

## **Essential Attributes to Stimulate 21<sup>st</sup> 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 focus group *design charrette*, this study obtained forty-eight primary six children's perception of what the school spaces afford. Schools should provide learning spaces that are sufficient, broadly utilized and flexible in providing supplementary learning experiences for the children.

Keywords: 21<sup>st</sup> Century; Children; Learning; 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 give serious attention to improving the education system, from remodelling the curriculum syllabus to rejuvenating the learning environment. Schools were historically 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, 2013a). 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 607 schools have been rebuilt or substantially refurbished since 2007, which increased the proportion of schools in good or satisfactory condition from 61% to 84% in April 2015 (Scottish Government, 2015). 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

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words, Scotland's children and young people will have better opportunities to obtain 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 19<sup>th</sup> century (McKendrick, 2005). The diversity in age of the school buildings in Scotland (McKendrick, 2005) reflects a rich mixture of old and new across the region, even up to the present day, with the majority of the remaining school buildings still delivering the national curriculum at every level of education. The issue of learning within pre-war schools extends directly to school design. One of the significant challenges in maintaining the school estate nationwide is the lifespan of the school buildings. 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.

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

## 2.0 Literature Review

This research revealed that there were reputable research studies on twenty-first-century learning. In identifying what twenty-first-century learning means, this research discovered a constant overwhelming occurrence of twenty-first-century skills instead. Learning is about gaining knowledge or skills, whereas a skill is the ability to do something well. The two terms differ from one another, but in the context of this study, the terms are inter-related. Twenty-first-century learning stimulates twenty-first-century skills. There were also unremitting studies on school design. However, this research focused on reviewing the literature related to the strategies on how schools could adapt to twenty-first-century learning.

In particular, Scotland has a vision for children and young people's lifelong education through the Curriculum for Excellence (CfE). Developed to enhance learning, life, and working skills for learners between the ages of 3 and 18 (Scottish Government, 2009), the CfE was implemented throughout Scotland's schools in 2010 after years of progressive debates and reviews. One initiative the government took was an extensive building program to rebuild or refurbish 21% of local authority schools nationwide.

## 3.0 Methodology

In investigating children's perceptions of the affordance of school spaces for learning, this research considered an exceptional method: the focus group. In this group interview, participants interact to answer some particular questions (Bryman, 2012). The term revolves around assembling people on one occasion to talk over a matter, either steered over an unstructured topic (Braun & Clarke, 2013) or an issue (Underhill & Olmsted, 2003). According to Leedy & Ormrod (2005), a moderator who may or may not be the researcher introducing the issues to be discussed must ensure every participant is focused without anyone dominating the discussion. The initial intention of the research was to study schools in Scotland, specifically within the population of primary schools. Out of the 32 council areas in Scotland, the research was narrowed down to Edinburgh, Scotland's capital city. Before achieving the research aim, the potential case studies were shortlisted from the pre-war schools or schools before World War II. According to Thomson (1997), pre-war schools in Edinburgh fall either as 'Victorian pre-war schools' or '1930's pre-war. Schools'. There was a total of 33 state-funded pre-war schools in Edinburgh. Initially, two schools from each pre-war school category were selected as the case studies for variation purposes. One of the 1930s pre-war schools, however, was omitted after the completion of the data collection phase due to the relocation of selected participating children to an entirely newly built school block. In other words, this research involved only **three case studies** and a total of **forty-eight children** between the ages of 9 and 10 who should be equally competent and most familiar with the school environment.

### 3.1 Method of data collection

This research proposed a *design charrette* as an alternative means of communication with the children, which allowed children to work as designers with adults solely as moderators. The *design charrette* in each school took at least two and a half hours. Each session commenced with an *introductory briefing* followed by three sequential activities: *brainstorming*; *photo-taking*; and *design sketch*, each ranging from 30 to 50 minutes (Figure 1).

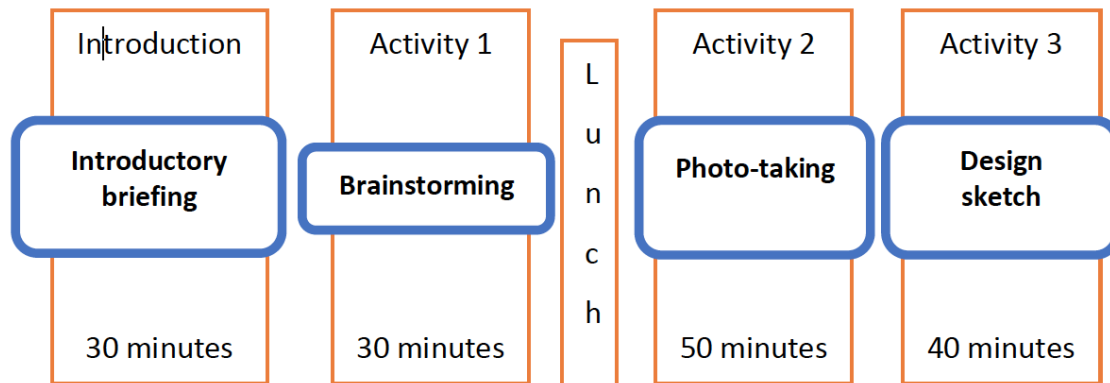


Fig.1 : The conceptual design of design charrette  
(source: Author, 2021)

Generally, the children were first briefed on the research objectives through a PowerPoint presentation. Emphasizing the rights to participate in the *design charrette*, the children were constantly reminded of their voluntary participation and that they could leave without personal risk or discomfort. The children were briefed on the ethical considerations and later tasked with designing the school's recycling bin as their first group activity through Activity 1 – *brainstorming*. The children were asked to brainstorm amongst their group members using the A3 template provided (Figure 2a) on the processes to be taken only if they were to complete the task. The processes were to be written sequentially as keywords on the provided template. Activity 2 – *photo-taking* then required the children to take pictures of each space they would consider using before completing the processes mentioned in Activity 1. The research provided an instant camera with a maximum of ten films for each group of children. The children were to stick the pictures on the given template of Activity 2 (Figure 2b), marking the selected spaces' locations on the school's layout plan with a colored sticker. The final activity then required the children to work individually prior to all information gathered during earlier group activities. Through Activity 3 – *design sketch*, the children were to propose their design sketch on the most ideal space for conducting the recycling bin design task. The individual proposals were presented in a given A4 template (Figure 2c) and were to be completed within forty minutes only. The children were allowed to use any drawing media they were most comfortable working with. The children were allowed to give feedback on their classmates' design ideas through a short critique session at the end of the *design charrette* focus group.

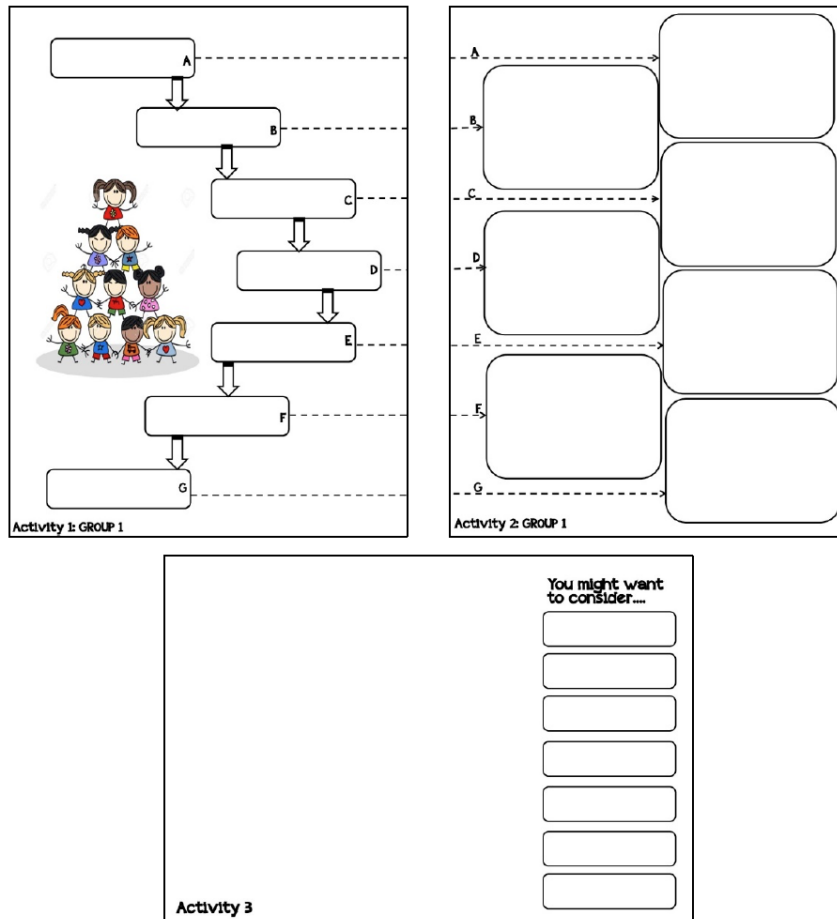


Fig.2: Template for design charrette activities: (a) Activity 1-Brainstorming; (b) Activity 2-Photo-taking; (c) Design sketch  
(Source: Author 2021)

### 3.2 Method of data analysis

The children's proposals were primarily presented in floor plans, while the rest were presented as elevational or sectional drawings—the proposals subsequently underwent Content Analysis. Content Analysis emphasizes the frequency of categories by calculating and analyzing the occurrences of particular visual elements (Rose, 2006). The method is known for its flexibility in analyzing text data. Therefore, this research attempted the approach for analyzing the various forms of visual datasets, including the diverse mapping, the instant photographs, and the children's design sketches from the focus group design charrette. This research acknowledged the significant role of CAQDAS during this 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 research attempted the matrix—a simple table-form information display to comprehend the coded segments. A matrix revealed the linkages between the phenomena (Boeije, 2009), which reflected a prospective means of identifying patterns or data that occurred more than twice (Saldaña, 2015). This research observed meaningful codes that replicated, overlapped, and were 'unique' in answering the research question. Expanded from the matrix, two sequence strategies to identify patterns were *within-case* and *cross-case analyses*. This research scrutinized every feature discovered in children's individual drawings through two cycles of coding. The first coding cycle involved labelling each feature in the children's drawings. Three hundred and twenty-four features were identified and then classified into seventeen groups with similar characters or *subcategories*. One of the *subcategories* was coded as 'other,' which grouped any unidentified features in the children's drawings due to either a lack of labelling or poor drawing qualities. The second cycle of coding involved reorganizing the *subcategories* into *key categories*. This research eliminated the subcategory 'other' from the second cycle of coding in order to provide a rigorous study of the more discernible information from the other *subcategories*.

## 4.0 Findings

The analyzed drawings classified children's proposals into two key themes: *types of layout* and the *types of attributes* of a learning space.

### 4.1 Types of Layout

Children analyzed drawings generally implied the types of layout as an attribute of a learning space that encourages twenty-first-century learning. The terminology outlined the organization of space or how space is prearranged. The children perceived a learning space to be organized either as an **open plan** or a **cluster/grid** layout. The *open plan* layout occurred forty times out of the total number of children drawing. An *open plan* layout groups all activities together within a single area and is principally accessible through a single entry point, which leads to one large area with multiple *activity units* available. A *cluster-grid* layout distinctly segregates a space into individually defined activities or activity units, mostly restrained to a specific room. 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.

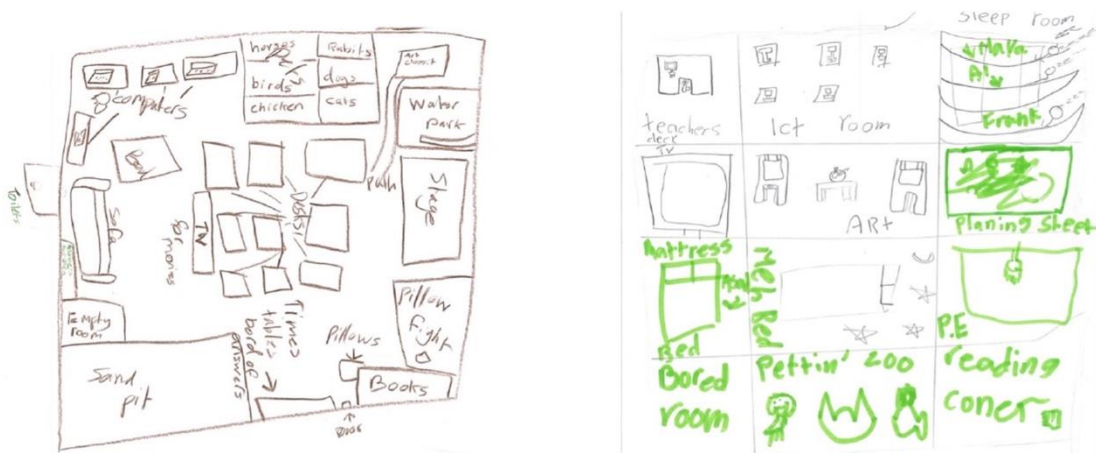


Fig.3: Types of layout: (a) Open-plan layout; (b) Cluster/grid layout.  
(Source: Author, 2021)

### 4.2 Types of Attributes

Inductively designated from the two cycles of the coding process, this research distinguished six *types of attributes*, 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*

The frequency of attributes that occurred in the children's drawings throughout the three case studies is presented in Table 1. The table includes the number of participants in each case study who will initiate a preliminary evaluation of the attributes. The table provides the summation of the frequencies to distinguish the most frequent attributes in the children's drawings and intuitively suggests 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 drawings. After the three main types of attributes, the children in Case Study 1 considered the attribute 'specialized rooms' in a learning space, which entails separate rooms for specific activities, either as working or personal space. In Case Study 2 and Case Study 3, however, the children presented the attributes 'environment' and 'well-being' as the most frequently occurring attributes in the drawings.

Table 1: Six types of attributes of learning space (Source: Author,2021)

Type of attributes	Frequency of attributes mentioned			Sum (N=48)
	Case Study 1 (n=10)	Case Study 2 (n=18)	Case Study 3 (n=20)	
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

## 5.0 Discussion

In order to learn effectively, children need resources, which include materials and tools, as well as ICT equipment, which are modern-day learning necessities. This research initially assumed both types of resources to be considered mainly in the children's learning, but the application of ICT equipment, as discovered during observations, was significantly less across the case studies. No longer dependent on conventional materials and tools, present-day learners were furnished with technology devices in homes as much as in school environments. Children in schools should have unconditional access to information, primarily through telecommunication devices such as desktops, laptops, and iPads. According to Pearlman (2008, p. 127), twenty-first-century students 'utilize new technology tools as investigators and producers of knowledge'; schools should appropriately and adequately accommodate technological supplies for the children's learning. Most children perceived ICT equipment as equally important as the materials and tools, affirming that more learning should involve ICT equipment in schools. The provision of an appropriate range of materials, tools, and other resources enhances learners' creativity skills based on several studies reviewed by Davies et al. (2013).

Furnishings, comprising furniture, fittings, and other decorative accessories, were the second most highlighted physical attribute in children's learning. Children learning employed furnishings regularly during the observations. Notably, the children mentioned the same *type of attribute* during the focus group *design charrette*. Children's desks and chairs were extensively involved in the learning process and were appropriate for group work rather than individual use. 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 skill of collaboration. Children also mentioned the significant involvement of storage in learning; the teachers corresponded well on the extensive utilization of storage in classrooms. Despite classroom practice and the availability of space, responsibilities in resource organization should be extended to each classroom user. The configuration of a classroom space that works well will involve complete teamwork and the authority of the primary users, according to Sommer (1977). Clayton and Forton (2001) mentioned that an essential strategy for creating an effective learning environment is managing the essential supplies in a classroom space.

In addition to resources and furnishing, the children frequently revealed features related to leisure as another *type of attribute* considered in learning. The findings underlined a great emphasis that learning should not be stagnant but, instead, should incorporate enjoyable activities for children to have fun through relaxing features that mainly involve digital entertainment, such as TV shows and gaming, as well as children's time-out for sleeping or sitting through resting features, such as beanbags and beds. It is common for children to engage with diverse physical attributes while executing learning activities in schools; however, as contemporary education revolutionized, learning and teaching necessities were deliberately developed.

## 6.0 Conclusion and Recommendations

This research concluded that children nowadays have various technological devices in classroom learning. One key feature is providing a *supportive environment* for the children to learn. A *supportive environment* includes the space where learning takes place and other features that supplement the space for children to consume. In schools, teachers are often associated with organizing a supportive environment, particularly the classroom space, through configuring the classroom layout and managing the learning resources. Besides visual accessibility, the teachers clearly emphasized the importance of children's physical access to resources in a classroom. During the focus group *design charrette* activities, children showed a positive inclination towards

having all necessary supplies in the classroom space. The majority of the children considered learning to transpire in a classroom with an *open-plan* layout, and the probability for such inclinations was perhaps due to the limitation of space in the existing classroom. In situations where too many children are learning in a regular-sized classroom, the restricted space may cause a limitation of movement and accessibility to learning resources among the users. Besides teachers, it is also the responsibility of school management to ensure children are facilitated with sufficient and appropriate resources beyond the classroom space. Addison et al. (2010), through Davies et al. (2013), even suggested that children have continuous access to learning necessities during informal learning hours.

### 6.1 Limitations

During the three case studies, this research discovered some thought-provoking instances in defining basic terminologies by children and teachers. The children inferred that the tasks for each activity were different from one another. This research presumed the questions prepared for the children were straightforward and could easily be understood; however, the assumption needed to be corrected and apparent during the research pilot study. Almost every group in the sessions required further explanation, and, at one point during the first focus group, the researcher sought the teacher's assistance in clarifying the tasks given. A fifteen-minute after-school feedback session with the classroom teacher was conducted on the same day as the *design charrette*. Based on the teacher's recommendation, the questions were improvised for the next design charrette. This research could have established the teachers' perspective beforehand to optimize the probability of understanding amongst the children.

### 6.2 Contribution

The development of an architectural-based method, the focus group *design charrette*, was an alternative to involving vulnerable groups in the research process. Inspired by several earlier studies, the *design charrette* has shown huge potential in the applicability of the research, as the method's design allows various information to be collected within a short period of time. The *design charrette* is practically relevant to present-day classroom learning, apart from the diverse forms of activities, and the method initiates the skills of twenty-first-century learning.

### 6.3 Recommendation

The research made several recommendations for schools to afford twenty-first-century learning and consequently instil 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* that are appropriate in prompting the required skills for the children.

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## Paper Contribution to Related Field of Study

The positioning of an architect as a researcher in the real-life school context significantly impacted contemporary learning environment studies. This research has documented how children learn in pre-war schools from the insight of a qualified designer rather than from a more conventional educational researcher's viewpoint. It added value to the research to record findings from architectural standpoints pertaining to the utilization of 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.

## References

- Addison, N., Burgess, L., Steers, J. and Trowell, J. (2010) Understanding art education : engaging reflexively with practice. London ; New York: Routledge.
- Boeije, H. (2009) Analysis in Qualitative Research. 1st ed. SAGE Publications Ltd.
- Burke, C. (2013a) Looking back to imagine the future: connecting with the radical past in technologies of school design. Technology, Pedagogy and Education. [Online] Vol.23 (1), pp.39–55. Available: [http://www.tandfonline.com.libezproxy.open.ac.uk/doi/full/10.1080/1475939X.2013.838450#U4M18S\\_ZWSk](http://www.tandfonline.com.libezproxy.open.ac.uk/doi/full/10.1080/1475939X.2013.838450#U4M18S_ZWSk).
- Bryman, A. (2012) Social Research Methods. 4th ed. Social Research Methods. New York: Oxford University Press.
- Clayton, M. K. and Forton, M. B. (2001) Classroom space that work. Center for Responsive Schools, Inc.

- Davies, D., Jindal-Snape, D., Collier, C., Digby, R., Hay, P. and Howe, A. (2013) Creative learning environments in education-A systematic literature review. *Thinking Skills and Creativity*. [Online] Vol.8 (1), pp.80–91. Available: <http://dx.doi.org/10.1016/j.tsc.2012.07.004>.
- Leedy, P. D. and Ormrod, J. E. (2005) *Practical Research: Planning and Design*. 8<sup>th</sup> ed. Kevin M. Davis.
- McKendrick, J. H. (2005) *School Grounds in Scotland* Research Report.
- Rao, D. B. (2003) *Successful Schooling*. Discovery Publishing House.
- Rose, G. (2006) *Visual Methodologies: An Introduction to the Interpretation of Visual Materials*. 2nd ed. SAGE Publications Ltd.
- Saldaña, J. (2015) *The Coding Manual for Qualitative Researchers*. 3rd ed. SAGE Publications Ltd.
- Scottish Executive (2004) *A curriculum for excellence*. Scottish Executive. Edinburgh.
- Scottish Government (2015) *Summary Statistics for Schools in Scotland*.
- Scottish Government and COSLA (2003) *Building Our Future: Scotland's School Estate*.
- Scottish Government and COSLA (2009) *Building better schools: Investing in Scotland's future*. Edinburgh.
- Sommer, R. (1977) *Classroom Layout. Theory Into Practice*. Vol.16 (3), pp.174–175.

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