MSA UNIVERSITY ENGINEERING JOURNAL

The Impact Of Walkways and Open Spaces on Promoting Sustainable Pattern of Life in the Campus

Case Study Of Mahlia Girls' Campus Jazan University , Saudi Arabia

Muna AHMED [a*]

[a] Assistant professor , Jazan University , Jazan , Saudi Arabia
E-mail: mgahmed@jazanu.edu.sa , munagd@gmail.com

Abstract

The term "University Campus" defines an institutional place that is used for education as the primary activity for a large number of students and staff, the physical environment of a campus includes buildings, open spaces and all the essential infrastructures needed to function effectively .The concept of 'Walkability' provides an important principle of sustainability in such places, the quality of campus environment in terms of walkways and open spaces has positive influence on 'Walkability'. The quality of which the built environment enables the mobility of pedestrians define it's walkability .This study examines the impact of walkways and open spaces on walkability in Mahlia Girls' Campus of Jazan University. The author investigated the existing conditions of the campus and their impact on creating a sustainable pattern of life .The research methods applied a mix of methods: a walkability audit tool to record data of physical built environment elements was developed and tested, a questionnaire and direct observation. The resulting data were statistically analysed. The results obtained were supported by graphical illustrations prepared by the author. The research found certain physical infrastructure challenges that influence female students and staff willingness to walk. Results emphasis major factors such as landscape , width and connectivity of the walkway ,weather protection and shading , appropriate urban furniture for activities such as seating and places for refreshment .The conclusions are summarized to provide design guidelines for the improvement and enhancement of existing conditions.

Keywords: Walkability , sustainable campus design , open spaces , walk way.

ENGINEERING JOURNAL Volume 2 Issue 2
Received Date January 2023
Accepted Date March 2023
Published Date March 2023
DOI: 10.21608/MSAENG.2023.291875

1. Introduction

The term "University Campus" defines an institutional place that is used for education as the primary activity for a large number of students and staff, the physical environment of a campus includes buildings, open spaces and all the essential infrastructures needed to function effectively. The concept of 'Walkability' provides an important principle of sustainability in such places, the quality of campus environment in terms of walkways and open spaces has positive influence on 'Walkability'. Walkability is described according to the ease with which individuals can walk around an area, from one point to another [1] . The quality of which the built environment enables the mobility of pedestrian defines it's walkability. Pedestrians are defined as the individuals traveling by foot, or those who use wheelchairs or other assistive devices [2]. Walkability is considered as a foundation for designing sustainable campus[3] while campus walkability can be considered as one of the main components to achieve the status 'green campus' where walking become 'green transportation' in a green campus. Campus walkability is aimed for the students to easily reach hostels, faculties, green spaces and other facilities by foot.[4] Walkability can be measured through five indicators : directness, continuity, street crossing, visual attractiveness and security [5].

2. Study Area

Jazan University based in the city of Jazan in Saudi Arabia . Founded in 2006, it is the province's only public research university [6] , Jazan University has a main central campus that rests by the Red Sea on the southwest coast of Saudi Arabia and also has satellite campuses in other locations as Mahlia , Sabya, Abu Arish, Farasan, Ad-darb, Samtah, Al-Daer and Al-Ardah.

The study was conducted among students at Mahlia female campus , it comprises 5 buildings, 350 lecture halls of various types , 60 laboratories serving the beneficiary colleges and a 500 seat theatre, as well as a central library , 400 Offices for academic staff members , gymnasium for sports and recreational activities, student service centres , a cafe complex and lounges. The total area of the campus is approximately 270000 square meters (450*600) with approximately eight thousands of students(8000) and (600) staffs .The campus has one main central building and (4) smaller blocks in a fan shape lay out. It can be considered as a well-planned, newly constructed buildings finished in 2020 . The campus has two surrounding fences separated by a buffer zone with high walls (2.5) meters to provide privacy for female users inside the inner courtyard of the the campus .The buffer zone contains parking area for staff and students and services buildings . (Fig. 1 Mahlia Girls campus, Jazan University , Jazan , Saudi Arabia).

3. Methodology

The research methods applied a mix of methods: a walkability audit tool to record data of physical built environment elements was developed and tested, a questionnaire and direct observation by the author .

Fig. 1. Mahlia Girls Campus , Jazan University , Jazan , Saudi Arabia

3.1. Walkability Audit Tool

For this study, the Worksite Walkability Tool developed by Center for Disease Control and Prevention [7] , U.S Department of Health and Human Services in (2015) was adopted with modifications to suit the context of (Saudi Arabia) to assess walkability, it includes 10 sections:

1. Pedestrian Facilities
2. Pedestrian Conflicts
3. Crosswalks
4. Maintenance
5. Path Size
6. Buffer
7. Universal Accessibility
8. Shade
9. Aesthetics
10. Privacy

The form is designed to enable the auditor to rate the walkway route and write comments and add photographs or sketches to record the existing situation. Each section is completed separately and the final score is used to ascertain the walkability of the segment audited . For the purpose of this study, the walkway routes were identified according to observation and logical pedestrian routes from Entrances (origins) to building blocks (destinations) that resemble the daily walk of the users as illustrated in fig(2) .

The walkability audit tool was conducted in Mid. November 2022 for one week during day time (8:00- 18:00) at different times of the day , no night tours were implemented as the campus is used during working hours and does not include hostels or

housing, the tours were documented with photos , maps , and written notes . Complete assessment was conducted using the walkability audit form and summarized in a report template

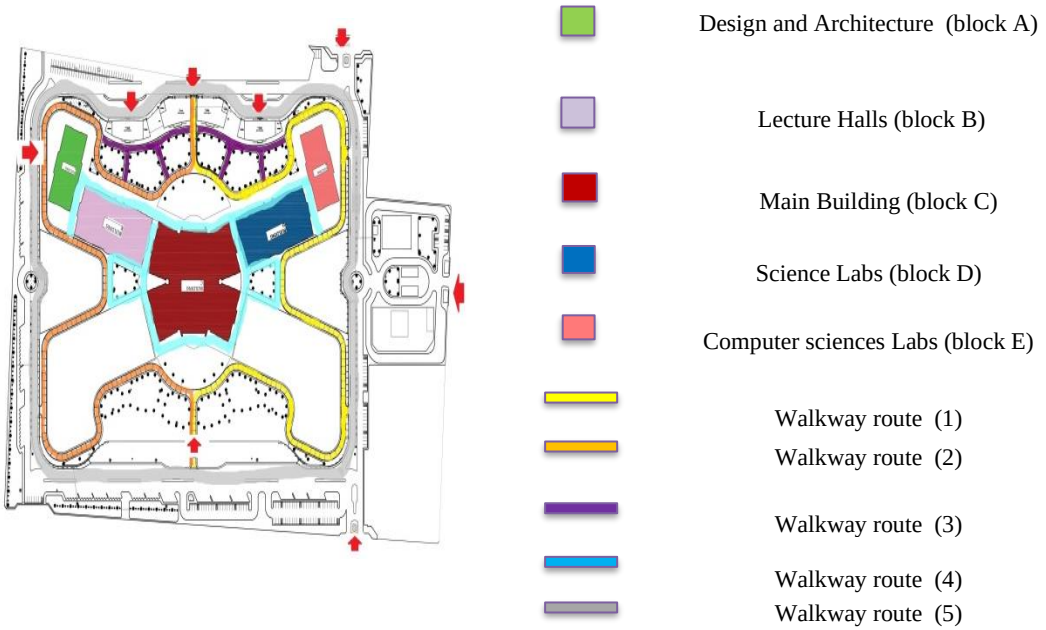

Fig. 2 The walkway routes of the Mahlia Girls Campus used for the walkability audit

3.2. The Questionnaire

To obtain the users perception about walkability of the campus , a questionnaire composed of (18) question was delivered electronically via QR code for a period of one week , (80) responds were collected via Google form . The users of the campus are divided into three main categories; female students , female academic and administrative staff, and male academic or administrative staff who study or work at Mahlia campus. The data was statistically analysed .and the authors' observations are explained in the next part.

4. Findings

4.1. Existing Conditions at Mahlia Students Campus Jazan

Based on the data collected from the walkability audit forms , the characteristics of the walkway routes identified for this research is represented in terms of walkability score level for each walkway route as shown in Fig.2 , summerazied in tales as follows :

4.1.1 Walkability Score Level

Walkway Number	Width (meters)	Duration (Minutes)	Length (meters)	Walkability score level	Meaning (Walkability Index)
1	6.50m	14min.	592m	93	High Walkability
2	6.50m	14min.	592m	93	High Walkability
3	4.50m	9min.	260m	96	High Walkability
4	6.00m	15min.	370m	88	High Walkability
5	20.00m	30min.	1490m	48	Fair Walkability Improvement needed

Fig. 4 Mahlia Girls Campus existing conditions observations

4.1.2 Walkway Routes Characteristics and Assessment :

4.1.2.1 Walkway Route Number (1) :

Characteristics	Walkway Route Number 1
Pedestrian Facilities	-The route has suitable walking surface, with continuous sidewalk on both sides , completely away from road
	- No real obstacle were observed.
Pedestrian Conflicts	-No conflict with motor vehicle traffic due to driveway and loading dock crossings
	- Lack of adequate green landscape at some segments
Crosswalks	- No intersections, or crosswalks, the carsshare the walkway with pedestrians in rare occasions .
Maintenance	- No racking, buckling or overgrown vegetation
	- No standing water on or near walking path
	- Minor spots with maintenance activities (on going) .
Path Size	- Total path width is 6.50 m with 1.20 m side walk on each side barrier free
Buffer	- Not adjacent to roadway
Universal Accessibility	- Designed to facilitate wheelchair access with easey access for the mobility impaired , adequate ramps , handrails accompanying steps curb cuts, etc.
Shade	- Partial shade from large trees in specific parts of the walkway, with long un shaded parts .
Aesthetics	- Pleasant landscaping , with few and pedestrian-oriented features, such as benches.
Privacy	- Private (not seen from outside the campus)

4.1.2.2 Walkway Route Number (2) :

Characteristics	Walkway Route Number 2
Pedestrian Facilities	-The route has suitable walking surface, with continuous sidewalk on both sides , completely away from road
	- No real obstacle were observed.
Pedestrian Conflicts	-No conflict with motor vehicle traffic due to driveway and loading dock crossings
	- lack of adequate green landscape at some segments
Crosswalks	- No intersections, or crosswalks, the carsshare the walkway with pedestrians in rare occasions .
Maintenance	- No racking, buckling or overgrown vegetation
	- No standing water on or near walking path
Path Size	- Total path width is 6.50 m with 1.20 m side walk on each side barrier free

Buffer	- Not adjacent to roadway
Universal Accessibility	- Ease of access for the mobility impaired , adequate ramps , handrails accompanying steps curb cuts, etc.
	- Designed to facilitate wheelchair access
Shade	- Partial shade from large trees in specific parts of the walkway, with long un shaded parts .
Aesthetics	- Pleasant landscaping , with few and pedestrian-oriented features, such as benches.
Privacy	- Private (not seen from outside the campus)

4.1.2.3 Walkway Route Number (3) :

Characteristics	Walkway Route Number 3
Pedestrian Facilities	-The route has suitable walking surface,
	- No real obstacle were observed.
Pedestrian Conflicts	-No conflict with motor vehicle traffic
Crosswalks	- No intersections
Maintenance	- No racking, buckling or overgrown vegetation
Path Size	- Total path width is 4.50 m
Buffer	- Not adjacent to roadway
Universal Accessibility	- Ease of access for the mobility impaired
Shade	- fully shaded by large trees in specific parts of the walkway.
Aesthetics	- Pleasant landscaping ,
Privacy	- Private (not seen from outside the campus)

4.1.2.4 Walkway Route Number (4) :

Characteristics	Walkway Route Number 4
Pedestrian Facilities	-The route has suitable walking surface
Pedestrian Conflicts	-No conflict with motor vehicle traffic
Crosswalks	- No intersections.
Maintenance	- No racking, buckling or overgrown vegetation
Path Size	- Total path width is 6.00 m with 1.20 m
Buffer	- Not adjacent to roadway
Universal Accessibility	- Ease of access for the mobility impaired

Shade	- No shade
Aesthetics	- Pleasant landscaping ,
Privacy	- Private (not seen from outside the campus)

4.1.2.5 Walkway Route Number (5) :

Characteristics	Walkway Route Number 5
Pedestrian Facilities	-The route has suitable walking surface, with continuous sidewalk on one side
Pedestrian Conflicts	-conflict with motor vehicle traffic
Crosswalks	- has intersections, and crosswalks,
Maintenance	- Minor spots with maintenance activities (on going) .
Path Size	- Total path width is 20.00 m
Buffer	- Adjacent to roadway
Universal Accessibility	- Difficulties of access for the mobility impaired
Shade	- Partial shade from large trees in specific parts .
Aesthetics	- Pleasant landscaping
Privacy	-Not Private

4.2 Users Perception of The Walkability of The Campus:

Female students respondents were (82.5 %) of the total number whereas female academic and administrative staff were only (13.8%) . The percentage of students using campus gate number (1) are (55%) of the students while only (26.2%) are using campus gate number (2) and apparently it was observed that gate number (1) has more traffic congestions at peak hours .

Building blocks (A) and (C) were found to be the preferable destination for all the respondents with (75%) walk to building (A) and (52.5%) walk to building (C) in morning hours .The percentage of respondents who walk for an average time of (5-15) minutes per day in the campus are (63.7%) , while (15%) walk for more than (15) minutes during the day in the campus, and (21.3%) who declared they walk less than (5) minutes per day. Most of the respondents (77.5%) complained from lack of shading in outdoor walkway routes while (63.7%) commented on the availability of adequate number of seating and shading areas in open space. The majority (96.3%) requested sunshade for outdoor walkway routes and open spaces . Most of the respondents (51.2%) suffered from car traffic congestion and crowds at students gates at peak hours , and (53,8%) stated that the campus lack signs and site maps to guide pedestrians through the campus. The percentage of the respondents satisfaction about walkability of the campus is (7.5%) very satisfied , (35%) satisfied ,

and (45%) partially satisfied , while only (8.8%) are unsatisfied , and (3.7%) are very unsatisfied.

5. Discussion

The research highlight certain physical infrastructure challenges that influence female students and staff willingness to walk . Results emphasis the need for weather protection and shading for the walkway routes which is quite important considering the weather of Jazan , It is one of the warmest region in Saudi Arabia with an average daily high temperature of 35 degrees , it is yearlong warm or hot. The positive aspect of providing shading for outdoor walkway routes is that sustainable materials or solar power production units can be used . The majority of female students respondents suggested the need for appropriate urban furniture for activities such as seating and places for refreshment and cafes to be provided in outdoor arenas and open spaces. The provision of seating and shading units made of sustainable materials that implement modern technologies and intelligent weather sensors would stimulates the promotion of sustainability and (Green) campus for young university students . Research showed insufficient landscape design of green arenas on campus with large unutilized lawns that can be used to provide outdoor theatre or walk tracks or other outdoor activities for students . The research demonstrated the convenience and effectiveness of walkway routes considering the presence of a suitable walking surface with comfortable width , side walk ,and paving conditions .

6. Conclusion

The conclusions are summarized to provide design guidelines for the improvement and enhancement of existing conditions as follows :

i. To achieve sustainable (Green) campus environment it is of high importance to provide sufficient, connective , shaded walkway routes.
ii. Provision of shading for outdoor walkway routes built with sustainable materials or solar power production units to reduce the energy consumption and promote sustainability .
iii. provision of seating and shading units made of sustainable materials that implement modern technologies and intelligent weather sensors to stimulates the promotion of sustainability and (Green) campus for young university students.
iv. The distance a student is willing to walk in the 10-minute break between classes as suggested by respondents is (500-800m) , this can be considered for future lay out and extensions of building blocks
v. Utilization of large lawns that can be used to provide outdoor theatre or walk tracks or other outdoor activities for students.

7. Recommendations

Design guidelines for the improvement and enhancement of existing conditions of university campuses of Jazan University can be summarized as follows :

7.1 Sustainable (Green) campus environment should consider the provision of sufficient, connective , shaded walkway routes built with sustainable materials or solar power production units to reduce the energy consumption and promote sustainability .

7.2 Sustainable materials that implement modern technologies and intelligent weather sensors to stimulates the promotion of sustainability and (Green) campus concept should be adopted for future development in all campuses of Jazan University.

7.3 Future lay out and extensions of building blocks should provide outdoor activities such as walk track , outdoor open air theatre .

7.4 Similar studies of walkability can be implemented for the main campus of Jazan University .

7.Acknowledgement

The author would like to thank all the participants from Jazan University who were willing to answer the questionnaire and to give their valuable comments and remarks ,and would like to express deep gratitude to the reviewers for their comments, critiques, and advice that have improved the quality of the manuscript .

References

[1] Fard , Saman J, “Walkability in Campus, the case study of University Technology Malaysia ”, A thesis submitted in fulfilment of the requirements for the award of the degree of Master of Urban design, Faculty of Built environment , Universiti Teknologi Malaysia, Malaysia, 2012.

[2] Lo , R. H., "Walkability: what Is it?" J. Urbanism: Int. Res. Place making Urban Sustainability 2, 145–166. doi:10.1080/17549170903092867 , 2009.

[3] Makki . S, Surat M., Che-Ani A., Farkisch H., MokhtarianH ,"The importance of design characteristics in walking from student’s perspective: a case study in Universiti Kebangsaan Malaysia" , Journal of Building Performance, Volume 3 Issue 1 , 2012.

[4] Nor Z. H. , Amanina N. and Syahriah B., "Walkability factors for a campus street", Planning Malaysia : Journal of the Malaysian Institute of Planners ,volume 18 issue 1 , Page 45 – 55, Doi: 10.21837/pm.v18i11.708. , 2020.

[5] Miyakod , A. "A pedestrian friendly environment for Downtown Baton Rouge" , (Master thesis). B.D. Kobe Design University, 2004.

[6] Ministry of Higher Education(2011),"About Jazan University", https://web.archive.org/web/20110103024519/http://www.mohe.gov.sa/en/studyinside/Government-Universities/Pages/JAZAN.aspx

[7] Smith L ,"Walkability Audit Tool. Workplace Health Saf.";63(9):420. doi: 10.1177/2165079915595307. Epub 2015 Jul 27. PMID: 26215975 , 2015.

[8] Southworth M, "Designing the walkable city", Journal of Urban Planning and Development, 131(4):246-257 , 2005.

[9] Government of Western Australia , Department of Transport," walkability audit tool", The Department of Transport 140 William Street , Western Australia , 2011.

[10] Roemer EC, Kent KB, Goetzel RZ, Krill J, Williams FS, Lang JE.," The CDC Worksite Health Score Card: A Tool to Advance Workplace Health Promotion Programs and Practices", Prevention Chronic Disease Jun 23;19:E32. doi: 10.5888/pcd19.210375. PMID: 35749146; PMCID: PMC9258447 , 2022.