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Essential Attributes to Stimulate 21st Century Skills amongst Children Learning in Pre-war Schools

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Abstract
Globally, new schools are built according to users' needs and are comparable with the newest pedagogical approach. The efforts, however, raised concern about the affordance of existing school buildings and whether the users are experiencing the present educational transformation. This study, therefore, aims to examine factors that qualify a school to provide twenty-first-century learning, specifically pre-war school buildings in Scotland. Through a focus group *design charrette*, this study obtained forty-eight primary six children's perceptions of what the school spaces afford. Schools should provide sufficient learning spaces that are broadly utilized and flexible to provide supplementary learning experiences for children.

Keywords: 21st Century skills; Children; Learning; Pre-war Schools

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1.0 Introduction
Many nations have shifted to twenty-first-century educational thinking and planning to provide comprehensive quality education to the younger generation. Many government bodies seriously consider improving the education system, from remodelling the curriculum syllabus to rejuvenating the learning environment. Historically, schools are defined as 'plain buildings dressed in the current fashionable design containing a single teaching room' (Institute of Education Archives, 2009, p.1). It is a proper place where teachers convey an approved curriculum for a specific period (Rao, 2003). School is often perceived as a place where formal education takes place even though, in reality, learning transpires anywhere and at any time (Burke, 2013). In Scotland, notably, the Government vowed to improve every school in the state that remained in a poor and bad 'condition' or 'suitability' (Scottish Government, 2009). Approximately 1139 schools have been rebuilt or substantially refurbished since 2007, which increased the proportion of schools in good or satisfactory condition from 61% to 91.7% in April 2024 (Scottish Government, 2024). Many more quality new buildings for primary, secondary, and special schools are anticipated in the next phase of Scotland's building school program. In other words, Scotland's children and young people will have better opportunities for formal education in quality school buildings.

The encouraging investment in Scotland's new school buildings raises the question of the equal learning experience for children and young people in the remaining schools, exclusively the pre-war schools. Of the 31% of schools that predate World War II in Scotland,

18% were built during or before the 19th century (McKendrick, 2005). The diversity in age of the school buildings in Scotland reflects a rich mixture of old and new across the region. Currently, most of the remaining school buildings still deliver the National Curriculum for Excellence at every level of education. The issue of learning within pre-war schools extends directly to the design and lifespan of the school building. Schools must serve not only the future needs of the users but also those of the surrounding community. The statement delineates a firm perception that older school designs are less likely to provide for twenty-first-century education and that the learners will not attain the essential skills required for the future. The ability of traditional school design to provide twenty-first-century teaching and learning has been questionable. Available studies ineffectively describe what the design actually and potentially offers to achieve the educational transformation required.

Therefore, this study aims to explore the potential of pre-war school design in providing users with a comparable twenty-first-century learning experience. In addition to understanding how and where learning takes place in pre-war schools, this study extended an objective to distinguish *types of attributes* that instill twenty-first-century skills from the children's perceptions.

2.0 Literature Review

This study reviewed literature related to the theme of twenty-first-century learning and twenty-first-century skills. Learning is about gaining knowledge or skills, whereas skill is an ability to do something well, according to the Oxford Dictionary of English (2024). The most comprehensive description of twenty-first-century learning was first initiated by P21 or Partnership for Twenty-First-Century Learning (2015). Based in the US, the national organization developed the 'Framework for Twenty-first-century Learning,' which outlined the critical attributes of education consisting of 'skills, knowledge, and expertise that will prepare students for success in the twenty-first-century industry'. The framework has become a fundamental reference point for local and international education organizations through its four learning and innovation skills (4Cs): critical thinking, communication, collaboration, and creativity. The term twenty-first-century learning was attempted among researchers, too. For instance, Kereluik et al. (2014, p. 127) reviewed the concept of twenty-first-century learning across fifteen education and economic organizations. The study claimed that the only means to achieve the goals of twenty-first-century learning had developed throughout, while the concept remained the same. Similar attempts were also made by Aabla (2017) and Mishra and Mehta (2017).

Twenty-first-century skills were initially claimed to be deceiving (Silva,2009), but there is no established definition (Suto & Eccles, 2014). In 2010, Dede compared three frameworks of twenty-first-century skills about the P21 Framework and revealed coherent similarities across them. Dede (2010) concluded that there is a need for reassessment in classroom cultures to understand concepts of twenty-first-century skills better. Chalkiadaki (2018) successively investigated the skills and competencies of twenty-first-century in primary education. Twenty skills are classified into four categories: personal skills, social skills, information and knowledge, and digital literacy. Those skills are assumed fundamental in twenty-first-century education, leading to the notion that an understanding of the terminology of twenty-first-century skills has been distinguished. In 2019, however, there were distinct findings by Nehring et al. on the understanding of school teachers toward twenty-first-century skills. Teachers were found to prioritize skills that are not crucial through test-based accountabilities. Another earlier study by Fox (2011) discovered that teachers and students had a restricted understanding of twenty-first-century skills. Although limited in the context of high school, the study learned that school administrators had responded more positively. The study suggested an involvement of the school community before successfully implementing twenty-first-century skills in schools.

3.0 Methodology

This study considered the *focus group interview* method in obtaining children's perceptions of what the school spaces afford. The method gathers a group of people over a session to discuss a structured or unstructured topic (Braun & Clarke, 2013). Each session should be coordinated by a moderator responsible for ensuring the session continues without anyone dictating. The study was centred on a primary school in Edinburgh, the capital city of Scotland. The selection of case studies involved only schools before World War II or *pre-war schools,* which Thomson (1997) categorized into two: *Victorian pre-war schools* and '1930 pre-war schools'. Initially, two case studies for each category were selected; however, due to non-compliance with the selection criteria, the study considered only three case studies. Forty-eight children between the ages of 9 and 10 participated in the focus group interview. The children were selected due to their competencies and familiarity with the school environment.
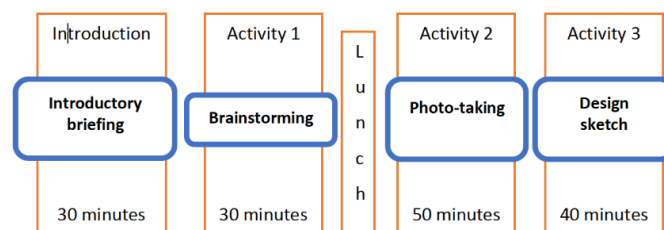
3.1 Method of data collection

Fig.1: The conceptual design of design charrette
(Source: Author, 2021

The focus group interview was conducted via *design charrette,* an alternative mode of communication with the children. The *design charrette* in each school took at least two and a half hours. It involved three sequential activities: brainstorming, photo-taking, and design sketching, preceding an earlier introductory briefing (Fig.1). Templates were prepared for the activities, and the duration of each activity varied from 30 to 50 minutes.

The children were briefed on the intention and procedures of the *design charrette* through an *Introductory briefing.* During the session, the children were constantly informed about their ethical considerations and voluntary participation. In a group of five or six, the children were tasked with designing the school's recycling bin. Through Activity 1 – *brainstorming,* the children were to brainstorm the procedure to design the recycling bin amongst their group members. The 'step-by-step processes' were to be written sequentially as keywords on a provided template (Fig.2a). Activity 2 – *photo-taking* then required the children to take pictures of the school spaces in completing the entire design task. Each group of children received an instant camera with only ten films. The pictures taken were to be stuck on the given template of Activity 2 (Fig.2b), in which the children, too, were asked to mark the locations of the selected school spaces with a colored sticker. The final activity required the children to work individually before gathering all the information during the former two group activities. Through Activity 3 – *design sketch*, the children were to propose the most ideal space for conducting the entire recycling bin design task. The individual proposals were done in a given A4-size template (Fig. 2c) and were to be completed within forty minutes only using any preferred drawing media. The *design charrette* focus group ended with a short feedback session where the children could criticize their group-mate's design ideas.
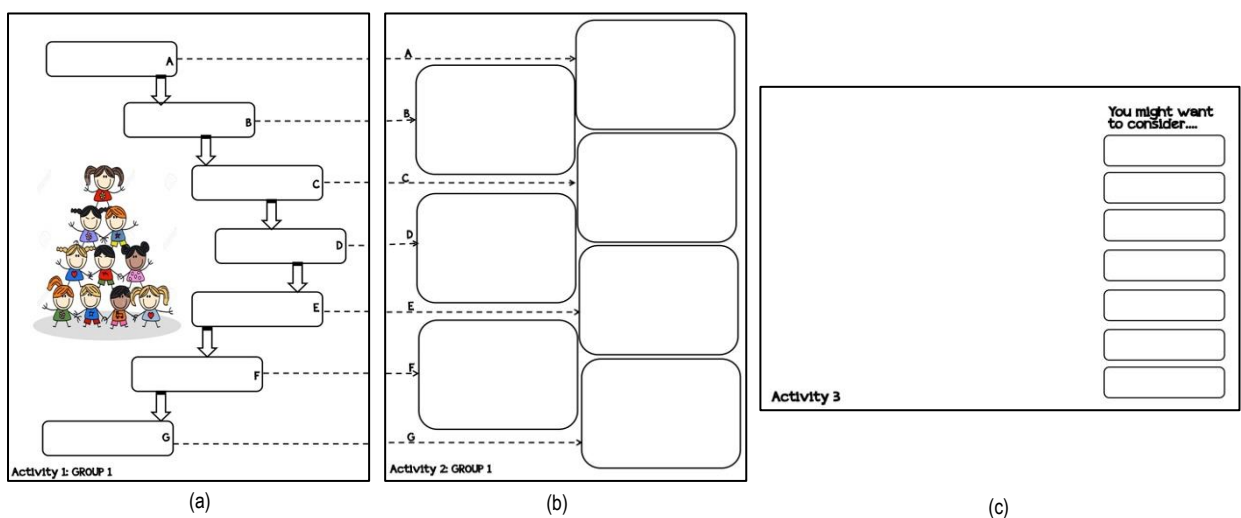
(a)	(b)	(c)

Fig.2: Template for design charrette activities: (a) Activity 1-Brainstorming; (b) Activity 2-Photo-taking; (c) Design sketch
(Source: Author 2021)

3.2 Method of data analysis

This study attempted the approach for analyzing the various forms of visual datasets, including the diverse mapping, the instant photographs, and the children's design sketches through Content Analysis. Rose (2006) stated that the method mainly emphasizes the frequency of categories by calculating and analyzing the occurrences of particular visual elements. The children's proposals were primarily presented in floor plans, while several were drawn as elevation or sectional drawings. This study acknowledged the significant role of CAQDAS during the analysis phase as it provided alternatives to personalizing data organization. A straightforward setting in MAXQDA efficiently sorted the coded segments into various data display modes. This study attempted the matrix—a simple table-form information display to comprehend the coded segments. The matrix effortlessly reveals the links between phenomena (Boeije, 2009). According to Saldana (2015), the matrix also quickly identifies patterns or data that occurred more than twice. This study observed meaningful codes that replicated, overlapped, and were unique in reporting the findings.

4.0 Findings

The analyzed children's proposals led the study to two key themes: *types of layout* and the *types of attributes* of a learning space.

4.1 Types of Layout

The analyzed children's proposals generally implied the *types of layout* as an attribute of a learning space that encourages twenty-first-century learning. This study outlined the terminology as space organization or how space is prearranged. The children perceived a learning space to be organized either as an *open plan* or a *cluster/grid* layout. An *open-plan* layout groups all activities together within a single area and is principally accessible through a single entry point that leads to one large area with multiple *activity units* available (Fig.3a). A *cluster-grid* layout distinctly segregates a space into individually defined activities or *activity units*, mostly restrained to a specific room (Fig.3b). Movement is, therefore, limited from one *activity unit* to another due to physical barriers such as walls and doors.

The findings demonstrate children's positive inclination towards *open-plan* learning spaces via the forty times occurrence of *open-plan* layouts out of the total number of children's proposals.

Fig.3: Types of layout: (a) Open-plan layout; (b) Cluster/grid layout.
(Source: Author, 2021)

4.2 Types of Attributes
Inductively designated from two cycles of the coding process, this study distinguished six *types of attributes* from the children's proposals, which are defined as follows:

- Resources: features that children require for learning
- Furnishings: furniture, fittings, or any other decorative accessories of a learning space
- Leisure: features reflecting activities that children undertake or participate in during their free time or when released from any classroom task
- Environment: features related to a natural context
- Well-being: features reflecting the means of being health
- Specialized rooms: any form of space or room for specific activities

Table 1 illustrates the frequency of attributes in the children's proposals throughout the three case studies. The table includes the number of participants in each case study who will initiate a preliminary evaluation of the attributes and the summation of the frequencies to distinguish the most frequent attributes in the children's proposals that intuitively suggest the children's anticipation of the quality of learning space. The *type of attribute* with the highest frequency differs from one case study to another. In general, 'resources,' 'furnishing,' and 'leisure' are the three most frequent *attributes* throughout the children's proposals. Case Study 1, however, recorded the highest frequency of attribute 'specialized rooms' in a learning space, which entails separate rooms for specific activities, either as working or personal space.

Table 1: Six types of attributes of learning space

Type of attributes	Frequency of attributes mentioned			Sum
	Case Study 1 (n=10)	Case Study 2 (n=18)	Case Study 3 (n=20)	(N=48)
Resources	22	31	42	95
Furnishing	16	26	45	87
Leisure	47	6	21	74
Environment	2	8	16	26
Well-being	4	6	13	23
Specialized rooms	8	2	2	12

Note: n= total number of participants in each case study; N = total number of participants

(Source: Author,2021)
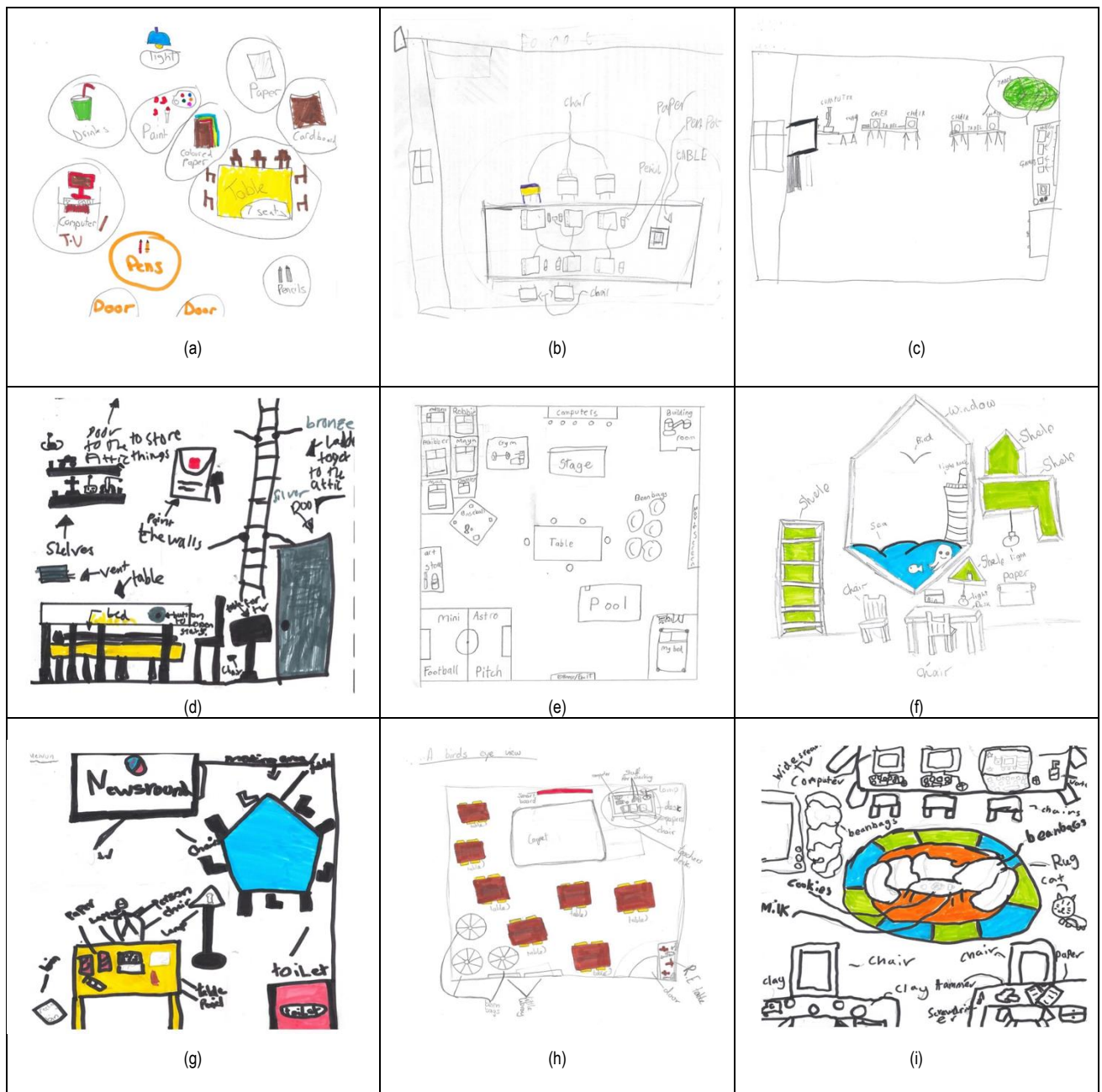
5.0 Discussion

Fig. 3: Children's proposals representing each type of attribute or with a unique feature: (a) Resources; (b) Furnishing – group work desk and chairs; (c) Furnishing – individual desk and chairs; (d) Furnishing – storage; (e) Leisure; (f) Environment; (g) Well-being – cleansing; (h) Well-being – food and beverages; (i) Specialized rooms
(Source: Author,2021)

Children need materials and tools, and ICT equipment to learn effectively. Those resources are the modern-day learning necessities. This study initially assumed that both types of resources should be considered mainly in children's learning. During observations, however, the application of ICT equipment was significantly less across the case studies. Present-day learners no longer depend on conventional materials and tools; instead, they are equipped with technology devices in homes and school environments. According to Pearlman (2008, p. 127), twenty-first-century students 'utilize new technology tools as investigators and producers of knowledge'; hence, schools should appropriately and adequately accommodate technological supplies for learning. Children in schools should have unconditional access to information through telecommunication devices such as desktops, laptops, and iPads. As most children perceived ICT equipment as equally important as the materials and tools, this study affirms that more learning in schools should involve ICT equipment. Davies et al. (2013) mentioned that various resources can enhance creativity skills.

The second most mentioned *type of attribute* was furnishings, comprising furniture, fittings, and other decorative accessories; during observations, the children frequently used furnishing. The learning process significantly involved the children's desks and chairs,

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especially for group work learning activities. Organizing children's desks and chairs in a group work setting demonstrated the children's inclination towards learning in a team, parallel to the defined twenty-first-century collaboration skill. The children also mentioned the importance of storage, which was aligned with the teacher's perception. The responsibility for organising classroom resources should be given to the users, who are the children. Based on a study by Sommer (1977), practical classroom space is very much influenced by classroom teamwork and authority. An essential strategy for creating an effective learning environment is managing the essential supplies in a classroom (Clayton & Forton, 2001).

The third most frequently highlighted *type of attribute was leisure* attribute. Leisure involves mainly the digital entertainment, such as TV shows and gaming, as well as children's time-out for sleeping or sitting through resting features, particularly beanbags and beds. The findings underlined a great emphasis that learning should be dynamic, and incorporate enjoyable activities for relaxing. It is common for children to engage with diverse physical attributes while executing learning activities in schools. As contemporary education revolutionized, learning and teaching necessities were deliberately developed.

6.0 Conclusion and Recommendations

This study concluded that present-day classroom learning is to be equipped with various attributes including, technological devices. One possible approach is to create a *supportive environment* for the children to learn. This study defines a *supportive environment* as the space where learning takes place and is supplemented with all the necessary features the children need. Teachers are often associated with creating such an environment, particularly in configuring the classroom layout and managing the learning resources. In addition to visual accessibility, teachers often prioritise children's physical access to resources. The findings from the *design charrette* activities showed a positive inclination towards children having all necessary supplies in the classroom space. Most children reflected classroom learning to transpire in an *open-plan* layout, perhaps due to the limited existing classroom space. In a regular-sized classroom space, a limitation of movement and accessibility to learning resources might occur significantly if the number of children exceeds the standard ratio. School management, too, is responsible for ensuring sufficient and appropriate resources beyond the classroom space. Addison et al. (2010), through Davies et al. (2013), distinctly proposed that children have continuous access to learning necessities even during informal learning hours.

6.1 Limitations

This study discovered some thought-provoking instances in defining the basic terminologies by children and teachers. This study presumed the tasks prepared for the children were straightforward and easily understood; however, during the pilot study, nearly every group in the sessions required further explanation. This study decided to seek the teacher's assistance during an after-school feedback session to clarify each of the tasks given. Based on the teacher's recommendation, the questions were improvised for the *design charrette* activities. Such an approach establishes the teachers' perspective beforehand to optimize the probability of understanding among the children.

6.2 Contribution

The *focus group design charrette* was a complementary method involving vulnerable groups in the research process. It has shown massive potential in collecting various information within a short period. The *design charrette* is practically relevant to present-day classroom learning. Apart from the diverse forms of activities, the method initiates the skills of twenty-first-century learning. The *design charrette* contributes to the development of an architectural-based method.

6.3 Recommendation

This study made several recommendations for schools to afford twenty-first-century learning and consequently instill the necessary competencies amongst children as preparation for future years. The recommendations included *types of learning activities*, *types of physical attributes*, and *attributes of space* appropriate in prompting the required twenty-first-century skills for the children.

Acknowledgments

Paper Contribution to Related Field of Study

This study positioned an architect as a researcher in the real-life school context and significantly impacted contemporary learning environment studies. Documenting how children learn in pre-war schools from an architect's insight surpasses the conventional educational researcher's viewpoint. It added value to the research to record findings from architectural standpoints using spaces and the physical attributes considered for learning in pre-war schools. The findings complement the initiatives of the Scottish Government in

improving all schools' estates as part of the enhancement of the national education system through the launch of the Curriculum for Excellence.

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