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Chapter

The Effect of Place Attachment on Educational Efficiency in Elementary Schools

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Abstract

Close attention to education and its effects on the identities of societies has been ingrained in the history of studies. Nowadays, a considerable amount of criticism in the field of education is related to inefficient and obsolete educational scheduling, with a large number of researchers exploring new learning methods. Logically, these new methods require new architectural environments, which can meet the needs of a new generation with the approach of positively affecting students' learning efficiency. The main purpose of this research is to identify effective factors in students' sense of attachment to school. First, this research finds factors on the sense of attachment by studying past literature. Second, a number of questions and hypothesis are developed. Third, in order to validate the effective factors and answer the developed questions, a questionnaire is devised and distributed among 278 students of 10 state primary schools of Shahriyar, Iran. The collected data are then analyzed using SPSS software. The findings indicate that there is a meaningful relation between students' educational efficiency and their sense of attachment to school. It also shows that important factors, such as social activities and connection with natural elements in design, can have a noticeable impact on the students' sense of attachment to school and consequently their educational efficiency.

Keywords: elementary school, place attachment, sense of attachment, educational efficiency

1. Introduction

In recent years, attention has been drawn to the importance of education in developing countries. The reason for this is a rise in global awareness of this issue. Each year, many countries in the Persian Gulf region allocate significant expenditure toward improving schools and universities according to the most up-to-date methods and equipment. In Iran, the conditions seem to be different. In spite of the formation of various educational organizations, each with a systematic program to improve the quality of education, the situation in reality seems to be different. In order to clarify the subject, we propose a few questions:

- Do Iranian students go to school every day with the interest in new lessons and teachings?

- Do the environments of schools lead students to become successful people?

- Are the thought concepts in schools permanent and effective, or are they forgotten after completing the exam period and do they remain intact at the community level?

- What are the key issues in students' effective learning? Are they high self-esteem, high sense of collective participation, creativity, etc.?

Answers to the above questions are critical in better understanding the learning process and its impact on individual student identities. According to many scholars, the identity at early ages is the foundation for the future identity of communities.

Students attending school early in their childhood typically show enthusiasm for learning; however, after a short period of time, the passion suddenly subsides. They spend time in school environments that do little to increase their willingness to learn. It is likely that such environments have been stagnant in their pattern of construction for almost half a century and have not, in essence, been successful even with the development of its educational programs. The importance of addressing this issue from a variety of perspectives must be considered. At the current time that many institutes in different parts of the country are building schools in high numbers, the quality of these schools and the impact they make on the future of each individual and, more generally, on society require close attention.

Students and children are a very important factor in building and making progress for any society and the way they make decisions can impact the society, which is vital by various institutions in today's developed countries. And to attain the ability to compete with other communities, children are instructed and trained in schools that implement appropriate and useful approaches in educational program areas as well as in school architecture design. It is obvious that the designed environment has the potential to affect individual behaviors and can continue to influence personality through the continuation of the same process. Therefore, it is important to address the issue of building schools by adopting a suitable approach focused on designed environment.

By their nature, individuals' identities form and vary throughout their life. Children between the ages of 6 and 9 are at a critical period in this personality formation and find their character comparable to others [1]. Hence, it is expected that the role of elementary schools in children's lives during these years will be given greater emphasis and can have a positive impact on the formation of their individual identities.

The main purpose of the present research is to extract effective factors in creating a sense of attachment in students to the school. Such factors, instrumental in designing and creating a sense of attachment, can have a positive impact on students' educational efficiency. By asking questions such as "Does increasing the sense of belonging to the school increase educational efficiency?" and "What factors in school design can increase the sense of attachment to the school?", the study explores the following hypothesis: "the sense of attachment to school has a positive impact on their educational efficiency."

2. Literature review

In reviewing the past studies on designing educational spaces, and in particular the design of schools, it is evident that designing schools has been of great importance to the researchers for many years. John Dewey addresses the subject about a century

ago, stating that the environment of schools must be considered as one of the primary societies. He further emphasizes the importance of these types of societies. In his view, the general atmosphere governing the school environment and the activities that take place can directly reflect the general public's perceptions [2].

Burke and Grosvenor in a book entitled "The School I Love" were trying to find the school-specific characteristics of their students. The first line of this book begins with questions that ask about the ability of schools to meet the needs of children and adolescents. In this book, which is full of children's views in the form of poetry, painting, and interviews, there are some points about the interaction between children and school environment, their expectations of learning, and the problems of educational systems [3]. The Guardian magazine hosted a contest entitled "The School I'd Like" in 2001 and invited children to comment on their favorite school. The school we like is this: a beautiful school, a comfortable school, a safe school, a listener school, a flexible school, a school associated with us, a respectable school, a school without a wall, or a school for everyone. Burke and Grosvenor discuss school buildings, classes, courtyards, and other spaces, and comments from students are presented in each section, after reviewing relevant studies by scholars. Many of these comments refer to the extracted subsets of the sense of belonging to the school space. For example, an eight-year-old girl named Hannah describes her school as: "The school I love is a beautiful park in the valley passing by a river" [3].

This description notes the interest of students in communicating with the natural environment, called the "interaction of the active environment."

School buildings, their environments and landscapes, open spaces and classrooms, layout, and decorations all are referred to as the third teacher [4]. In the opinion of many scholars, there is a need for school to be a guide, and a part of it should convey some of the shoulds and shouldn'ts to the students [5].

In this context, the term "school exemplary" has been used by a number of scholars for leading schools. In a research conducted by Christopher [6] with the aim of extracting the characteristics of primary schools, ten factors are introduced as the main characteristics of these schools. One of these factors was the performance of the school building as a teacher, using design elements in structural units and facilities, which would have made students curious about how they work. Another feature of these schools was to provide an environment where users would feel at home, as well as to develop a sense of participation in social activities in their students, thereby strengthening the sense of being one and uniting them [7, 8]. The characteristics of these schools are listed below:

- The buildings of these schools are designed according to the environment and are part of its assets.

- Paying attention to details of building construction up to its smallest components.

- Various space experiences for social and individual activities.

- Designing spaces that enhance social skills.

- Providing enough space to provide services to all students.

- Flexible design.

In a study published by the Thomas Jefferson Foundation, it was found that school design can push students to positive behaviors on their own, and as students

derive this spirit from the school space, opportunities for positive influence in their education and learning are created [5]. He also says that children are highly capable of observing, and any shortcomings that designers may have in design can give them the feeling that they are not essentially in an important place.

The comments mentioned above have long concerned researchers trying to improve the educational environment and have tried to distinguish the building of schools from barracks and give them an appropriate identity, and transfer this distinction to the students, an identity that can in turn create positive effects on student behaviors [9].

In a study by Maxwell and Chmielewski, the role of classroom personalization by students and its impact on students' self-esteem were explored. The results of their research indicate the positive effects of classroom personalization on self-esteem and personal identity of primary school students as well as children in kindergarten. In their findings, the authors note that the presence of preset spaces in order to enable students to visualize their works can affect their self-esteem [1].

Ma, in a research on the sense of attachment to the school, states that there is a direct relationship between students' self-esteem and their sense of attachment to the school. In fact, their view of themselves can be generalized to their view of the school environment. In this regard, the school environment and its design can be affected, and designers should be diligent in designing the school in order to increase students' knowledge of their individual identities [10].

In many studies in the context of the psychology of the environment in relation to educational spaces, researchers have sought to identify the factors that enhance the sense of self-esteem in students. In a study entitled "The Role of the Continuing Presence of Students' Effects on Their Sense of Self-Esteem," it was found that students who were involved in class layout and decoration, and had their works displayed continuously, had a higher sense of self-esteem and have shown a more appropriate educational performance [11].

By studying four schools, Upitis, examines issues that increase the sense of belonging to the school. In his view, the school environment should be seen from two aspects of the natural environment and artificial environment, an example of which is shown in **Figure 1**: a part that is the main building of the school and a part that is the natural environment where students attend school. By examining case examples, he shows that the presence of nature and the provision of direct student interaction with it can have a very positive impact on increasing their sense of attachment to the school environment [12].
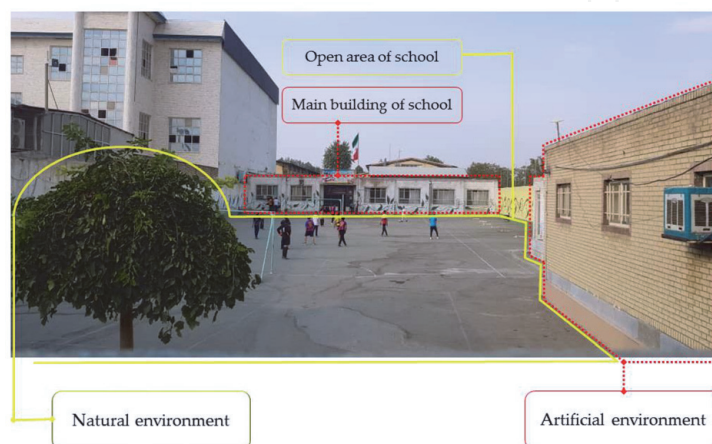

Figure 1.
Artificial and natural aspects of a school environment located in Shahriyar, the photo is taken by authors.

The school should be a place where students acquire their personal identity, where educational process takes on a meaningful form, where the educational experiences students receive turn attractive to them, and where the learning environment is welcoming to all. Collectively, such attributes give a particular morale to the school's atmosphere, which is subsequently passed onto students [5].

In many writings of scholars on the sense of belonging to the school, the role of teachers has been emphasized in the creation of this feeling. At this stage, it is important to note that the appropriate school environment is not just for students and it affects the behavior of teachers and their training process [13]. This positive impact can, in effect, directly affect students' learning and also create a sense of belonging in them.

In the area of school design, a significant part of the research focused on the impact of the quality of the educational environment on the student's educational situation. The researchers also conducted independent classroom research and attempted to illustrate the interaction among the classroom conditions, educational condition, and students' behavioral conditions. Their studies indicate that the class environment, depending on its type of design, can have a positive or negative effect. On the one hand, the classroom environment can lead to positive educational and behavioral improvements; on the other hand, the classroom may also increase inappropriate behaviors, increase the desire for isolation and avoiding social interactions in school, as well as increase stress among elementary students or preschoolers [14–16].

Knight and Noyes conducted studies on classroom space in relation to the relationship between class arrangement and student behavior. In their view, such a study was necessary because most students spend time inside the classroom; that is, the space, along with its furniture, can play a significant role in students' behavior. A sample of class design with various furniture types is shown in **Figure 2**. Comparing the old chairs and new chairs that entered a school, the authors found that chairs were essentially requiring students to do an activity and its newness per se cannot be efficient and useful [17]. Other studies regarding classroom arrangement-behavior include the study of the effect of noise pollution and density in the classroom and their role in student learning [18–21].

Another part of the study is the school's overall atmosphere. In a study entitled "Explaining the Relationship between Achievements of the Students and the School's Physical Environment," the basic assumption was that the pattern of school environment design influences students' achievements. In this research, five design patterns including access, open spaces, visibility and perspective, access to natural light, and finally the way of placing classes together, were considered as design
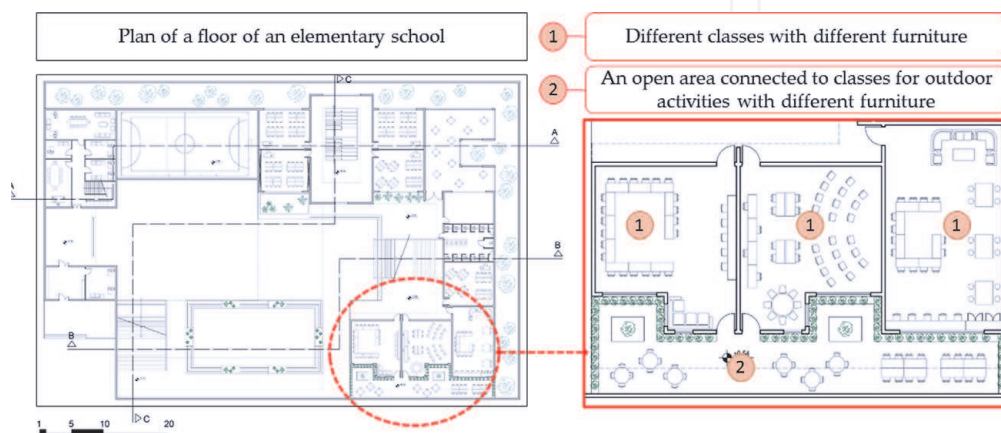

Figure 2.
Various furniture types designed for classes, by authors.

features. The ITBS test, designed and evaluated to assess students' learning at school, was used to measure students' progress. In this test, the various skill levels of the students can be evaluated. One of the main advantages of this method is the possibility of comparing students' educational situations with their peers and, consequently, comparing one school with another school. The results of this study revealed a very significant relationship between the type of school design and the student's learning. This study puts an emphasis on further research on the field of learning, since there are another key factors contributing to the mentioned field that need to be investigated, such as: the status and ability of school teachers and their skills in teaching, students' economic and social conditions, racial and ethnic differences, and many other factors [22].

Over the last few decades, the issues of educational spaces and school facilities have been raised in scholarly debate. Specifically, there was some discussion about the necessity and importance of building new schools. The origin of these concerns, on the one hand, was economic issues and, on the other hand, with increasing population growth, was sufficient time to build. The main question was: could old schools be restored to new schools instead of building new schools and adding new ones? McGuffey studied seven case studies and, in almost all cases, students whose schools had a lower age of construction and had newer equipment showed better performance [23].

Philips noticed a significant difference in reading and math skills among students in new buildings and those in older schools. His research revealed a clear relationship between the age of the building and its equipment with the quality of students' performance. Students who were in the newer building and environment, with more up-to-date facilities, showed a 7.63% increase in their grades [24].

Another issue that has been addressed by researchers is the impact of school size and capacity, as well as the size of the classroom on the student's educational situation [25]. In his 2008 study in the Danish context, Duke divided schools into two large and small groups. At high school, both groups of schools had their own positive benefits [26]. Having said that, Cotton found that in small schools, student achievement is sometimes more dramatic than that of older school students [27]. Of course, both scholars in their writings state that the smallness and largeness scale of schools vary from one region to another.

In the elementary school, this has been given less attention, because the general belief is that smaller schools provide a more suitable atmosphere for the elementary school. However, in a study of seven schools in California, schools with more students than those set for elementary schools were better educated than the smaller ones [28]. However, it seems that this requires more in-depth research.

Another topic that has been taken into consideration by researchers is outdoor education. Over the past few years, this has attracted more attention and led to the design of schools without walls. Research shows that students regularly recall times that they spent outside the classroom framework as academic visits or student camps. Falk and Deirking admit that 96% of the subjects in the study group referred to the memories of their scientific journeys in their early years. He goes on to say that it's not just a matter of remembering these times to show that they are useful, and that even its usefulness does not result in the inappropriateness of training in ordinary classes [29].

Other researchers have found that educational experiences transmitted to students in open environments are far more influential than classroom environments [30]. This effect is essentially based on the desire of students to learn from the outdoors. But this interest varies over the age range. Research shows a significant difference in the tendency of primary and secondary school students to learn in open spaces. Elementary school students were significantly more enthusiastic than

high school students after experiencing a scientific journey [31]. Outdoor education can provide activities that are not possible in the classroom in the form of an outdoor training workshop. Exterior spaces are environments suitable for activities that deal with natural elements such as water, soil, and mud and can increase student motivation; a sample of such a place is shown in **Figure 2**.

As observed and reported, many researchers have investigated various sectors of designing a school. Such studies, each with a different approach, examined a part of the subject of education and the role of architecture in student learning. In a number of these studies, there are common points in the research approach and the subject matter.

In the area of Iranian research, scholars have also focused on designing schools based on different approaches:

Some researchers mentioned several interesting points in an article entitled "Recognizing the Role of Nature in Educational Spaces." They emphasize the role of nature as a factor in the attractiveness of school education to different aspects of such an impact. From their point of view, examining different aspects of this impact could lead to more diverse designs. They eventually suggest design patterns such as creating open spaces and interacting with natural elements, creating eye-catching dimensions at different points, using open spaces in class design, as well as student changes in designed gardens [32].

Kamel Nia explores the factors for better environmental quality in schools in a book entitled "Learning Environment Design Grammar." He states that because most educational environments form a narrow line of view for students, it is necessary to use the horizontal elements to create the appropriate visions and perspectives along with establishing a more effective external and internal interaction [33]. **Figure 3** represents an example of the mentioned elements.

In this regard, another researcher in an article entitled "The concept and function of open space in traditional and new schools," historically addresses the different roles of these spaces and uses the model of central life as a successful and effective model of outdoor education [34].

A study entitled "Space perception; a key element in designing children's spaces" presents the views of children gathered in the form of painting and opinion polls. The results show that children essentially paint their school in interaction with nature, and the details of the chairs and benches, the blackboard, and the overall form of building the school are very important to them. Also, in terms of the colors used for the school building, the children are more pleased with the lighter and brighter colors for their classes [35].
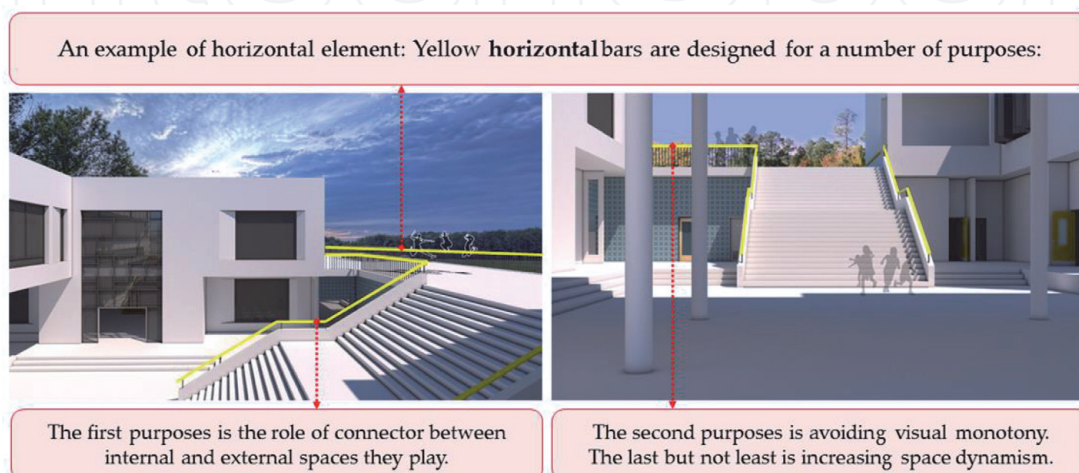

An example of horizontal element: Yellow **horizontal** bars are designed for a number of purposes:

The first purposes is the role of connector between internal and external spaces they play.

The second purposes is avoiding visual monotony. The last but not least is increasing space dynamism.

Figure 3.
A sample of horizontal element, designed by authors.

The issue of flexible design in educational spaces is explored in an important study entitled "Flexible learning environment." In the researchers' view, the advantage of this type of design is the ability to respond to the different needs of children in their childhood. On the other hand, it is possible to adapt to the ongoing changes in educational programs that require different spaces. Subsequently, with the introduction of the ideal class, they set forth factors of spatial fluidity, internal and external communication, communication with the community, spatial transparency, and livelihood of communication corridors and transitional spaces to make the design more flexible [36].

"Criteria for Designing Future Education Space" investigates the changes needed in design attitudes in the new age. In this article, it is pointed out that the architecture of today's schools is very similar to its original examples in the country and has not adapted itself to changing lifestyle and educational system. Then, he identified and studied the factors needed in the field of school education and architecture, and tried to provide solutions for architectural harmony and implementation of new educational ideas in schools. One of the characteristics that is mentioned at the end of this article is the issue of flexibility in design, which can be adapted to the new educational needs of the curriculum as an important factor [37].

The article "Study of the environmental components of learning space and its impact on student behavior" states that humans are always interacting with their environment and this interaction is two-way. That is, people affect the environment and the environment affects people. The environment is effective due to its structure in shaping the personality and physical and mental development of each individual. One of the environments in which human beings spend most of their lives is a learning environment. The physical space of schools also affects the behavior of children, which is the future capital of our country, and, as a result, a lack of attention to design can create the background for abusive behaviors in students. This research seeks to answer the fundamental question of how the physical environment of educational environments affects the behavior of children. In this regard, understanding the concept of the environment and the interaction between the child and the environment, we first point out the physical components of the educational environment and their impact on the cognitive processes and social behaviors of the students [38].

The article entitled "A Study of the Way to Create a Sense of Place for Restoration of Identity and Confidentiality in Architectural Areas" focuses on space and location as a theoretical base in various fields. Its fundamental findings include achieving the recognition of space and methods for semantic quality and its transformation into a place and, consequently, the creation of a sense of place and place belonging [39].

Finally, the article "The Effect of School Architecture on the Students' Learning Process" states that the learning process is ongoing, and this occurs naturally in a space, and since the environment influences human beings, it can affect the learning process too. The study highlights factors such as light, color, and furniture affecting the learning process [40].

3. Theoretical framework of research and key words definition

3.1 Educational outcome

Training is a purposeful and predesigned activity aimed at providing opportunities to facilitate and speed learning in a breeding system. Training may be conducted through films, radio, television, and other media, with or without the

presence of a professor [41]. The meaning of the word efficiency in the dictionary comes as a result of work and efficiency. Therefore, the goal is to increase the educational outcome and improve the outcome of the work and the learning activity that takes place in learning.

3.2 Elementary school

The school is an educational organization that is usually located in a building, based on official standards and certain criteria. By education system supervision, the school is responsible for implementing approved programs, offering a variety of education and training for students at the level or course of study. After graduation, they will be awarded an official degree. The elementary school is a six-year course that students enter at the age of seven. After completing the first round (first, second, and third grades) and the second round (fourth, fifth, and sixth grades) and if they succeed in the exam, they will receive a certificate of completion of the elementary school. Public schools are also schools where students can study for free, and students can study at these schools if they have the required age and residence range.

3.3 The sense of place attachment

The sense of place attachment is defined as the emotional connection between the individual and the place [42], which Shumaker and Taylor refer to as a positive or influential link between individuals and their environment [43]. Hummon introduces it as an emotional involvement with the environment [44]. Rubinstein argues that the positive experience that a person acquires from the place is the result of the positive emotions that are formed between the individual and the place. The more emotional the relationship is, the more interested a person is in the place [45]. One of the things that is constantly observed in all studies about the sense of place attachment is the presence of emotion and excitement at the heart of these definitions. The next feature of these definitions is "the desire to stay close to the subject to which it belongs." This attribute is implicit in many of the definitions available. By combining this feature with the definitions mentioned above, it can ultimately be reached: an emotional and positive relationship between a person and a particular place that leads to motivation and staying in that particular place [46, 47].

3.4 Factors affecting the sense of place attachment

3.4.1 Cognitive-perceptual factors

Indeed, the greater the individual's awareness of the place, the more the sense of place and attachment to the place can increase. An important factor in this case is time, which means that over time, the person becomes more familiar with the environment and gets a better understanding of the place. The other two factors are related to the following perceptual factors:

3.4.1.1 Spatial and physical distinction

School design with a variety of spatial qualities, as well as the use of materials of varying color and texture, can add to the identity of each part of the overall space. This affects the students' perception of the space that they are involved in and increases their sense of belonging to the place [48].

3.4.1.2 Environmental legibility

Another factor that positively affects the person's perception of the environment is the increase in the level of individual attachment to the location, which is the cause of the readability of the environment. In his book [49] on the sense of place attachment as one of the most effective features in design, Kevin Lynch poses the issue of environment legibility and examines the factors that make this legibility. Lynch goes on to outline features and body elements, paths, edges, cues, and nodes as effective in shaping the concept of legibility of the environment [50].

3.4.2 Social factors

As previously stated, a sense of belonging can be the result of the individual-place interaction or the individual-individual interaction in a particular place. In fact, just as cognitive factors play a role in creating a sense of place attachment, social factors can also contribute to the formation of this sense. As mentioned above, past research has shown that the social dimension of the sense of attachment is stronger than its physical dimension. Therefore, the environment that makes these interactions possible is an effective step in creating a sense of attachment. One of the needs that humans have always sought to answer is to have a proper definition of their individual identity. Social interactions, in the context of communicating with family, friends, and relatives, provide an important part of the context for responding to social needs and acceptability [51]. This need for children is also demonstrated through communicating with parents and other family members, teachers, and other adults as well as other children [52].

3.4.3 Environmental-physical factors

3.4.3.1 Personalization of the environment

Existence of personal elements in the environment is another factor in strengthening individual identity, especially that of students. For example, providing spaces, in which students can display their artwork on a permanent basis like a sample that is shown in **Figure 4** or the presence of personal closet and other spaces
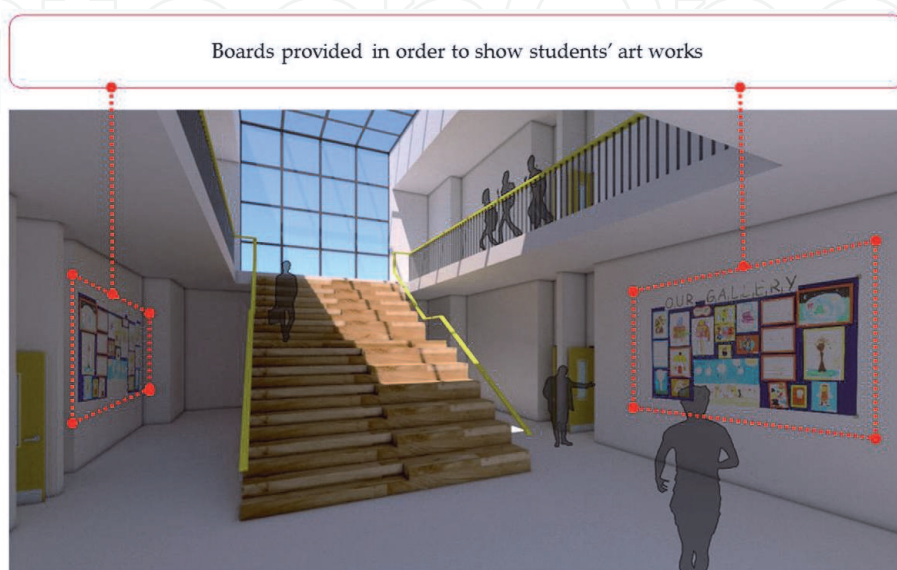

Figure 4.
Permanent galleries, where students can exhibit their art works, designed by authors.

and equipment that convey a sense of ownership of part of space to students, can significantly enhance a student's sense of attachment to school. This is one of the environmental-physical factors that develops a sense of attachment to a school's physical dimensions. Riger and Lavrakas also emphasize the role of these physical factors in their writings [53, 54].

3.4.3.2 Connection with natural environments

One of the most important factors and perhaps the most effective factor in creating a sense of attachment to a site and, specifically, the school site is the use of natural elements in design. Likewise, many researchers point to the importance of this topic in the field of environmental psychology, and it is referred to as a factor in shaping the active environment interaction, which can furthermore lead to a sense of attachment [55]. Also, in designing educational spaces, many studies and patterns direct designers to the use of natural elements in the design and creation of spatial fluidity between the inside and outside and the natural and artificial environment [56].

3.4.3.3 Answering the functional needs

If an environment does not provide functional requirements to the people occupying it, to whatever extent it offers factors of a sense of attachment, it still fails to perform its duties toward the individual. This is particularly evident in the design of places like the school, which remains a central issue for the users.

3.5 Theoretical research framework

According to the main hypothesis mentioned in the research, "the sense of place attachment for students in relation to the school has a positive impact on their educational efficiency," and the sense of attachment to the school space is considered as an independent variable. The rest of this research attempts to prove that it is effective on the dependent variable, which is the efficiency of the training. **Figure 5** shows the relationship between variables and their components.
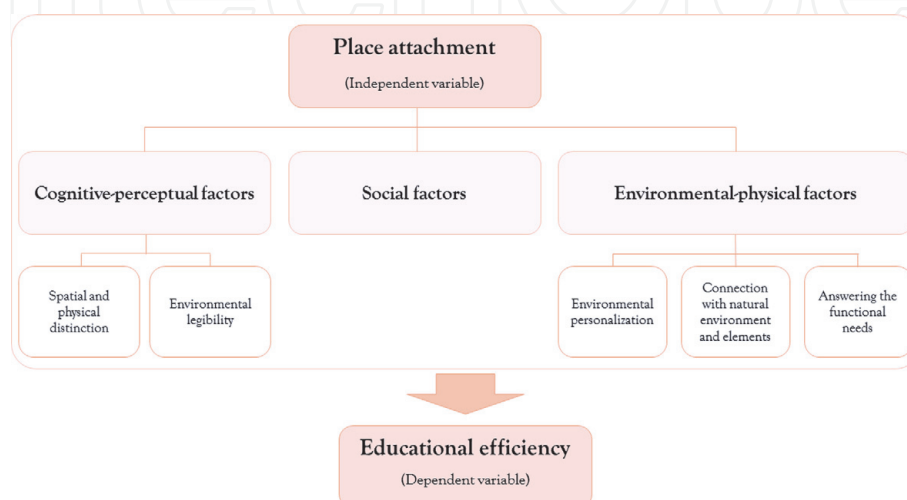
Figure 5.
Theoretical research framework.

4. Research methodology

So far, we have reviewed the extant literature in the field of education, considering the relevant definitions, general assumptions, and the design of questions. In these studies, there is a great deal of difference in the attitudes toward education, school curriculum, and school buildings in developed and developing countries, as well as regarding the measures taken in these areas within the country. Therefore, the need to assess the factors that make sense of attachment to the school is evident. Also, the extent of the impact of the school's environment and its relationship with students' educational efficiency needs to be investigated. In this regard, following the extraction of factors affecting the sense of attachment, based on the extant literature and the goals of the current research, a questionnaire in the form of online survey was created. In line with these aims, questions were put together and distributed among students in a questionnaire. In order to investigate the relationship between students' sense of place attachment and their educational efficiency, the questionnaire was distributed among three groups of students with high, moderate, and poor educational status. Creating this category allows communication between students' sense of attachment and their educational efficiency. Information extracted from the questionnaire and its analysis can lead to the presentation of useful factors and patterns in school design.

The statistical population of this study is elementary schools in Shahriyar city, which consists of 10 schools. All schools selected were public schools, which offer a higher homogeneity of the schools' spatial quality allowed for a broader generalization in the next step and also for extracting more relevant information. Another factor that was used as far as possible in the selection of the statistical society was the economic situation in the families of these students. This was made possible by choosing a certain range of the city of Shahriyar and also considering the fact that these schools are public schools. In order to eliminate the gender factor and its effect on the sense of place attachment, all of these schools were selected from boys' schools. **Figure 6** shows some parts of a selected school.

With regard to similar research and the process that other researchers have taken, it is important to note that in cases where there was a need to measure the degree of attachment in elementary students, generally, the third or fourth to sixth grades were studied. The reason for this was the lack of trust in the views, as well as the lack of space and time that students had in the first, second, and third grades in

Figure 6.
Images of different parts of a school located in Shahriyar, taken by authors.

schools. These younger students generally exhibited the initial excitement of attending school; however, their views and enthusiasm could change reaching higher grades. This, of course, does not mean that they are generally discredited; it is merely a decision that has been made by other researchers in terms of research methodology. Therefore, students of the second elementary school were selected so that more information could be extracted from the questionnaires.

To determine the sample size using the Morgan table and according to the number of students in the statistical society, the population size was 278. The questionnaire was distributed among these students.

The validity and reliability of the questionnaire used in the present study were evaluated using the views of architectural professors as well as primary school teachers in order to achieve the best results.

To assess the reliability of the questionnaire and to examine the correlation between questions that asked common factors, Cronbach's alpha test was used in SPSS software. After applying the Cronbach's alpha test, values above 0.7 were acceptable (**Table 1**). The value of Cronbach's alpha is as follows:

The general hypothesis and questions that shape the purpose of the present research are as follows, respectively:

1. What factors in school design increase students' sense of attachment to school?

2. Does enhancing the sense of attachment to the school increase the educational efficiency?

   - Students' sense of attachment to school has a positive impact on their educational efficiency.

Further detailed questions and hypothesis examining the theoretical foundations associated with the sense of attachment variable, and including a wider section of the main hypothesis and question, are the basis for the preparation of the questionnaire distributed among the statistical population in question. The information extracted from this questionnaire will highlight important factors in school design that will give students a sense of place attachment and increase their educational efficiency. The findings of the questionnaire will also provide a snapshot of the current relationship between the degree of students' interest and their sense of attachment to the school and their educational efficiency. The subhypotheses are as follows:

1. The existence of a personal locker for each student in school increases the sense of attachment to the school and, consequently, increases the educational efficiency.

2. The absence of favorable environmental conditions in the classroom (comfortable temperatures and appropriate light) reduces interest in participating in classroom activities and negatively impacts educational efficiency.

Variable	Cronbach's alpha value
Reliability	0.78

Table 1.
Cronbach's alpha value.

3. Providing cozy spaces and offshoots outside the classroom to study or perform personal activities of students increases their sense of attachment to the school.

4. The presence of green space in the school (in the schoolyard, inside the building, and in classes) can increase the sense of attachment to the school.

5. Open spaces within the school for students' gathering and group activities can increase students' interactions and increase the sense of attachment to the school.

6. Classes that have larger windows with a suitable perspective are more appealing to students.

7. The lack of clarity of class design, the closure of its space, and the lack of visual communication with the outside create unpleasant feelings among students.

The subquestions are as follows:

1. Does the personalization of the environment and having a permanent closet for students throughout the year increase their sense of attachment to the school?

2. Does transparency in the design of school buildings and the interconnection between closed and open spaces increase the perception of space and the sense of attachment to the school?

3. Does creating a spatial distinction and providing spaces for small and individual groups in the school affect student interest in school?

4. Are public spaces more influential in increasing student interactions and enhancing their sense of attachment to the school?

5. Does the presence of green space and vegetation in the school environment (courtyards, public spaces, and classes) increase their sense of attachment to the school?

6. Does classroom environment inappropriateness (sufficient light and comfort temperature) have a negative impact on students' educational efficiency?

4.1 Data analysis

In order to analyze the information obtained in each section, according to the hypothesis formed, a suitable method is chosen for each one and after analyzing it using a selective approach to accept or reject the hypothesis, the analysis is performed.

For displaying descriptive data, numerous tables and percentages are used, and for inferential data, analytical tests are used as follows:

The first subhypothesis was analyzed using one-dimensional chi-square test, the ninth hypothesis was analyzed using the Spearman test, and the rest of the hypotheses were analyzed using the single-variable chi-square method. To exclude more accurate analysis, each section of the analysis of hypothesis includes intersection tables as well as associated diagrams. All data import operations were performed and tested in SPSS software.

A summary of the analysis methods carried out is shown in **Table 2** as follows:

Type of statistical method	Application	Statistical methods and tests
Descriptive statistics	Describing demographic variables, describing main questions and variables	Frequency and rate of frequency
Inferential statistics	Testing hypothesis	Spearman correlation, chi-square test, single variable chi-square

Table 2.
Summary of statistical methods.

4.2 Descriptive statistics

4.2.1 Qualification level of students

To create the possibility of analyzing the relationship between students' educational efficiency and their sense of attachment to the school, three groups of students with a high, moderate, and poor level of education were selected; the frequency of which is shown in **Table 3** as follows:

Students' educational level	Number of students
High educational level	93
Moderate educational level	90
Weak educational level	93

Table 3.
The frequency of students' educational level.

As can be seen, the number of students at different levels is roughly equal and the possibility of comparison between these three categories is provided.

4.2.2 Grade

The questionnaire was distributed among boy students of elementary school (in the fourth, fifth, and sixth grades). The frequency of students in different grades is shown in **Table 4** as follows:

Students' grade	Number of students
4th grade	83
5th grade	103
6th grade	90

Table 4.
Frequency of students in different grades.

4.2.3 Inferential statistics

In this section, inferential findings will be considered. These findings will lead to analyzing hypothesis by using the statistical methods in the SPSS program. Next, the hypothesis is expressed and, using tables and charts, each of them is analyzed.

4.2.4 Theories

1. Analysis of the first hypothesis: "The existence of a personal closet for each student in school increases the sense of attachment to the school and, consequently, increases the educational efficiency"

In this assumption, we examine the relationship between personal closets for each student and their impact on their sense of attachment.

The test used in this case is a single-valuable Chi-square test; the results of which are shown in **Table 5** as follows:

Students' educational level		Personalization (personal closet)			Total
		There is no difference between having a personal closet in school or not.	If there is a personal closet in school, it will not be bad.	Yes, I like to have a personal closet in school.	
High	Count	47	13	33	93
	Expected count	28.3	17.2	47.5	93.0
Moderate	Count	17	19	54	90
	Expected count	27.4	16.6	46.0	90.0
Weak	Count	16	21	56	93
	Expected count	28.3	17.2	47.5	93.0
Total	Count	80	53	143	276
	Expected count	84.0	51.0	141.0	276.0

Table 5.
*Intersection table of (students' educational level * personalization (personal closet)).*

By examining the table above, we find that this need is more pronounced in educationally poor and educationally moderate students than in students with high educational status. That is, as many as 54 moderate students and 56 poorly educated students welcomed the idea of having personal lockers, while this number is only 33 in students with high educational status. This indicates the importance of the issue of creating individual identity in students who are not in a good educational situation. The frequency chart is shown in **Figure 7**.
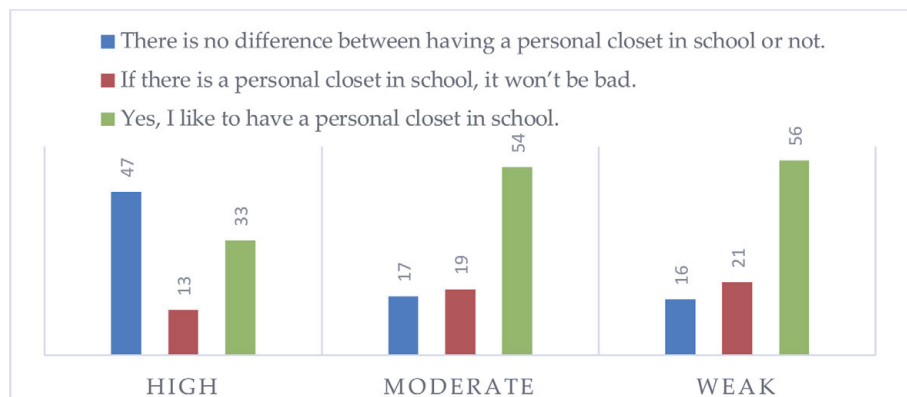

Figure 7.
The frequency of the first hypothesis.

2. Analysis of the second hypothesis: "The lack of favorable environmental conditions in the classroom (the comfort temperature and appropriate light) reduces the interest in participating in class activities and negatively impacts on educational efficiency"

This hypothesis is based on the inadequacy of classroom environment conditions and examines the impact on student learning. The mentioned hypothesis is evaluated by asking this question to the students: "Have you ever experienced falling asleep or dislike listening to teacher because of the uncomfortable temperature or light of your class?"

The test used for this hypothesis is a single-variable Chi-square test whose results are shown in **Table 6** as follows:

Students' educational level		Functional requirements			Total
		Yes, it has happened.	It has happened sometimes.	It has never happened.	
High	Count	13	7	73	93
	Expected count	11.1	19.2	62.7	93.0
Moderate	Count	9	31	50	90
	Expected count	10.8	18.6	60.7	90.0
Weak	Count	12	24	57	93
	Expected count	11.1	19.2	62.7	93.0
Total	Count	34	62	181	276
	Expected count	33.0	57.0	186.0	276.0

Table 6.
*Intersection table of (students' educational level * functional requirements).*

Table 6 above shows that there is no problem in the classes in terms of comfortable temperature from the viewpoints of students. This issue is answered uniformly in all three groups of students, and this hypothesis is accordingly rejected. The frequency chart is shown in **Figure 8**.

3. Analysis of the third hypothesis: "The availability of cozy spaces and offshoots outside the classroom to study or perform personal activities of students increases their sense of attachment to the school"

One of the patterns for personalizing the design of schools is the design of spaces of varying quality for small groups or individual activities. Therefore, the impact of these cozy spaces and quiet places on students' sense of attachment to the school is
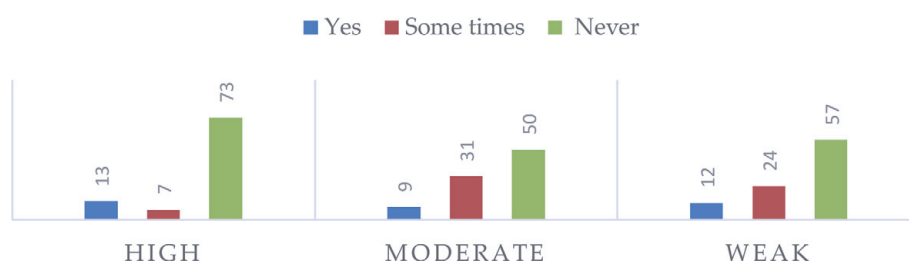

Figure 8.
The frequency of the second hypothesis.

Figure 9.
A cozy and peaceful area of school, where students can study or perform personal activities, designed by authors.

analyzed. An example of such spaces is shown in **Figure 9**. The mentioned hypothesis is evaluated by asking this question to the students: "Will you like your school more if there are cozy and quiet places and you can do your favorite activities?"

The test used is a single-variable Chi-squire whose results are shown in **Table 7** as follows:

Students' educational level		Functional requirements			Total
		Yes, it has happened.	It has happened sometimes.	It has never happened.	
High	Count	13	7	73	93
	Expected count	11.1	19.2	62.7	93.0
Moderate	Count	9	31	50	90
	Expected count	10.8	18.6	60.7	90.0
Weak	Count	12	24	57	93
	Expected count	11.1	19.2	62.7	93.0
Total	Count	34	62	181	276
	Expected count	33.0	57.0	186.0	276.0

Table 7.
*Intersection table of (students' educational level * personalization (personal space)).*

The results in **Table 7** show that none of the three student groups are interested in having such spaces in the school. A total of 168 out of 276 people reported the ineffectiveness of such spaces in their degree of interest to the school. The frequency chart is shown in **Figure 10**.
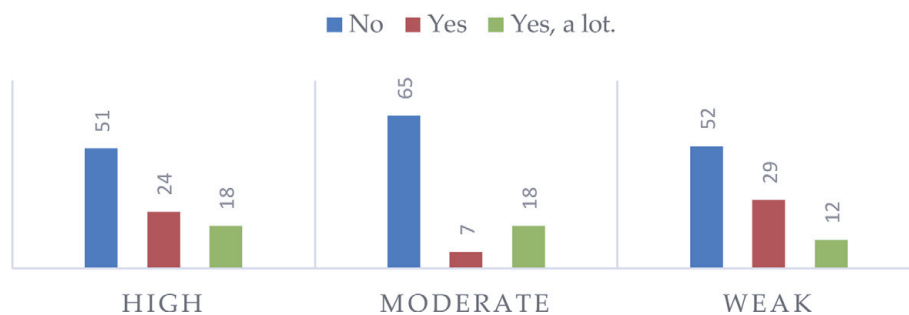

Figure 10.
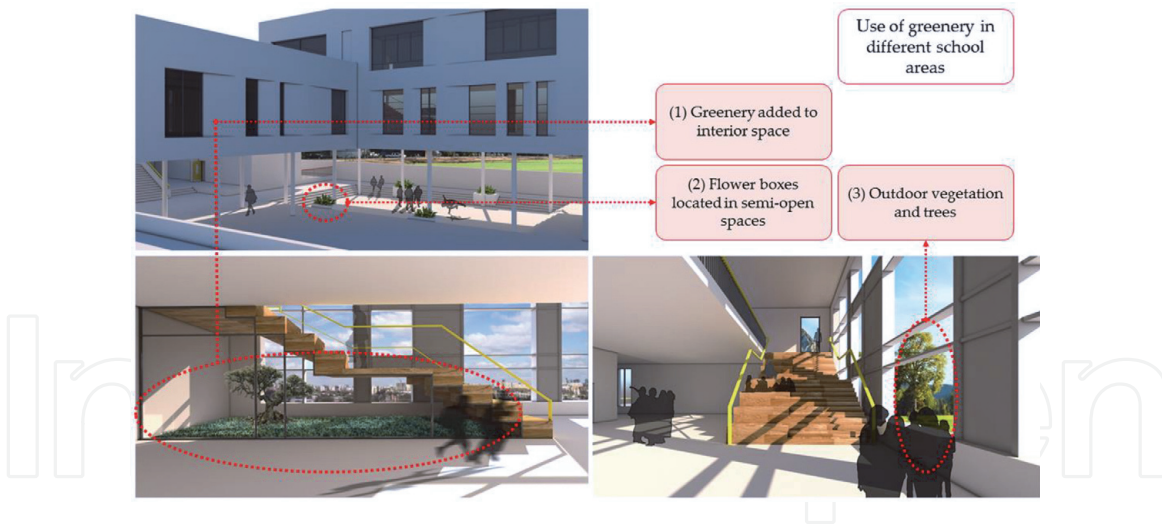*The frequency of the third hypothesis.*

Figure 11.
Presence of green spaces in the school (in the school yard, inside the building, and in classes), designed by authors.

4. Analysis of the fourth hypothesis: "The presence of green spaces in the school (in the schoolyard, inside the building, and in classes) can increase the sense of attachment to the school." A few examples are shown in **Figure 11**.

In many studies, the undeniable role of interacting with the natural environment has been mentioned in the sense of attachment to the place. To this end, this issue was investigated. For evaluating this hypothesis, the students were asked to answer the following question: "Will you feel better about school if several trees are planted in the school yard or some greenery are added to some places?"

The statistical method used is a single-variable Chi-square model; the results of which are shown in **Table 8** as follows:

Students' educational level		Natural elements (greenery)			Total
		No	**Yes**	**Yes, a lot**	
High	Count	8	22	63	93
	Expected count	13.1	17.2	62.7	93.0
Moderate	Count	11	13	66	90
	Expected count	12.7	16.6	60.7	90.0
Weak	Count	20	16	57	93
	Expected count	13.1	17.2	62.7	93.0
Total	Count	39	51	186	276
	Expected count	39.0	51.0	186.0	276.0

Table 8.
*Intersection table of (students' educational level * natural elements and (greenery)).*

The results in **Table 8** point to the great importance of this factor in creating the sense of place attachment. Of the 276 participants, a total of 237 students expressed their interest in having vegetation in the school environment.

The frequency diagram of the relationship between the presence of vegetation and the sense of attachment is shown in **Figure 12**.
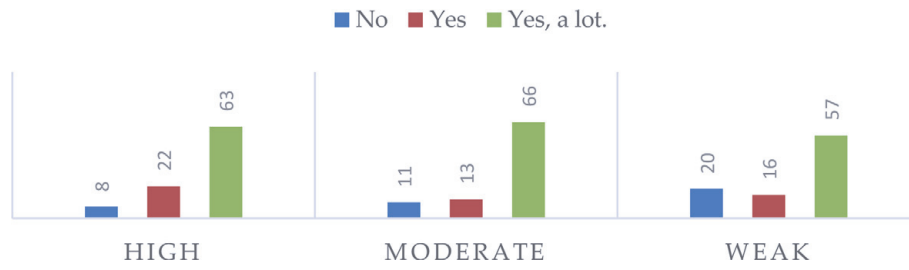
Figure 12.
The frequency of the fourth hypothesis.

5. Analyzing the fifth hypothesis: "Open spaces within the school designed for students' gathering and engaging in group activities can increase interpersonal interaction and increase the sense of attachment to the school"

The factors that led to increased personal identities and a sense of social and physical attachment are the possibility of social interactions that are provided by the environment. This section analyzes the impact of this factor on students' sense of attachment to the school. The mentioned hypothesis is evaluated by asking this question to the students: "Will you feel better about school if the school has a spacious hall, where you can spend time with your friends instead of going to the school yard or class?"

The method used to measure this hypothesis is the single-variable Chi-square test; the results of which are presented in **Table 9** as below:

Students' educational level		Interaction with others			Total
		I prefer the yard.	I have not thought about it yet.	Yes, I like such a place.	
High	Count	19	35	39	93
	Expected count	18.2	28.3	46.5	93.0
Moderate	Count	11	22	57	90
	Expected count	17.6	27.4	45.0	90.0
Weak	Count	24	27	42	93
	Expected count	18.2	28.3	46.5	93.0
Total	Count	54	84	138	276
	Expected count	54.0	84.0	138.0	276.0

Table 9.
*Intersection table of (students' educational level * interacting with others).*

The results in **Table 9** illustrate that interested students have spaces where they can spend more time with their friends, separate from the usual schoolyard pattern.
The frequency chart is shown in **Figure 13**.

6. Analysis of the sixth hypothesis: "Classes that have larger windows with a suitable perspective are more appealing to students"

The question for evaluating this hypothesis is: "Will you like your class more if it has larger windows with a suitable perspective?"
Table 10 shows the impact of the proper outlook of the class and its positive impact on student interest in the class.
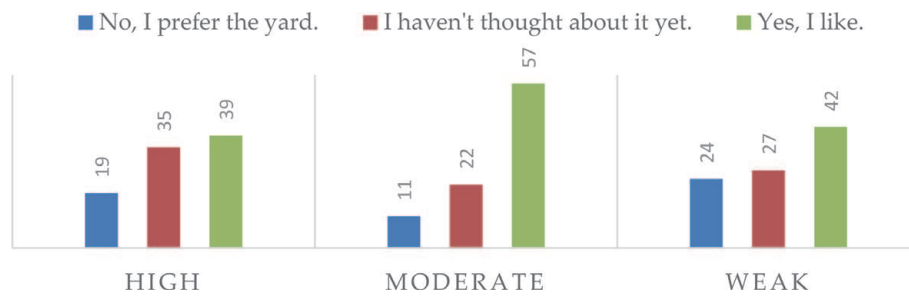
Figure 13.
The frequency of the fifth hypothesis.

Students' educational level		Perspective and communication with the outside			Total
		No, I do not like.	There is no difference.	Yes, I like.	
High	Count	4	44	45	93
	Expected count	4.0	38.4	50.5	93.0
Moderate	Count	5	40	45	90
	Expected count	3.9	37.2	48.9	90.0
Weak	Count	3	29	61	93
	Expected count	4.0	38.4	50.5	93.0
Total	Count	12	113	151	276
	Expected count	12.0	114.0	150.0	276.0

Table 10.
*Intersection table of (students' educational level * perspective and communication with the outside).*

A very limited number of students were uninterested in having a suitable perspective (a total of 12); 150 were positive about this. Also, the number of students with interest in this topic is significant (60 people). The frequency chart is shown in **Figure 14**.

7. Analysis of the seventh hypothesis: "The lack of clarity in the design of the class, the closure of its space, and the lack of visual communication with the outside create unpleasant feelings among students"

The question for evaluating this hypothesis is: "Do you like your class to be more spacious and not to be surrounded by walls from every side?"
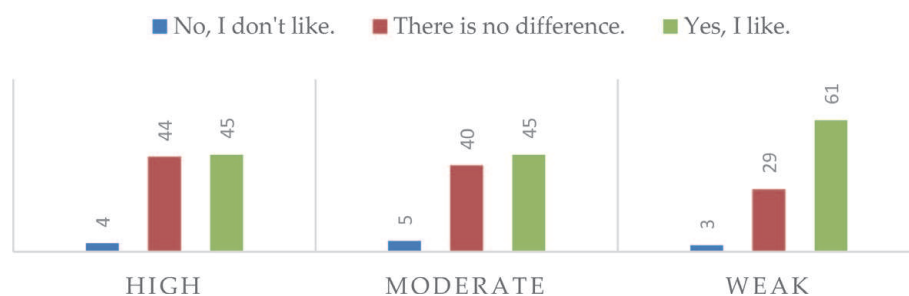

Figure 14.
The frequency of the sixth hypothesis.

Students' educational level		Transparency in design			Total
		Yes, a lot.	If it is, it will not be bad.	I like the current class.	
High	Count	31	30	32	93
	Expected count	34.4	25.3	33.4	93.0
Moderate	Count	30	20	40	90
	Expected count	33.3	24.5	32.3	90.0
Weak	Count	47	25	21	93
	Expected count	34.4	25.3	33.4	93.0
Total	Count	108	75	93	276
	Expected count	102.0	75.0	99.0	276.0

Table 11.
*Intersection table of (students' educational level * transparency in design).*

Figure 15.
The frequency of the seventh hypothesis.

In **Table 11** below, the effect of the external and internal visual impact on the sense of attachment of the students has been investigated.

The degree of interest in more open spaces and visual visibility is inversely correlated with the educational level. The other way around is the case with low achiever students. The frequency chart is shown in **Figure 15**.

8. Analysis of the main hypothesis: "The students' sense of attachment to school has a positive impact on their educational efficiency"

In this section, the main hypothesis of the research is analyzed (the relationship between students' sense of attachment to the school and their educational efficiency is examined).

Intersection **Table 12** presents the results as follows:

The frequency chart is shown in **Figure 16**.

As it is shown, there is a direct relationship between the students' educational efficiency and their sense of attachment to the school. In students with excellent educational status, there is significant interest in the school, while this has decreased in low achiever students educationally, and almost half of these students either do not like the school at all or they have little interest in school. In fact, the sense of attachment factor can be considered as one of the factors that influences educational efficiency. At the same time, it is also necessary that the sense of attachment is not the only factor affecting the level of educational outcome, but can

Students' educational level		Sense of attachment to school			Total
		Not at all	A little	A lot	
High	Count	4	20	69	93
	Expected count	3.0	30.3	59.6	93.0
Moderate	Count	5	25	60	90
	Expected count	2.9	29.3	57.7	90.0
Weak	Count	10	48	35	93
	Expected count	3.0	30.3	59.6	93.0
Total	Count	19	93	164	276
	Expected count	9.0	90.0	177.0	276.0

Table 12.
*Intersection table of (students' educational level * sense of attachment to the school).*
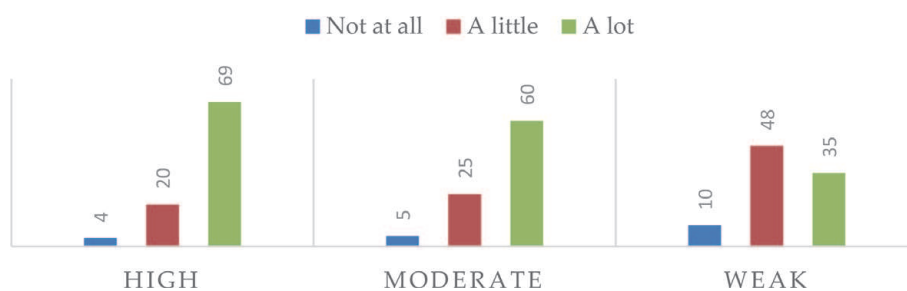

Figure 16.
The frequency of the main hypothesis.

be increased by creating an environment with which students have an affinity. This in turn has a positive effect on their interest in the school environment and learning.

Based on what has been done so far in the topic of effects of place attachment on educational efficiency in schools, there are opportunities to expand the research on the following directions:

- Implementing sense of place and identity for cultural sustainability [57]

- Benefits of schools' attachment and sense of identity among children for smart cities [58]

- Issues and opportunities for sustainable development of schools to sustainable development of societies [59]

- The effect of providing the approaches to increase sense of attachment among students on sustainability in higher education [60]

- Developing a unified framework for academic research on sustainable school attachment and smart city concept [61].

5. Conclusion

Recently, there is a significant increase toward understanding the importance of education in developing countries. One of the factors that plays a vital role in

educational development is known as sense of attachment to the schools' environment. The main aim of this research was to investigate effective factors to enhance sense of attachment among students in schools' environment through design. Then, to justify the effectiveness of these factors, the positive impacts of creating sense of attachment in students were presented. Thus, in this research, a number of questions and hypothesis are developed. Then, a questionnaire was designed to demonstrate the effectiveness of factors and to validate them. The survey targeted 278 students of 10 state primary schools of Shahriyar, Iran. The final findings analyzed by SPSS indicate that there is a meaningful relation between students' educational efficiency and their sense of attachment to school. Data analysis also shows that important factors, such as social activities and connection with natural elements in design, can have a noticeable impact on the students' sense of attachment to school as well as their educational efficiency. The results of the research carried out are as follows:

1. Primary school students are more interested in social issues and engaging with others than personal issues (cozy places and personal closets).

2. Transparency in the design and communication between the inside and outside of the different parts of the school building will make students more interested in and feel more attached to the school.

3. Communicating with the natural environment, providing open and green spaces in the school, and directly connecting these spaces with students represent a very important factor in increasing pupils' sense of belonging to the school.

4. Students who are low achievers educationally are more inclined to gravitate toward other topics, such as being transparent in designing and communicating with the natural environment and using trees; thus, it seems that these aspects can have more of an impact on them than stronger students.

5. Educational quality and outcomes in students are affected by their sense of attachment to the school, so that low achiever students are less interested and stronger students are more interested in school.

Although, in this research, most important factors were investigated through analyzing the students' responses, there are still some fundamental aspects of this subject that need to be covered in future research. The link between these factors to the cultural and social background of students with the design principles of the school is a broad subject that can be extended in future studies.

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