get help from auxiliary forces	Allow parents or educators to be involved in the participation process. They are good bridges between you and the children. Of course, they should not give clues to children. They just convey what you mean to the children and what the children say to you.

Motivational components	
Goal : Encourage children to think deeper and make more genuine comments	
Concept	Proposed method
Approve children's ideas	In the early stages of children's brainstorming, welcome all their ideas. However, after collecting all the children's ideas, a filtering process should be used, in which some ideas are confirmed, and some are rejected.
Priority to comment with children	Let the children comment before you. Your comment will give clues to the children, and they will comment on these clues. That is, participation with children will not work well.
Evaluate ideas and opinions when children are not present	Make the final judgment and evaluation after saying goodbye to the children. If your assessment coincides with the children's comments, they will feel like they are in the exam session. This feeling affects their comments.
Children answer other children's questions	If a child asks you questions, ask others to answer. They will find a child-friendly answer that is accepted by all.

Architect-focused components	
Goal : Enhance special features in designers who design for children	
Concept	Proposed method
Strengthen the ability to use a variety of participation tools	Develop your ability to use various participation tools because, in this participatory model, children have the right to choose the tools they want.
Self-concept of child	Try to look at the design theme through the eyes of children.
Strengthening the inner child	Try to strengthen child-like feelings we have been deprived of by adulthood.

Deep Participation

Figure 9. The practical solutions for increasing the depth of architect-children participation. Source: Authors.

- (2) Focusing on the need to study the practices of promoting children's position in their specific decision-making (e.g. Burton, 2006; Davies, 2009 as cited in Karsten, 2012; Kleine, Pearson, & Poveda, 2016; O'Kane, 2013; Sener, 2006).
- (3) Emphasizing the relationship between participation quality and improved emotional bond between children and the architectural space (e.g. Day, 2007; Drianda & Kinoshita, 2015; Sutton & Kemp, 2002).
- (4) Participating with children and deriving their ideas on the design of an architectural project (e.g. Behnia, Kheirollahi, Sahragard, & Soltanifar, 2020; Kamel Nia & Haghir, 2009; Khak Zand, Agha Bozorgi, & Kadkhoda, 2014).

A comparison between the findings of the present research and these classifications demonstrates that:

- (1) The four components allow increasing children's ideas on their special architectural projects. Therefore, the findings are consistent with the first category of research results and develop strategies for respecting children's rights.
- (2) The findings emphasize practical guidelines for improving the position of children in their own decisions. Thus, the findings are in line with the second category of research results and open up a new perspective on the place of children in participatory processes.
- (3) The findings pursue the intended goals in the third category of research and introduce several practical strategies for improving the quality of architect-children participation.
- (4) Contrary to the fourth category of research with their results on a specific project, the findings of this study apply to the co-design of a wide range of projects specific to children because the guidelines focus on the architect-child interaction process instead of relying on the project theme.
- (5) Deep participation seeks to fill the gap associated with the direct use of children's ideation in common participatory processes.

Thus, the findings pursue the intended key goals in previous research while having an atomistic perspective compared to them. Participatory models (e.g. Hart's ladder of participation or the proposed Shier model) seek to fill the gap related to children survey in the design, planning, and decision-making processes. However, the findings of this study focus on practical solutions to enhance the quality of architect-children participation and allow architect-children consultation and direct effectiveness of children in shaping the architectural work, contributing to complementing the results of previous research. Many sources were analyzed in this study although they can be more complete. This is because various articles and books are permanently published on the research topic, the results of which can facilitate the completion of the results of this research. According to the authors, many factors are involved in the quality of architect-children participation, including age, geographical location, culture, indigenous customs, gender, and children's level of education, along with the architect's knowledge of participation, the architect's personality traits, and the like. However, this study sought to introduce a basic model for participation instead of exploring key factors, which is a research constraint. Therefore, the results of this research can form the basis of future supplementary research. To develop the research results, the pillars of future studies are proposed as follows:

- (1) What is the relationship between factors such as age, gender, or culture of participating children and strategies for exploiting the results of this research in practice?
- (2) Do such factors allow the introduction of new components and the completion of an in-depth participation conceptual model?

It is also believed that architect-focused components provide the basis for new studies:

- (1) Reviewing training strategies for architects specializing in design for children.
- (2) Reviewing strategies for strengthening the inner child of the architect.
- (3) Reviewing strategies for improving the architectural skills of the architect conversation with children.
- (4) Investigating the relationship between child psychology and architecture.

In the conceptual model of deep participation, children draw a vision of their ideal architecture for the architect. During the design process, the architect transforms children's ideas into a workable architectural design. Therefore, deep participation complements the results of previous studies because it relies on the results of those studies while providing more practical guidelines. In conventional participation models, children's wishes are understood relatively (e.g. architects decide based on their perceptions of children's drawings about the design theme). However, deep participation increases children's effectiveness in design. Thus, with each run of this model and evaluation of the product features of participation, more genuine criteria are obtained for architecture for children. These criteria can be recommended to other architectural designers because they are based on children's ideation and design. Therefore, deep participation can facilitate the development of design criteria for children.

Instructions for this model are highly simple while not relying on the design theme and are not specialized.

Accordingly, all designers can easily use these instructions. The authors intend to participate with children in their subsequent research in several pilot case studies and use the introduced instructions throughout the participation process. They also want to take note of the efficiency (strengths) and weaknesses of the instructions at the end of each process. They then attempt to modify and further complete their proposed model after analyzing the obtained results. Finally, other researchers are advised to test this model, which significantly contributes to further complementing the model.

Conclusion

The deep participation conceptual model seeks to provide a platform for children to freely brainstorm about the project they will be exploiting, to observe the results of their ideas up close, to provide their complementary ideas, to be actively present with the architect during the co-design, and to modify the project. Accordingly, children play the most important role in the development of architectural project. The architect-children participation structure also evolves from polling children at the beginning of the design process to consult children during the design process. The four components of this model are scalable and flexible, which are mandatory features in the construction of conceptual models. The further development of this participatory model brings us closer to the ideal state in which children are the small architects of the projects they exploit themselves. In this case, adults (the architect) solely their role in standardization and project execution. To use this model, architects should consider the concepts under the main components (Figure 9). Considering that the proposed model is fundamental, architects can complement these concepts using their professional experience after utilizing this model. They probably face some shortcomings and overcome them based on their needs and introduce a new concept. This work builds upon the proposed model and overcomes its shortcomings.

P.S.

- (1) Co-design is a user-oriented design approach that is based on collective creativity (Sanders & Stappers, 2008). Sellama (cited in Raheb, 2014) introduced co-design as a new design approach.

Sanoff (2007) states that the sum of group thinking is much more reliable than that of individual thinking (Sanoff, 2007). In co-design, the design is accompanied by an exploiter, and exploiter knowledge is considered along with designer knowledge (Sanders, 2005). Moreover, co-design is a method of participatory design, attended by exploiters both at the time of ideation and at all times of decision-making (Sanders & Stappers, 2008).

Disclosure statement

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