Proceedings of the 2021 New York Cyber Security and Engineering Technology Association
Virtual Conference

ENGINEERING FOR FITNESS ON THE QCC SPANISH STAIRS

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Abstract

Welcome to Queensborough Community College! This presentation introduces a distinguishable feature of our campus, the QCC Spanish Stairs. Centrally located with the Kurt R. Schmeller Library on its' north edge and the Administration Building on its south edge, it represents the heart of campus. The Spanish Stairs serve as an important link between the upper and lower campus and is traversed by thousands of students each day. As part of a larger collaborative service-learning project, students from the ET Department and the HPED Department investigated the stairs' characteristics and potential as a natural physical fitness site on campus. This introductory talk breaks down the stairs' history, physical features, and its potential for improving the physical fitness levels of QCC students.

Introduction

This project highlights a collaboration of service between two academic departments on the Queensborough Community College (QCC) campus and features a distinctive campus landmark and its practicality for learning and practicing physical fitness. As part of a larger initiative to raise awareness of fitness opportunities on campus, the QCC Engineering Technology and Health, Physical Education and Dance departments worked together to determine which parts of the QCC campus would be suited for physical fitness activity outside of the conventional campus recreational facilities. The study found that one central location, a set of stairs between the Kurt R. Schmeller Library and the Administration, provided an apt setting for students to learn and practice physical activity. For the ET department, the stairs provided an excellent campus location in which to learn and practice surveying elevation-leveling skills.

QCC background

Queensborough Community College is one of 24 campuses of the City University of New York. QCC has one of the most diverse college campuses in the world. Students hail from 117

countries and approximately 25 percent speak a language other than English at home. QCC currently serves approximately 12,500 students, down from the pre-pandemic enrollment of 16,000 (QCC Fact Book 2021). QCC was founded in 1959 on the former Oakland Golf Course site covering approximately 37 acres within the Oakland Gardens section of Bayside, New York. This small area, combined with uneven topography, has contributed to a unique campus configuration, built on several levels and connected by stairways and walkways. Upon opening, the original facilities consisted of portable buildings and trailers used as classrooms and offices along with the original golf clubhouse serving as a cafeteria. Over the years, improvements lead to where Queensborough Community College stands today beginning with the Technology Building opening in 1963.

The next decade saw two construction phases and the creation of a permanent campus. This involved plans for constructing seven buildings of which three were completed by 1968. These plans included the Library building (1967) where the first floor main entrance opened onto a terrace containing small stairways leading either to the upper campus or lower campus. The QCC Master Plan (1970-1975) detailed a Phase I – 1973 plan presented a lower campus center and the proposed Administration Building south of the Library Building. Upon completion, these buildings were separated by a triangle shaped open space offering a gradual transition between the upper and lower.

Stairs Construction

Included in the construction of the Administration building was a new stair array designed to occupy the space between the new building and the existing library. The stairs consist of reinforced concrete with landings of masonry hexagon blocks reflecting the concrete - masonry facades of the library and Administration Building. Angled changes within the flights enhanced aesthetics within this now central node of the campus. The Administration Building along with the stairs were completed in 1978.

They have become to be informally known as the *Spanish Stairs*, after the noted 1725 Spanish Steps landmark in Rome, Italy designed by Francesco DiSantis and Alessandro Specci (Chin, 1979). In the present composition of QCC, these stairs represent a central feature of the campus by not only providing a direct link between upper and lower, but as a place to meet and

relax before or after classes throughout the day. In a full-campus environment, they are traversed by thousands of students, faculty and staff on a daily basis.

Stairs to the Stars

Over the years, the QCC Spanish Stairs have become iconic in its own right. Because of its proximity to Manhattan and its unique aesthetic features, the stairs have been featured in films, television, and commercial productions, including appearing in the television series: Law and Order: Criminal Intent. Prominent actors such as Vincent D'Onofrio, S. Epatha Merkerson, Jesse L. Martin, Nicole Wallace, and the late Jerry Orbach have adorned our stairs.

Current Project

Interest in fitness opportunities on the campus began in 2015 when the QCC Office of Academic Service-Learning (OASL) sought to develop a campus-wide collaborative project to serve a student need. Individual levels of physical activity tend to decrease with age (Kwan, et al., 2012). Particularly, physical activity amongst college students tend to decline even though colleges usually provide ample facilities and opportunities for recreation and exercise (Keating, et al., 2005; Huang, et al., 2003). One of the main goals of the American College Health Association's Healthy Campus 2020 initiative is for colleges to "create social and physical environments that promote good health for all" (2010, p. 1).

The current project sought to address this concern, especially since the QCC fitness center is undersized and unable to handle the volume of its student population. As part of this initiative, a campus fitness plan was developed in the Health, Physical Education & Dance Department (HPED) to help inform the QCC community of the various health and fitness opportunities that exist within the campus. While caloric values of food items are commonplace, determining calories burned through physical activity tends to be more elusive. The project was presented as a way for students to a) gain a working knowledge of caloric expenditure while walking through the campus, and b) increase awareness of physical fitness within the QCC campus in settings outside of the gym and fitness center.

It was thought that a collaborative project could ease some of the work load for participating professors by allowing them to focus on a part of the whole. This would allow each discipline to contribute to a project that, on the surface, might not seem relevant to their

respective fields; but through their collaboration, contribute vital expertise toward a larger project. The HPED project was joined by an unlikely partner when the QCC Engineering Technology Department (ET) was recruited to assist in the venture. Each department identified specific classes with which to undertake the project. The Spanish Stairs fitness initiative became an integral part of that original campus-wide project.

Participating Classes

HE-108: Health and Physical Fitness

Course catalog description: An inquiry to the concepts of health, physical fitness, physical performance and wellness. Factors such as nutrition, body composition and weight control, principles of physical conditioning, physiology of exercise, and other issues related to optimal physical performance will be considered. The classroom lectures will be supplemented by laboratories and demonstrations using available gym facilities to provide students the opportunity to assess their present state of physical fitness. The student should be able to formulate a program of self-improvement in relation to their individual goals after completion of this course of study.

Procedures

Continuing work started by previous HPED classes, students in HE-108 focused their measurements on the Spanish Stairs and surrounding areas. Students were instructed to walk with a purposeful gait while measuring, since most people walking on a college campus are walking with a purpose. Repeated measurements were taken of calories burned ascending and descending the stairs as well as an alternate route – the north walkway. Students used measuring wheels, Fitbits® (technology-based fitness-tracking devices), and clipboards intended to obtain distance and caloric measurements.

ARCH-125: Principles and practice of elementary surveying

Course catalog description: Application of the fundamental techniques of site planning principles and the use of topographical maps and models. The importance of site development as it relates to architecture and sustainable site development. Field work in practical application of

surveying techniques; measurement of distances, angles, and elevations, computation and mapping of closed traverses.

Procedures

The capstone work concentrated on the Spanish Stairs and the walkway north of the Library Building. Each field-lab session was broken down with sixteen students in groups of four measuring distance and elevations-leveling at the Spanish Stairs and walkway.

Points were established along the stairs and walkway with the first point set at the lower campus relative to where the stairs and walkway began. A final point was set at the top of the stairs and walkway slope. These points were used to measure both distance and elevations.

Distance measuring used the following: Topcon GTS 225 Total Station in EDM: Electronic Distance Measurement mode along with a rod mounted prism. Both total station and prism must be in alignment and exactly over a point for accuracy. With the total station, this involved adjustments until horizontally level over the point. Prism alignment involved raising or lowering until cross hairs align and then a total of three measurements are taken. Final distance is the mean average of the three measurements taken with EDM.

Elevation-leveling used the following: Topcon Auto Level along with a Philadelphia Rod. The Philadelphia Rod allows users to obtain measurements to the nearest 100th of a foot and to the nearest 1000th of a foot using the rod mounted Vernier scale. The auto level is set up anywhere between two points making certain both points can easily be seen without interference or falling short.

After the auto level is horizontally aligned, a backsight rod reading is taken towards the point of known elevation. A reading is taken off the Philadelphia rod when auto level cross hairs align to any graduation mark on the rod. The backsight value is added to the known elevation obtaining a height of instrument defined as the line of sight aligned with the cross hairs. The auto level is turned towards the point of unknown elevation to obtain a foresight rod reading. After obtaining the rod reading value, this is subtracted from the height of instrument value obtaining the elevation for that point. The unknown point now becomes the known point with an elevation value for the next setup. This procedure is repeated again continuing until the final point elevation is measured and obtained.

Stair measurements

The Spanish Stairs comprise 46 six-inch risers across eight flights between the upper and lower campus. Its distance, as measured from lower campus to upper campus, equals 185 feet with an elevation difference of 22.30 feet. Calories measured ascending the stairs differed with those descending. Students burned an average of 12 calories climbing the stairs from base to summit, and eight calories descending from the top down to the base. Therefore, one trek up and down the stairs tally 20 calories.

Alternate Route – North Walkway

An alternate, handicap-accessible route connecting the upper and lower campus is the North Walkway, just north of the Library Building. This concrete path has a gradual incline and is accompanied by a support rail. Students in each discipline set out to measure this path as they did the stairs. The walkway distance as measured equals 265 feet with an elevation difference of 15.25 feet. Repeated student measures of calories produced an average of 6.5 walking up the walkway and 3.5 going down. Therefore, one trek up and down the walkway tally 10 calories.

The Difference

Students discovered that although the walkway was longer than the stairs by 80 feet (265' – 185'), calories burned on the stairs were more than those on the walkway. By contrast, the stairs had an elevation advantage over the walkway by 6.75 feet (15.25'- 15.25'). Another difference between the two paths is climbing steps vs. walking uphill. Climbing stairs requires lifting the body over each riser while walking uses more of an alternating shift of the legs. This study demonstrated that elevation and type of walk mattered when burning calories. Students were able to confirm previous studies demonstrating the health benefits of stair-climbing over walking (Kesinger, 2015). Traversing the Spanish Stairs burned double the calories than walking the North Walkway. In addition, students demonstrated that walking up an elevation burned more calories than walking down. Therefore, the calories burned from point A to point B do not necessarily equal the calories burned from point B to point A.

Practical application

In addition to the daily transit between classes and meetings, using the stairs, or the walkway can be a beneficial activity on the campus. With easy to calculate measurements (20 calories for the stairs, 10 for the walkway). Students and staff can calculate their trips during the day. To demonstrate, consider the following popular items at the Science Café, the campus cafeteria located just north of the bottom of the stairs and adjacent to the North Walkway:

Spanish Stairs workload per food item

Food Item	Calories	Stairs workload
Salad with Italian dressing	35	up 2x + down 1x (32 calories)
Cheese pizza slice	250	up 13x + down 12x (252 calories)
Cheeseburger	303	up and down 15x (300 calories)
French fries	378	up and down 19x (380 calories)
Chicken sandwich	515	up 26x + down 25x (512 calories)
Chicken burrito	1,095	up and down 55x (1,100 calories)

North Walkway workload per food item

Food Item	Calories	Stairs workload
Salad with Italian dressing	35	up 4x + 3x down (36.5 calories)
Cheese pizza slice	250	up and down 25x (250 calories)
Cheeseburger	303	up and down 30x (300 calories)
French fries	378	up and down 38x (380 calories)
Chicken sandwich	515	up 52x + down 51x (516.5 calories)
Chicken burrito	1,095	up and down 110x (1,100 calories)

Conclusion

This paper has been presented as part celebration and part exploration of the iconic QCC Spanish Stairs, located on the campus of the host institution for the 2021 New York Cyber Security and Engineering Technology Association conference. What began as a campus-wide project ended up with a special focus on its central landmark, the QCC Spanish Stairs.

Measurements of the stairs by Engineering and Health students demonstrated its potential as an alternative fitness location on the campus. Physical measurements of length, width, and elevation, combined with calories burned ascending and descending the stairs created the conditions for students to plan their own fitness workout on the stairs. Students became aware that the various physical features of the campus factor in determining the workload of a particular walking activity. This is welcome information, since the QCC Fitness Center has been closed since the pandemic lockdown. Through regular physical activity use and promotional activities, the Spanish Stairs could become a symbol for on-campus fitness. Perhaps one day a sign will be erected at its summit stating:

QCC Spanish Stairs
Completed 1978
Elevation: 22'4"
46 steps
Average calories burned up = 12
Average calories burned down = 8

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