Environmental Factors and Academic Performance: The Mediating Effect of Quality of Life

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Abstract. The study of students’ academic performance has gained much recognition internationally where it has drawn the attention of educational researchers, particularly in the previous decade. As such, this study examined the impact of the environmental factors on student’s academic performance at the University Malaysia Kelantan (UMK) city campus. It described three environmental factors, consisting of infrastructure and services; pollution and healthy environment and environmental hazard, with quality of life as a mediator. This is a survey type of study by distributing questionnaires randomly to 300 fourth-year students; however, only 200 returned and usable questionnaires were received. The study used the regression and correlation analysis to analyse the data. The result of the study shows that all variables significantly impacted academic performance of students. The result also indicates that all the variables were consequential in affecting the students’ quality of life (QoL). Since this is the first effort to look at the challenges at the UMK city campus, it offers useful inputs into the causes so that UMK and other academic institutions can take actions to provide a better environment and QoL for students in order for them to reach their fullest academic performance potential.

Keywords: University · Environmental infrastructure and services · Environmental pollution · Environmental hazard · Quality of life · Academic performance

1 Introduction

Academic performance (in other words, academic accomplishments) is the extent to which a student, teacher or institution has achieved accomplishment in their short or long-term educational objectives. According to Hasan et al. (2017), academic performance is the capacity of students to attain the courses’ expectations in which they are enrolled and is usually evaluated by GPA (grade point average). As reported by Badiger
and Aiholli (2017), academic accomplishment can be described as competence in all academic disciplines, in class as well as in co-curricular activities. It includes excellence in sporting activities, confidence level, communication skills, timely delivery, arts, culture and the like which can be achieved only when an individual is well adjusted.

The performance of university students is frequently evaluated based on the final results obtained or known as the achievement of Cumulative Grade Point Average (CGPA) which was assessed via examination or several types of assessment (Bakar 2006). In this context, students with a CGPA below the average are considered low achievers in their academic performance. Meanwhile, university students with a CGPA above the average score are considered to obtain high achievement in their academic performance. In line with Basri et al. (2018), academic performance of students refers to improving the current state of their knowledge and skills reflected in their GPA (Grade Point Average) and also in shaping their personality and their academic progression from lower to greater levels of study. In this regard, achievement or performance is measured through scores on exams, tests and GPAs. It is believed that academic performance is the ultimate goal expected by students, teachers and other educational stakeholders, where it is demonstrated in the high level of achievement and performance in academic subjects.

In an outcome discovered as various socioeconomic, psychological and environmental factors being determinants of their academic success in higher education (Hijazi and Naqvi 2006; Anticevic et al. 2018), over the past several decades, academic researchers and educators have performed several research experiments to determine the influencing driving factors of students’ academic performance. Socio-demographic characteristics such as gender, age, family status, marital status, ethnicity and previous accomplishment have thus been shown to influence their undergraduate academic performance (Hasan et al. 2010). Despite ground-breaking studies over the past decade showing a link between the students’ atmosphere and academic success, environmental factors have not previously been taken into account as one of the influencing elements affecting academic success in educational institutions, so little or no attention has been paid to educational discourse and consideration. There is no doubt that the environment plays a major role in any individual’s life whether they are a student, teacher, employee or employer. Nonetheless, some people are still to accept that the environment contributes to better results (Chukwuemeka 2013). A study by Gilavand (2016), has established several factors in the learning environment that significantly affect students’ learning outcomes, such as open space and noise in classrooms, inadequate light, unsatisfactory temperature, overcrowded classes, improper classroom layout and misplaced boards. All these constitute factors and confounding variables that disrupt students in class. Finally, Gilavand (2016), proved that noise as well as negative and inappropriate colouring, poor classroom lighting and open space affect learning and academic achievement of elementary school students. Accordingly, Gilavand (2016), suggested that in designing educational settings, the school management must take environmental factors into account.

In addition, Katherine et al. (2012) was of the opinion that numerous factors affect students academically, including the personal factors of the students, their interactions with others such as parents, teachers and administrators and, last but not least, the larger systems surrounding them; for instance, school districts, neighbourhoods, local economy
and multicultural relations and political policy. It is believed that the socialisation process of students requires a healthy environment and models so that their performance can be enhanced. According to educational experts, school architecture and its intrinsic elements such as colour, light, sound and equipment, as well as other factors can have major impacts on learners and students from a systematic perspective (Gilavand 2016).

In actuality, student performance issues are often spotlighted in the mass media and academic literature such as achievement, motivation and attitude (Bakar et al. 2010); socioeconomic status (Farooq et al. 2011) and adoption of information and communication technology (Basri et al. 2018). Among educational professionals, the environmental component is one of the most researched and debated factors that contribute toward the academic performance of students, despite most studies conducted in Malaysia generally only focusing on determinants of the academic performance of students without focusing on the environmental factors. It also helps in enhancing research on environmental factors and encourages more debates in this area. Therefore, it is pertinent for educators to be aware and to study the environmental factors related to student performance.

A study by Ramli and Zain (2018), concluded that conducive and sound facilities result in better performance or achievement of the students. As supported by Yeboah-Appiagyei et al. (2014), environmental factors will definitely influence the success of students. It is believed that the access to infrastructure and environmental services will affect academic performance. For example, if a student is in a learning environment that has access to reasonable infrastructure and environmental services, the student can learn comfortably to achieve better academic performance. At UMK, drainage systems (infrastructure) are not functioning properly. The drainage systems were inadequate during the rainy seasons to handle the flow of water, had sub-standard construction, occupied an inappropriate site, were clogged by solid waste disposal into drainage and had improper alignment of some drainage structures with respect to the road alignment. Hence, this study is essential to the university so that it can impart a proper environment to increase the effectiveness of its education system in the future.

As such, the objective of this study is to examine the impact of environmental factors on students’ academic performance at the University Malaysia Kelantan (UMK) city campus. It described three factors of environmental components such as infrastructure and services; pollution and healthy environment and environmental hazard, with quality of life (QoL) as a mediator. It is hoped that the discoveries in this study will bring many benefits to researchers in the field of academic performance. Furthermore, the results of this study can assist the management of the University Malaysia Kelantan (UMK) in their awareness of the environmental elements affecting the students’ performance. Thus, the university can have a better understanding about the environmental factors that give significant effects to academic performance. This study also may give ideas and bring new impetus for university in relation to adjustment and change needed to increase the academic success among students.

This paper is organized as follows. Section 2 reviews the related literature and proposed the design of the study relationships in the conceptual model. Section 3 describes and data collection procedure. Section 4 analyzes the data and presents the results. Section 5 discusses interesting findings of the study. Section 6 concludes the paper, states the limitations of the study, and recommendations for future research.
2 Literature Review

2.1 Factors Affecting Students’ Academic Performance

In order to generate the best human capital, higher educational institutions constantly need a thorough and comprehensive research about the influencing factors of academic performance (Garkaz et al. 2011), with university being an establishment that is hoped to graduate excellent individuals that will constitute the country’s workforce in the future. The significance of academic performance especially at higher levels is vital (Sonmez and Akpinar 2017), because economic and social development of a nation depends on the schooling and its progress level in that nation. Currently, the chances of getting an education at a public university in Malaysia are greater with the growth of prestigious universities. As reported in Malaysia Education Blueprint 2015–2025, in 2012, Malaysia reached 48% total enrolment rate in higher education. This reflects a rise of 70% in enrolment over the past decade, reaching the number of 1.2 million students in public and private Malaysian Higher Learning Institutions. There are 20 public universities in Malaysia, and its higher education system is improving every year, boasting top universities and colleges. Most have been recognised not only locally but abroad as well. Public institutions are made of teacher training institutes, community colleges, polytechnics and public universities. Private institutions include private universities, private colleges, private university colleges and branch campuses of foreign universities. From year 1990 to year 2010, there was a six-fold increase in enrolment of Bachelor degrees and a 10-fold rise in enrolment of Masters and Ph.Ds. Having rapid growth, Malaysia currently has the third ranking after Singapore and Thailand in Masters and Ph.D. enrolment among ASEAN countries.

However, with family backgrounds also contributing to their performance, such as socioeconomic conditions and the level of their parents’ education, the number of siblings and the students’ role models, the university students’ academic performance is affected by various factors. These range from individual factors such as these distinctive socioeconomic backgrounds and capability, teaching staff and methodology to environmental components such as facilities, social atmosphere, support activities and so forth (Win and Miller 2005). For example, Gobena (2018) conducted a study to examine the impact of socioeconomic family status on academic achievement of students. The study discovered that the level of family education contributed 40.96% to their academic success.

A study by Remali et al. (2013), summarised that the major element that can impact the academic performance of students is the demographic factor, while other factors such as gender, marital status, prior background or gender can also possibly be one of them. With analyses indicating that aspects such as the communities in which students live or the attributes of the schools that students attend are also influential in determining how students perform (Johnston et al. 2014), numerous studies have shown that the motivation and learning of students is significantly influenced by elements associated with the physical environment. This comprises of school buildings design and outward appearance, classroom colour, school infrastructure and amenities, locations and surroundings areas. As noted by Chiang and Liang (2014), for those who have concerns about education in science and engineering, they should pay attention to the learning atmosphere.
of the students and take heed of the importance of physical and social environments in boosting their performance.

In this respect, some researchers have gained dissimilar outcomes, for example Zakaria et al. (2011), found that environmental factors have different effects on male and female students. Johnston et al. (2014) concluded that communities where students live and school settings may be important in influencing their academic success. In another study, Sonmez and Akpinar (2017) focused on physical environment, including building design and ambience, campus design and surrounding neighbourhood. Their study found that there is no connection or impact between academic performance and tangible environmental components such as school building, campus layout and surrounding area in influencing academic performance of university students.

Apart from that, there is limited research on factors involving the physical environment that affect students’ academic performance at university level. Therefore, the relationship between the impact of environmental factors and students’ academic performance is important to explore, especially at higher level institutions and they constitute a valuable segment for this study. This study aims to examine the environmental factors (infrastructure and services; pollution and healthy environment; and environmental hazard) and QoL that may influence students’ academic performance at a public university in Malaysia (UMK) that utilises business blocks as their main campus, called the city campus.

2.2 Access to Environmental Infrastructure and Services

Because one cannot overemphasise the value of living in a healthy environment, the first independent variable in this study is access to environmental infrastructure and services. This refers to the availability of public facilities for human life such as management of waste disposal, water and sanitation systems, transport systems and drainage systems (Keles 2012). Usually, if an area is free from indecent waste, the effect is seen in all facets of the life of individuals living in that area. A study by Diriba (2016), views that the function of a drainage system is to prevent onsite water standing on the surface and convey the offsite storm runoff from one side of the roadway to the other. An effective drainage system is necessary for water to flow off and out of the road in the shortest possible time. This study was to investigate the causes and effects of poor drainage system on the asphalt pavement of a road segment in Agaro–Bedele road, and it found that the drain suffered from low capacity, dirt accumulation, inlets unavailability, lacking proper maintenance and solid waste disposal into the drainage and the crossing culverts. For these problems, remedies suggested are that it is important to perform operations when designing and constructing the road drainage and it must follow the drainage design manual. In addition, regular maintenance and cleaning of the drainage structures and waste solids are vital to remove or prevent these problems.

Moreover, Nepal (2016) claimed that proper infrastructure always supported the educational enterprise, and his research proved that air quality, lighting, temperature, small, comfortable, safe environment, building age and condition, maintenance quality and colour could affect students’ health and safety as well as their self-esteem and psychological state. Many researchers, such as Ali et al. (2009), Shamaki (2015), Al-Qahtani (2015), Javed (2017), Zotorvie (2017), Malik and Rizvi (2018) and Shrestha et al. (2019),
explained that those good learning environments are important for students’ academic achievement. A previous study by Joan (2010), found that the sanitation of schools has a positive influence on secondary school students in Uganda in terms of their academic performance. In that study, the good sanitation refers to the cleanliness of the toilets and the bathrooms, the cleanliness of the school drainage system, the access to hand washing facilities and the garbage bin condition provided for student facilities. Based on the World Health Organization, sanitation means provision of facilities and the services provided for the safe disposal of human waste, the maintenance of proper hygienic conditions by the sustainable collection of solid waste and water waste treatment. On the contrary, sanitation and hygiene of improper water supply will cause diarrhoea, which will affect academic performance due to lack of awareness and environmental education (Farooqi and Fatima 2010). An article by Jasper and Bartram (2012), reported that lacking sanitation facilities in developing countries results in increasing truancy at schools, and increased access to sufficient sanitation facilities at schools leads to lower diarrheal and gastrointestinal diseases. Also, Jasper and Bartram (2012), further examined the consequences of water availability and/or sanitation facilities at educational institutions by focusing on water for drinking, handwashing, regular sanitation, sanitation for menstruation and combination of water and sanitation.

In another study, Nepal (2016) analysed the relationship between the condition of school’s infrastructure facilities, learning environment and students’ outcomes. His study includes three elements: input variable; mediating variable and output variable. The condition of the school’s infrastructure facility is an input variable, which indicates 70%, a good linear relationship between school’s infrastructure facilities and student learning outcome. Similarly, the schools’ infrastructure facilities contribute 43.6% to the students’ learning outcome. It means that it facilitates support to make an effective learning environment in schools. School’s practices, management, utilisation and planning practices are a mediating variable, which indicates 72% linear relationship between two variables, learning environment and student learning outcome. Furthermore, mediating variables contribute 43.4% to total learning outcome of students. The students’ outcome is the output variable (as measured by various standard achievement tests and exam), which is directly related to the condition of school’s infrastructure facilities and indirectly related to school learning environment and the result shows that the schools’ infrastructure facilities contribute 43.6% to students’ learning outcome. It indicates that it leads to an effective learning environment in schools.

There are limited studies in Malaysia on access to environmental infrastructure and services. As stated by Fauziah and Agamuthu (2010), the current practice in Malaysia has some improvements where dumpsites were upgraded and more sanitary landfills were established. The previous study by Ghani et al. (2008) mentioned the Sustainable City Waste Systems (SUDS), which is a technique used in Malaysia to solve the problem of flash floods, short supply of water resources and water pollution. This is because the rainwater reservoirs, especially in urban areas, will be taken into drains or the larger waterways with conventional drainage systems.
2.3 Environmental Pollution and Healthy Environment

Environmental pollution and healthy environment is the second independent variable for this study. The environmental pollution can also be categorised more into air pollution, water pollution, land pollution, food pollution, noise pollution and radioactive pollution and so forth (Appannagari 2017). Generally, the effects of pollution in turn can cause weather phenomena such as acid rain, heat island and flash floods. Furthermore, according to Sun and Zhu (2019), prevalent rates of various diseases such as cardiovascular disease, lung cancer, respiratory problems, asthma, adverse pregnancy and poor birth deliveries can be elevated by outdoor air pollution.

External pollution is not the only problem. Learning is often impaired by improper ventilation and air circulation systems in classrooms. Air stagnation increases the levels of carbon dioxide and prevents carpet and paint fumes from escaping. This directly impacts mental capacity. Researchers have inspected the quality of air indoors at 70 schools, totalling 140 classrooms, in a study done by the Indoor Air Program at the University of Tulsa. They tracked students’ performance in standardised testing and compared the accomplishment of the students in poor air quality classrooms with those in better quality air. The students in classrooms with poor ventilation achieved 74 points lower in average on the 2,400-point tests (Learning Liftoff 2019).

A previous study by Mohai et al. (2011), discovered that 95% of the approximated concentrations of air pollution in schools were from 12 chemicals such as diisocyanates, cobalt and glycolethers. Their study found that glycolethers contribute the least pollution, meanwhile disocyanates contribute the worst. They are originated from various materials (chemicals) produced by manufacturers that can endanger or harm health and life of the public. Their research showed that schools located in places where air pollution has the highest level recorded the poorest presence of students at schools, a possible sign of illness affecting their academic achievement.

As supported by Grineski et al. (2016), several ecological studies have shown that an increase in pollution at schools is related to lower school-level aggregate standardised test scores, possibly associated with heightened respiratory problems and/or cognitive impairment. Meanwhile, Sebastian and Mauricio (2013) in their study of the effects of air pollution on educational outcomes described that pollution can affect the students’ academic performance in Chile that is associated with absenteeism, attention problems, brain development and behavioural problems. This is because the high air pollution will lead to respiratory problems and produce a negative impact on academic performance due to fatigue for students associated with asthma and subsequently they are absent to class.

In Malaysia, a study by Abdullah et al. (2012), reviewed that the air pollution was the main factor that contributed to the air quality in Klang Valley, Malaysia. Their study indicated that urbanisation, industrialisation, the number of motor vehicles and forest fires were the main contributors to the air pollution in the Klang Valley. As supported by Leh et al. (2012), greater size of urban land positively affects the level of air pollution. Their findings showed that the city of Kuala Lumpur has an average level of air quality. Experts are pointing out that Malaysia’s air quality has deteriorated owing to urbanisation and the country’s seasonal haze. The increase in air pollutants is also worsened by growing industrialisation. Moreover, the high number of motor vehicles in the city
centres, contributing to high ozone concentration in the suburban areas (The Star 2020), also escalates air pollution. According to environmental experts, more than RM28 million was spent to curb the air pollution problem in Malaysia. Therefore, this critical circumstance caused harm to the public. On the other hand, it contributes to the income of the hospital sector, where the patients need medication due to the air (Thomas 2020).

In another study, Ahmed and Ismail (2018) focused on water pollution. They identified that the most important cause of water pollution comes from dumping of waste, while the second one is untreated sewage. Meanwhile, the third culprit is pollution and industrial discharge. It is recommended that a sound waste management system should be in place and that waste must be treated before reaching the river. As pointed out by Alyasi and Isaifan (2018), one of the major challenges for sustainable environment and communities is solid and liquid waste management. Effluents from waste treatment and disposal plants have direct and indirect implications for the environment and human welfare. The direct impacts entail the destruction of materials, loss of aesthetic value and harm to people’s well-being. Furthermore, the long-term indirect effects encompass climate change and ecosystem imbalance. In addition, due to high population growth, urbanisation, economic expansion and industrial development, the challenge of waste management has become greater than ever. Meanwhile, Gilavand and Jamshidnezhad (2016), were interested in noise pollution. Their study reported that noise pollution and academic performance has a significant correlation, among students in Iran and identified that noise can be caused by several sources, including external noise and internal noise. Internal noise is noise from construction works and vehicles, while examples of external noise are students walking in corridors and their sounds in the classroom.

In another study, Mattingwina (2018) supported that achieving quality excellence is the key priority of any educational institutions. In this regard, research evidently indicated that there exists a consequential link between academic accomplishment and students’ well-being. Hence, it is vital to take care of students’ health in order to achieve high performance by avoiding any pollution. A study by Mattingwina (2018) also supported that the academic risk increases as the health risks of the students are compromised.

Furthermore, Ansari and Stock (2010) reviewed that health is a significant factor for school and higher education achievement. Thus, boosting the health and well-being of all students at universities or colleges is vital to promote successful learning. In their study, Ansari and Stock (2010) examined the correlations between health literacy, healthy way of life, subjective health status and students’ satisfaction with their learning undertakings as independent variables, while for dependent variables they are the three outcomes of academic accomplishment. This paper explores the environmental pollution and healthy environment that influences academic performance, and it is worth noting that the subject of environmental health hazards across schools and higher education institutions is quite alarming, but researchers and analysts in Malaysia and around the globe have been neglecting it. It is necessary to see health through an expansive perspective, particularly when it involves the younger generation in the fast changing society of today.
2.4 Environmental Hazards

The definition of environmental hazards encompasses any sources of probable damage, and detrimental health consequences to someone or something inside the built environment under particular circumstances (Nunoo et al. 2018). Environment has a significant role in everyone’s life, be they students, teachers, employees or employers, yet many people still believe that it influences better performance much. Environmental factors do not have much consideration in educational discourse and therefore have not been regarded as one of the elements affecting academic success in secondary schools. As supported by Grineski et al. (2016), the environmental health threat issues affecting schools are widespread, but researchers and analysts have largely ignored them.

According to Daramola et al. (2016), environmental hazards manifest in any sphere of the human environment, wherever human activity takes place. One such place is the educational campus setting in which students live and carry out their daily academic pursuits. As stated by Keles (2012), environmental hazards consist of two types and are divided into the environmental hazards that originate from natural resources and human resources. Examples of environmental hazards from natural sources are earthquakes and floods, while the environmental hazards from human resources are caused by industrial, traffic, municipal and fire accidents. Effects of environmental hazards indirectly cause trauma and anxiety to people’s lives and they come from natural resources, with human resources having negative effects such as causing losses to the country, affecting human health, polluting the environment and destructing the environment.

Furthermore, Basit et al. (2011) claimed that floods would cause various problems such as loss of life and property, damage to infrastructure, impact livelihoods and lead to traumatic feelings. These floods are usually estimated to cause billions of dollars worth of damage resulting in many social, emotional and educational problems that also affect schools and students in Pakistan. Besides that, Pietro (2018) found that students tend to suffer from stress disorders and a significant disruption in their learning environment because some university buildings were damaged by the L’Aquila earthquake in Italy. The finding showed that the L’Aquila earthquake contributed to negatively impact on the academic achievement of students of local universities in Italy. The results proved that natural disasters reduce the likelihood of students passing the exam due to interruptions in the learning and traumatic environment experienced by them after the L’Aquila earthquake occurred.

Another study by Chaudhary and Timsina (2017) analysed the students’ view of the possible flooding effect on school facilities, students’ families, community infrastructure and the overall effects on their educational outcomes. The results of this research indicated that flooding impacts their performance, especially for secondary level students. They were fearful of any possible disastrous incidents such as the destruction of school infrastructure and their homes. The study revealed high rates of vulnerability to flood impacts, decreasing the quality of education as it disrupts access to schoolings for the students. The damaged school infrastructure leads to the discontinuation of education and increases children’s dropout rate. Schoolings will be disrupted and as a result, the quality of education is decreased.

In the capital city of Malaysia, flash flooding is a normal occurrence, as it has happened in many cities in this country, for example in the Klang River and the Gombak
The main cause for this disaster is the failure of drainage systems during the seasonal monsoon rain, which caused flash floods in the cities. Therefore, the situation has affected the mobility of the public, particularly students, in that it hindered them from going to schools (Bhuiyan et al. 2018).

Besides that, Yusoff et al. (2017) the effects of the flood in Kelantan at the end of December 2014, which is the worst flood in Malaysia, were investigated. It is considered a ‘disaster-like tsunami’ with 202,000 victims being evacuated and causing collapse of infrastructure. The purpose of this paper is to identify measures to reduce or mitigate the risk of flooding in hospitals because most of the injured victims will be treated there. As noted by Mohammed et al. (2017), flooding typically occurs in Malaysia after heavy rain, especially during the monsoon seasons. This is a matter of some concern, and their paper recommended potential improvements that can be implemented by Malaysian universities to improve current measures of handling the flood aftermath.

Their study aims to review relevant literature at Malaysian universities relating to flood recovery planning. Universities in Malaysia today face a variety of threats and natural disasters. Flooding can be a challenging experience, but adequate precautionary measures and guidelines on how to recover from flooding could assist in handling flooding during and after. Improved approaches to handling Natural Disaster Risk Management (NDRR) should be adopted by Malaysian and international universities, thereby increasing resilience to natural disasters. University administrators and decision-makers should also use these results to enhance their expertise on major problems involving recovery efforts, emergency planning and related changes to support the university sector in the future.

Other previous studies in Malaysia have focused on environmental hazards associated with hill land development (Chan 1998); the opinion of contractors on the numerous issues related to the environment which include water pollution, air pollution, deforestation, soil erosion and groundwater contamination (Begum and Pereira 2008); and to examine the awareness, views and understanding of the urban Malaysians regarding air pollution (Chin et al. 2019). Toxic and dangerous waste management status in Malaysia are reviewed by Aja et al. (2016). In their study, Aja et al. (2016), highlights the hazardous waste sources, government policies on waste generation and management, stakeholder participation and the different management procedures implemented in Malaysia. It is imperative to have a study measuring the significance of a hazardous environment on academic achievement, particularly for students at the Universiti Malaysia Kelantan, although there is a lack of studies conducted on the environmental factors affecting students’ academic performance at institutions of higher learning.

### 2.5 Quality of Life (QoL)

QoL is defined as a positive value, which is perceived happiness, success, wealth, health, life satisfaction and well-being, where these terms are used interchangeably throughout the literature (Sunden 2019). A study by Raihana and Nabilah (2018) analysed the life quality of students comprising five dimensions, namely physical health, psychological well-being, social ties, the environment and the general life quality. While O’Flynn et al. (2017) discovered that excessive stress could adversely impact the students’ pursuits of knowledge and even more importantly, their physical and psychological well-being,
the research study by Ilias et al. (2008) found that QoL plays a significant role in the academic success of the students where QoL, happiness and accomplishment among college students are related (O’Flynn et al. 2017). A study by Sunden (2019) was to understand the views of undergraduate university students regarding their QoL and how their perceived QoL influences their academic success.

A study by Ilias et al. (2008) identified that levels of satisfaction among students are influenced by the following precipitating factors: their learning and teaching perception; resources such as computer centres; libraries; laboratories; conducive infrastructure like lecture halls, social lounges and university buildings, as well as other facilities which include health clinics, refectories, accommodation, student service centres and also external components such as transportation and finance. Where QoL also can be influenced by various dimensions and complex issues such as environmental stress, water management, waste management, noise pollution and air pollution levels (Al-Naggar et al. 2013), the QoL of university students is an important issue to overcome physical, mental and social problems so as to produce future leaders for the future developed nations (Maria et al. 2013).

In a previous study, Norouzi (2012), found that the linkage between life quality and academic performance was affirmative. This researcher (Norouzi 2012), pointed that students with higher life quality will enjoy better health. Where there are other studies suggesting that poor life quality is also correlated to under-performance, his study also takes into account the mental trauma and the quality of students’ life in Ghana that influences the student learning process because anxiety can negatively impair the students in performing at their best academically. Furthermore, Saedi and Farahbakhsh (2016) explored the relationship between QoL and academic achievement for college students. The actual study revealed that development of one’s empowerment, feeling of success and the health condition of the body are positively correlated to the life quality of college students. As claimed by Raihana and Nabilah (2018), there are only a few researches exploring the relationship between life quality and academic achievement, with, in the Malaysian context, research about QoL status and academic performance having been given very limited attention by researchers. Nevertheless, Ilias and Nor (2012) had conducted a study to examine the relationship between life quality, academic behaviours and students’ motivation in training of teachers in Malaysia. Although many parties considered that the QoL issue is of great importance, this issue has never been assessed among students in this country. The goal of this study is to evaluate QoL among students at the UMK as a moderator variable in this research, which focuses on the environmental factors affecting their academic performance at the university (see Fig. 1 Conceptual model of the study). It is therefore anticipated that the study would give both students and educators insight into the significance and role of life quality for academic success. This as most researches conducted in the past on factors influencing academic performance have not focused on the environmental QoL factor.

## 3 Methodology

This study examined the final year students of UMK city campus. Final year students were selected because they had been in the UMK city campus for almost four years.
Thus, they were the best to determine the factors that affect their academic performance and QoL. They were also chosen due to their maturity and study experience, therefore, they were able to share their thoughts needed in this survey. The total number of fourth or final year students in the city campus was 1041, of which 645 students were from the Faculty of Entrepreneurship and Business and 396 students were from the Faculty of Hospitality, Tourism and Wellness. There are currently a total of 4,666 active students at the UMK city campus. This information is collected from both of the faculty offices. Three hundred questionnaires were randomly distributed during lecture classes to the final year students, however, only 200 (67%) usable questionnaires were obtained. This study runs the preliminary analyses by looking at the descriptive statistics, exploring relationships among variables using the correlation technique, test of internal consistency with purification of items and Cronbach’s Alpha, and finally run the multiple regressions to test the hypotheses. The Statistical Package for the Social Science version 26 is used to analyse the data.

4 Results

4.1 Pilot Study

Pilot tests were run to increase the clarity of the survey instrument by improving the quality of the questions. The survey instrument was piloted to enhance it before the actual distribution took place. For the process, the questionnaire had randomly been circulated to 10 respondents and so they were uninvolved in the real study.

4.2 Descriptive Statistics

**Demographic Statistic.** As shown in Table 1, 30% male and 70% female respondents were involved in this study. Most (47%) of them were 23 years old and followed by 38% of them were of the age of 22 years. Malays were the majority (77%) for the race followed by Chinese (about 14%) and Indian (about 9%). Of the total, 45% respondents were doing Bachelor of Business Administration (Islamic Banking and Finance), and
26% were taking Bachelor of Entrepreneurship (Logistics & Distributive Trade). In terms of CGPA, the majority (46%) of the students in both faculties lay in between 2.51 and 3.00, which is considered the average performance. Twenty-seven per cent of the respondents had their CGPA between 3.01 and 3.50; 20% of them scored between 3.51 and 3.69. Only nine respondents (5%) were getting excellence results of 3.70 and above.

### Table 1. Profile of respondents.

| Gender  | N  | %  | Age | N  | %  | Race   | N  | %  |
|---------|----|----|-----|----|----|--------|----|----|
| Male    | 60 | 30 | 21  | 18 | 9  | Malay  | 154| 77 |
| Female  | 140| 70 | 22  | 78 | 38 | Chinese | 28 | 14 |
| Total   | 200| 100| 23  | 94 | 47 | Indian | 18 | 9  |
|         | 24 | 8  | Total| 200| 100|        |    |    |
|         | 25 | 2  |        |    |    |        |    |    |
| Program of Study | N  | %  | CGPA | N  | %  |
| BBA (Islamic Banking and Finance) - SAB | 90  | 45 | Below 2.50 | 4  | 2  |
| BE (Logistics & Distributive Trade) - SAL | 26  | 13 | 2.51–3.00 | 93 | 46 |
| BE (Commerce) - SAK | 20  | 10 | 3.01-3.50 | 54 | 27 |
| BE (Retailing) - SAR | 18  | 9  | 3.51-3.69 | 40 | 20 |
| BE (Hospitality) - SAH | 16  | 8  | 3.70 and above | 9  | 5  |
| BE (Tourism) - SAP | 16  | 8  | Total | 200| 100|
| BE (Wellness) - SAW | 14  | 7  |       |    |    |
| Total   | 200| 100|      |    |    |

*BBA – Bachelor of Business Administration
BE – Bachelor of Entrepreneurship

### 4.3 Test of Relationships

The direction and strength of two variables with a linear relationship is examined by using the correlation analysis (Pallant 2013). This analysis is widely used in research to study the relationship between all variables (independent, mediator and dependent). Table 2 presents the results that show positive and statistically significant correlations in all relationships between independent variables, mediator and the dependent variable. The results of the analysis show that infrastructure and pollution correlate significantly with the mediator of 0.589 and 0.619, respectively. The more students feel they have problems of water and sanitation systems, drainage and transportation, the more they
are not satisfied with the QoL. The other independent variable of hazard has a medium strength relationship with the mediator. In this study also, pollution has the strongest positive relationship with the dependent variable of academic performance. The bigger pollution the students face, the bigger the fall in academic performance they experience. The other two independent variables have moderate strength relationships with academic performance. The relationship between the mediator and the dependent variable is strong, positive and statistically significant at 0.573. This results supported the findings of previous studies (Farooqi and Fatima 2010; Hasan et al. 2010; Gilavand and Jamshidnezhad 2016).

The value of relationships between each independent variable should be 0.70 and below (Pallant 2013) to avoid multicollinearity. In the results presented here (Table 2), the highest correlation is 0.553 (less than 0.70) and thus all variables are retained in the study for further analysis.

**Table 2. Correlations.**

|                  | Total Infra | Total Pol | Total Hazard | Total Quality | Total AP |
|------------------|-------------|-----------|--------------|---------------|----------|
| **Total Infrastructure** | Pearson Correlation | 1 | .532** | .314** | .589** | .448** |
|                  | Sig. (2-tailed) | .000 | .000 | .000 | .000 | .000 |
|                  | N | 200 | 200 | 200 | 200 | 200 |
| **Total Pollution** | Pearson Correlation | .532** | 1 | .553** | .619** | .615** |
|                  | Sig. (2-tailed) | .000 | .000 | .000 | .000 | .000 |
|                  | N | 200 | 200 | 200 | 200 | 200 |
| **Total Hazard** | Pearson Correlation | .314** | .553** | 1 | .485** | .470** |
|                  | Sig. (2-tailed) | .000 | .000 | .000 | .000 | .000 |
|                  | N | 200 | 200 | 200 | 200 | 200 |
| **Total Quality of Life** | Pearson Correlation | .589** | .619** | .485** | 1 | .573** |
|                  | Sig. (2-tailed) | .000 | .000 | .000 | .000 | .000 |
|                  | N | 200 | 200 | 200 | 200 | 200 |
| **Total Academic Performance** | Pearson Correlation | .448** | .615** | .470** | .573** | 1 |
|                  | Sig. (2-tailed) | .000 | .000 | .000 | .000 | .000 |
|                  | N | 200 | 200 | 200 | 200 | 200 |

**. Correlation is significant at the 0.01 level (2-tailed).
4.4 Test of Internal Consistency

The Purification of Scale Process. The purification process (Table 3) is examining the score of corrected-item total correlation (CITC). The CITC specifies whether each item is belongs to the construct or not. A value of CITC score below 0.30 would indicate that the item is assessed differently from the scale as a whole (Pallant 2013). It shows a good indicator for internal consistency of items in the construct.

The reliability of a construct is examined by Cronbach’s alpha coefficient (α). It ensures consistent measurement across the various items in the instrument. This study is using an alpha score larger than 0.70 as suggested by Sekaran (2003). The results in Table 3 show that the values are all above 0.70 for good internal consistency except for hazard with only 0.668. However, this construct is still acceptable for further analysis because only the value below 0.60 is considered to be poor (Sekaran 2003).

This current study is to evaluate the impact of environmental factors on the academic performance of the final year students in the UMK city campus through the mediating effect of QoL. Figure 2 shows the results of multiple regressions. For the first hypothesis (H1) between access to infrastructure and services and QoL, the result is positive and statistically significant at p-value 0.01 (β = .357; t = 6.001). The beta path coefficient between pollution and healthy environment to QoL (H2) is also positive and statistically significant at p-value 0.01 (β = .320; t = 4.717). Another strong positive and significant result is between environmental hazard and QoL (H3) (β = 0.196; t = 3.250). The results also show a positive and a statistically significant relationship between QoL and academic performance (H4) at p-value 0.01 (β = 0.573; t = 9.837). This current study is supported the findings of previous studies (Diriba 2016; Sonmez and Akpinar, 2017; The Star 2020). All the three constructs having a positive and statistically significant relationship at p-value 0.01 to the mediator, they explained 53.3% of the QoL, the mediator in the study. The mediator helps to explain 32.8% of the academic performance of the students.

Even though the main conceptual model shows a strong support, however, it was applicable to run for an additional robustness statistical testing to test whether affecting environmental factors may influence the academic performance directly, without the mediating impact of QoL. The results of the sub-test model in Fig. 3 show that beta path coefficient between access to infrastructure and services and academic performance (H1a) is positive but statistically insignificant which is in contrast with findings from (Farooqi and Fatima 2010; Hasan et al. 2010; Gilavand and Jamshidnezhad 2016). However, the result of the H2a between pollution and healthy environment is positive and statistically significant to academic performance at p-value 0.01. This result is in line with previous studies (Mohai et al. 2011; Katherine et al. 2012). This current study is supported the studies by O’Flynn, Dinan and Kelly (2017) and Pietro (2018) when path originating from environmental hazards (H3a) to academic performance is positive and significant at p-value = 0.10. This sub-test model helps to explain 42.2% of academic performance.

5 Discussion

The current study observed the impact of three independent variables on student academic performance with mediating effect of QoL. The study conducted statistical tests
The main findings from this study are that: (1) access to infrastructure and services does not have a direct impact on academic performance; (2) pollution and healthy environment directly affect academic performance; (3) environmental hazard has a direct

| Items                          | CITC  | Cronbach’s Alpha |
|-------------------------------|-------|------------------|
| Infrastructure and Services   |       | 0.712            |
| Infrastructure 1              | .448  |                  |
| Infrastructure 2              | .489  |                  |
| Infrastructure 3              | .403  |                  |
| Infrastructure 4              | .577  |                  |
| Infrastructure 5              | .437  |                  |
| Pollution                     |       | 0.723            |
| Pollution 1                   | .516  |                  |
| Pollution 2                   | .434  |                  |
| Pollution 3                   | .511  |                  |
| Pollution 4                   | .463  |                  |
| Pollution 5                   | .505  |                  |
| Hazard                        |       | 0.668            |
| Hazard1                       | .460  |                  |
| Hazard2                       | .396  |                  |
| Hazard3                       | .364  |                  |
| Hazard4                       | .389  |                  |
| Hazard5                       | .525  |                  |
| Quality of Life               |       | 0.706            |
| Quality1                      | .470  |                  |
| Quality2                      | .453  |                  |
| Quality3                      | .517  |                  |
| Quality4                      | .395  |                  |
| Quality5                      | .491  |                  |
| Academic Performance          |       | 0.802            |
| AP1                           | .539  |                  |
| AP2                           | .525  |                  |
| AP3                           | .650  |                  |
| AP4                           | .615  |                  |
| AP5                           | .623  |                  |
impact on academic performance and (4) the effect of all the three independent variables on academic performance is fully mediated by QoL.
This study analysis indicates that QoL mediates the relationship between infrastructure and services and education performance. Many other studies (Farooqi and Fatima 2010; Hasan et al. 2010; Gilavand and Jamshidnezhad 2016; Grineski et al. 2016) have confirmed the direct effect of access to infrastructure and services on academic performance. However, the findings from this current study hint at the need for more extensive research on the relationship with the mediating role of QoL. In the main model, this factor is contributing the highest result that impacts QoL. Access to clean water and waste disposal management are two major issues obtained from the respondents. Besides that, around the UMK city campus area, the drainage system is not working properly. Inadequate drainage systems in the rainy season to deal with water flow, blocked by the discharge of solid waste into irrigation by irresponsible people, have been constructed below standard and have improper alignment of some drainage structures with respect to road alignment. Although access to environmental infrastructure and services does not directly affect academic performance, it is a significant factor that affects the QoL of students, which in turn affects their academic performance. As a student’s access to reasonable environmental infrastructure and services means that the student can live comfortably to achieve a better QoL. Serious attention should be given and continuous action should be taken to ensure that students gain access to the basic needs of environmental infrastructure and services. Thus, this study is very important for the university in order to provide a good environment to improve the QoL of students and direct the effectiveness of its education system in the future.

Pollution and healthy environment can directly impact academic performance and could also indirectly mediate through QoL to influence academic performance. The outcome of this study is in agreement with previous findings (Zakaria et al. 2011; Katherine et al. 2012; Keles 2012; Nepal 2016; Mohammed et al. 2017). This finding confirms the importance of a healthy environment in life and achievement of excellence academically. The city campus area is a public spot with lots of shops and a hypermarket within walking distance. The night market and morning market held weekly are just a minute’s walk from one of the UMK gates. Noise pollution and rubbish become quite critical from those activities. In addition, city campus is about 1 km from the main and only airport of the state of Kelantan. It is one of the busiest state airports in Malaysia. Noise pollution often occurs regardless of the time of day or night. The location of the city campus in the public focus area has given challenges to UMK to ensure a healthy environment for students. So far, all of these challenges have been well met by the UMK to ensure the best possible learning environment for the students, except for the noises from the airplanes of a nearby airport. In praiseworthy attitudes that have become the culture of the UMK’s students and staff that will hopefully be an example and be followed by the local community, the management of the UMK educates its citizens to practice positive attributes. These include maintaining cleanliness by dumping garbage in the right place, avoiding waste by buying only what is needed, prudently using electricity and water and maintaining the cleanliness of universities and public places. The UMK continues to pay attention to these issues as it is very significant and has a great impact on academic performance of students.

Environmental hazards have a positive and significant impact on QoL ($p = 0.01$). This factor also directly affects academic performance at $p = 0.10$, which is in line
with the findings from previous studies (O’Flynn et al. 2017; Nunoo et al. 2018). The environmental hazard from natural resources that often occurs on the UMK city campus is flooding. It is a natural phenomenon beyond human control. The monsoon rains at the end of the year often cause floods. The UMK has taken action by installing water suction motors to accelerate the abundant rainwater that is drained into a nearby creek. However, if the rain is too heavy and prolonged, floods still occur when the water from the river overflows.

In terms of environmental hazards from human resources, in this relatively crowded city campus, the main problem is traffic congestion during peak hours in the early morning when the public goes to work and students go to school or university and in the evening when going home. Excessive amounts of traffic cause uncontrolled air pollution. To reduce the use of private vehicles, students are not encouraged to bring private vehicles, instead using buses provided by the UMK or sharing vehicles and city campus controls traffic congestion at major entrances to campus and hostels by limiting parking areas and placing guards to ensure the safety of students and staff in the campus. The rows of shops and a hypermarket that are very close make it easy for students and staff to get necessities on foot. This avoids the use of motor vehicles that cause environmental hazards.

The three independent variables in this study were positive and significantly impacted QoL at $p = 0.01$. These three factors also explain 50.3% of QoL, which mediates those factors to academic performance. QoL in this study explains 32.8% of academic performance. For UMK city campus students, QoL is very important to them in facing life as a student and at the same time facing the challenges of living in the midst of a very close local community. When the sub-test was performed by looking at the direct impact of the three independent variables on academic performance, only pollution and healthy environment had a strong result with positive and significant effect at $p = 0.01$. This showed that pollution played a major impact in the life of the UMK city campus students. Although in this sub-test access to environmental infrastructure and services is not significant on academic performance, overall this model has an impact of 42.2% on academic performance. Thus, the UMK and other academic institutions should give serious attention to the findings of this study that have highlighted the importance of environmental factors and QoL in influencing students’ academic performance.

Looking at the results of the CGPA of the respondents in the study, the majority (46%) of them were at an average performance, with 20% of them scoring in between 3.51 and 3.69 and only 5% getting an excellent result of 3.70 and above. If more attention is given to the factors that affect QoL of the students, it is believe that the academic performance of the students could be achieved at a better level, apart from other factors that may also influence their academic performance.

The university needs to instil awareness among its citizens about the importance of maintaining cleanliness and minimising environmental pollution. Universities can also educate the public by promoting this awareness. The university can be a catalyst for environmental care with talk sessions, providing on-going information on the effects of environmental pollution, communal works and so on. The university also needs to improve the facilities in the classroom, such as airtight space in the classes, to minimise noise from nearby airports, improve quality and quantity of water for student use in
dormitories, receive and provide appropriate feedback and take necessary actions to student complaints related to their QoL on campus.

6 Limitations, Future Research and Conclusions

This study has unavoidable limitations among which is reporting bias. Respondents may provide inaccurate information, reporting a better status to give good impressions to the UMK, or provide worse conditions to attract the UMK to their problems. The survey questionnaire was pre-tested; however, there may be questions that could not be clearly understood by all respondents, there may also be questions and answers that contradict each other. Respondents are only final year students, it may be better if all students regardless of year of study are given the opportunity to share their opinions on the issues in this study. Also, this study only tested the impact of one mediating variable. Other variables may intervene and mediate the relationship of environmental factors and academic performance. Future studies with larger sample sizes can confirm the finding of this study by looking at other ranges of mediating variables.

Despite its limitations, this study contributes to the findings regarding the effect of environmental factors on academic performance at higher learning institutions, especially in the Malaysia context. So, it is imperative to have this study particularly for students at the Universiti Malaysia Kelantan City Campus.

There are several implications resulted from the findings of the study. Pollution and healthy environment are the main factor to directly affect academic performance. It also significantly impacts the QoL. These factors influencing student life which ultimately affects academic performance (Katherine et al. 2012; Keles 2012; Jordanova et al. 2015). Therefore, maintaining a healthy environment and avoiding environmental pollution is important in the life of a student in particular, and society, in general. Environmental hazard also has a direct impact on academic performance and QoL. Environmental hazards related to student life at the UMK city campus are frequent floods in the monsoon season. Each time the monsoon season arrives, student activities are disrupted and life becomes more difficult (O’Flynn et al. 2017). In addition to floods, environmental pollution from heavy traffics affects student’s health. This eventually affects the academic performance of the students (Pietro 2018). Access to infrastructure and services does not have a direct impact on academic performance. It however, significantly affects QoL of the students. Therefore, it is also an important factor that affect students’ life.

Students are future leaders. They are the hope of family and country. They spend almost four years of their lives as students at higher learning institutions. The QoL during their campus life is vital in influencing their academic performance. Therefore, higher learning institutions need to pay attention by looking at the factors that affect them. Although UMK has done its best to ensure that the needs of students are always met, the UMK and other higher learning institutions need to pay attention to environmental factors in this study to improve the QoL and academic performance of students.

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