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August 14-15, 2020
Penang, Malaysia

Academic Collaborator



Editors:

R. C. Singh, Rohit Khokher, Rajendra Kumar

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on
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The Society for Research Development (SRD)

After long deliberations, it was decided by a group of academicians and philanthropists to establish the Society for Research Development in 2015. A draft of the constitution was framed in consultation with the founder members, to enroll members and to get the Society registered. During the first meeting, Prof. (Dr.) R C Singh was elected unanimously as President of the Society. The first event of the Society was International Conference on Science, Technology, Humanities and Business Management (ICSTHBM-16) in Bangkok, Thailand on 29-30 July 2016. The Proceedings of this Conference was published with McGraw Hill Education, India. The Society organized its second international conference on the topic International Conference on Recent Developments in Science, Technology, Humanities and Management (ICRDSTHM-17) on 28-29 April 2017 in Kuala Lumpur, Malaysia. The third international conference organized by society was on the topic International Conference on Recent Trends in Science, Technology, Management and Social Development (ICRTSTMSD-18) in Bali, Indonesia on 04-05 August 2018. The fourth international conference organized by society was on the topic 4th International Conference on Management, Engineering, Science, Social Science and Humanities (*i*Con-MESSSH'19) in Phuket, Thailand on 26-27 July 2019.

With great success and huge response from the participants, this year the Society is organizing the fifth International Conference on Management, Engineering, Science, Social Science and Humanities (*i*Con-MESSSH'20) in Penang, Malaysia on 26-27 July 2019.

The objective of the Society is Scientific, Technical, Managerial, Literary, and Educational in nature. The Society strives to advance the theory, practice, and application of Science, Technology, Social Sciences, Humanities, Education and Management and maintains a high professional standing among its members. The basic purpose of the Society is to bring together academicians and experts from different parts of the country and abroad to exchange the knowledge and ideas at a common platform by organizing National and International Conferences, Seminars and Workshops that unite the Science, Social Sciences, Language, Emerging Technologies, Management, Financial Engineering, Humanities, Literary, Cultural, Education and topics which are not mentioned here for the empowerment of research and development. The Society promotes the original, innovative ideas for betterment of the world and seeks to propagate the results of the interdisciplinary field across research communities and to the general public.

To know more about the activities and forthcoming events of the Society, the readers are advised to visit the official home page of the Society (<http://socrd.org>).

Prof. Rajendra Kumar
Vice President

PREFACE

We are very pleased to introduce the proceedings of the 5th International Conference on Management, Engineering, Science, Social Science and Humanities (*i*Con-MESSSH'20), held in Penang, Malaysia during 14-15 August 2020. This volume of proceedings from the conference provides an opportunity for readers to engage with a selection of refereed abstracts along with invited talks that were presented during *i*Con-MESSSH'20.

Out of 95 papers submitted for publication, 46 have been selected in this proceeding after two-tier peer review. The conference received a huge response and the researchers from USA, Philippines, Nigeria, Bangladesh, Oman, India, Indonesia, Malaysia, China, Uzbekistan, Korea, Thailand, Australia, Japan, etc. who submitted and presented their papers in the conference. Based on the subject matter of the selected papers, we have divided them into three parts: Part A contains the papers related to **Science, Technology, Engineering, Arts and Mathematics (STEAM)** by national and international experts who have made valuable contributions in their fields of research; Part B comprises papers related to **Educational Technologies** by experts and researchers who made valuable contributions in their fields of research; and Part C comprises of the papers related to **Management and Humanities** by scholars who are actively engaged in the areas of their research interests at national and international level.

Keynote address was delivered by Dr. Chong Hon Yew, the president of Astronomical Society of Penang on topic "Bringing Universe Appreciation, Astronomy Fun and Astronomy Career Prospects to Astronomy Enthusiasts" in the inaugural session of the conference. Best paper awards were given in each and every session judged by concerned Co-Chair. The presented papers will be published in reputed Scopus indexed journals as special issues.

One of the unique and valuable dimensions to the *i*Con-MESSSH'20 was the way the conference brought educators together from around the globe to discuss ways to serve learners better. All in all, the *i*Con-MESSSH'20 was very successful on digital platform. The deliberations provided a better understanding of the development in science, technology, management and humanities, making it possible for non-experts in a given area to gain insight into new areas. Also, included among the speakers were several young scientists, namely, postdocs and students, who brought new perspectives to their fields. Society for Research Development is continuously striving to join hands with different organizations and universities for academic collaborations. This year (2020) SRD society has signed Memorandum of Agreement with SEAMEO, RECSAM, Penang, Malaysia for joint organizing of events for next five years.

We would like to thank all participants for their contributions to the Conference and for their contributions to this proceeding. We take this opportunity to thank the efforts of all the reviewers whose efforts enabled us to achieve a high scientific standard in this proceeding. We also thank the members of the Technical Committee for extending their help and co-operation from time to time in organizing this conference. The success of this conference means that planning can now proceed with confidence for the next event. We would also like to thank all the Co-Chairs and invited speakers for their support and hard work to make this conference a huge success.

R. C. Singh
Rohit Khokher
Rajendra Kumar

Keynote Address

Keynote Address

Bringing Universe Appreciation, Astronomy Fun and Astronomy Career Prospects to Astronomy Enthusiasts

Dr. Chong Hon Yew

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Abstract: The last apparition of Halley's Comet in the Malaysian skies in 1986/87 has reignited tremendous interest in astronomy especially its practical aspects in Penang and all over Malaysia. Since 1986, members of the Astronomy Club of University of Science Malaysia have been busy bringing the joys and fun of astronomy to kindergartens, primary and secondary schools, international schools, colleges, universities, government departments, non-governmental organizations, multinational companies, large shopping complexes all over Malaysia. I was the advisor of this very active astronomy club. In 2015, I retired from the university and the Astronomical Society of Penang was formed and I became the president of this society. Many of our events have attracted thousands of students, teachers and members of the public. Our activities include stargazing and sungazing sessions, special events to observe solar and lunar eclipses, meteor showers, lunar occultations, etc., astronomy courses for teachers and students, mobile planetarium shows, amateur telescope making workshops, astrophotography workshops, astronomy module writing workshops for teachers, Largest Star Party in Malaysia with 138 telescopes in 2005, spectroheliograph making workshops, promotion of Astro-Tourism in dark-sky locations, making radio telescopes for schools and setting up astronomy clubs in schools. Due to our efforts, currently we have nine (9) astronomical observatories in Penang, the most in any state in Malaysia. Many young Malaysians have approached us throughout the years expressing their interest to pursue their future careers to become astrophysicists, cosmologists, astrobiologists, exoplanet hunters, doctors in space medicine, radio astronomers, etc. In 2019, the astronomy community in Malaysia planned to hold the "Global Malaysian Astronomers Convention 2020 (GMAC2020). Because of the Covid-19 situation, this major astronomy event has been postponed to 2021, For this event in 2021, many Malaysians who have PhD degrees in astronomy and who are residing in Malaysia or overseas will be gathering in Kuala Lumpur, Penang and other cities in Malaysia to hold a conference and road shows to meet the Malaysian people to share their current research findings. Indeed we can say that progress in astronomy has come of age in Malaysia.

1. Background of Astronomy Activities in Penang

In 1986 the Astronomy Club of University of Science Malaysia in Penang was formed and since then we have conducted many activities in Penang and in many other states in the country. Since 1986 until I retired from the university in 2015, I have been the advisor to this club. This very active astronomy club had conducted weekly activities in primary and secondary schools, kindergartens, matriculation colleges, teachers' training colleges, private colleges, government departments, non-governmental organizations, multinational companies, shopping complexes and public areas in Penang and all other states in Malaysia. I also taught astronomy courses and conducted research in this field in the university. In 2015, I retired from the university and the Astronomical Society of Penang was formed and I became the president of this society Over the years we have accumulated a lot of expertise in promoting astronomy and space education especially the practical aspects for the students, teachers and members of the public. We have developed a good networking with many of the astronomy clubs and organizations in Penang and Malaysia and neighbouring countries. Many of our events held in Penang and other parts of Malaysia have attracted thousands of astronomy enthusiasts from Malaysia and neighbouring countries.

2. Seeing is Believing, Doing is Fun, Open Your Hearts to the Universe

As of today, the interest in astronomy and space education amongst the students, teachers and members of the public is tremendous. Everywhere we go, the school population and members of the public in large towns and small villages are very eager and enthusiastic to learn everything they can about the amazing celestial objects and wonderful phenomena that can occur in the universe. The following are some of the regular activities carried out by us both in Penang and other parts of the Malaysia:

- (1) Weekly star-gazing sessions that are open to students, teachers and members of the public.
- (2) Public talks
- (3) Regular guided tours of PIXO (Penang's 9th Observatory) and Lim Choon Kiat Observatory in Penang.
- (4) Planetarium shows with the mobile STARLAB planetarium
- (5) Observation of special events such as solar and lunar eclipses, lunar occultations, meteor showers, comets, 2004 and 2012 Venus transits, planetary conjunctions, etc. Some of these special events have attracted thousands of astronomy enthusiasts.
- (6) Telescope making classes. Since 1986, we have shown many astronomy clubs of schools from all over the country to make fifty six (56) Dobsonian Newtonian Telescopes. These telescopes are completely home-made from easily available local materials and each telescope cost only RM100 to make.
- (7) Astronomy courses for students, teachers and members of the public.
- (8) Astrophotography workshops for astronomy enthusiasts.
- (9) Astronomy module writing workshops for teachers.
- (10) Water-rocket workshops and competitions in schools.
- (11) Spectrohelioscope workshops.
- (12) Talks in schools on careers in astronomy and space related industries.
- (13) Promotion of radio astronomy (Radio JOVE) in schools colleges.
- (14) Promotion of Astronomical Spectroscopy in schools and colleges.
- (15) Promotion of Variable Star Astronomy in schools and colleges.
- (16) Promotion of astro-tourism to many dark sites in the country, both in Peninsular Malaysia and in Sabah and Sarawak.
- (17) Telescope clinics where we show astronomy enthusiasts on how to use and maintain telescopes in good working order.
- (18) Astro-tourism and astrophotography visits to dark-sky locations in Malaysia.
- (19) Organized the annual "National Astronomy Convention" in University of Science Malaysia.
- (20) Organized the "Largest Star-Party in Malaysia 2005" in University of Science Malaysia with 138 telescopes and 5,000 people present.
- (21) Organized the annual "Astrophotography Contest" for Malaysians to produce the Annual Desk Calendar of the Astronomical Society of Penang.
- (22) Encouraging schools in Penang to form their astronomy clubs and to build their own observatories. Currently, we have nine (9) astronomical observatories in Penang, the most in any state in Malaysia.
- (23) Since 2013, we have led groups of Malaysian students to participate in the International Astronomy Olympiads (IAO) and International Olympiads on Astronomy and Astrophysics (IOAA).

3. PIXO (Penang's 9th Observatory)

More and more schools and organizations in Penang are keen to build their own astronomical observatories. Currently we have nine (9) observatories in Penang with the latest one being PIXO (Penang's 9th Observatory), being situated in Tech Dome Penang, the popular public science centre of George Town, Penang. Tech Dome Penang was formed by the Penang State Government in 2016. During the weekends and public holidays many families with children from Penang and other states in Malaysia will visit this science centre with its many interactive exhibits in science, engineering, technology and medicine. Many of the visitors will also make tours of

PIXO Observatory. These observatory tours are conducted by members of the Astronomical Society of Penang. PIXO Observatory has the biggest and best telescopes in Penang. The main telescope is the 16-inch OFFICINA STELLARE Ritchey-Chrétien Telescope on a PARAMOUNT MEII Mount for observation, astrophotography and data collection of the Moon, planets, star clusters, nebulae, galaxies and many amazing celestial objects. With the 6-inch LUNT Hydrogen-Alpha Telescope we can capture live many of the solar activity of the Sun during daytime including the solar prominences expanding out from limb of the Sun. The 5-inch SKYWATCHER Telescope allows us to observe and capture in great detail the sunspots that occasionally appear on the Sun's disk. Many visitors to PIXO are astonished to see through these telescopes with their own eyes the sunspots, prominences, Moon, Venus, Saturn and Jupiter during daytime. They are also pleasantly surprised to know that this observatory is in a public science centre which is surrounded by large shopping complexes. Many of the visitors to PIXO Observatory including large groups of school children will also spend time at night in the observatory to observe the Moon, planets and many beautiful Deep-Sky Objects. If the sky at night is clear above PIXO Observatory, there is no end to the excitement for the visitors as they go from telescope to telescope to observe the Moon, planets and many beautiful celestial objects and at the same time snapping pictures of these objects with their mobile phones and cameras. Members of the Astronomical Society of Penang, school students and university students are also using the telescopes in PIXO Observatory to collect data for their astronomy projects in their schools and universities. Indeed with the excellent facilities in PIXO Observatory which is available to the people of Penang, the awareness and progress in astronomy in Penang has been brought to a higher level as compared to other places in Malaysia.

4. Astro-Tourism

We have been promoting many astro-tourism activities in Malaysia and neighbouring countries since 1986. These activities have attracted a tremendous response from astronomy enthusiasts, teachers, students and members of the public. Many of the well-known dark-sky tourist locations in Malaysia present good prospects for astro-tourism. For example, the night skies in Langkawi, Kelantan, Terengganu, Pahang, Sarawak and Sabah can be very clear and dark and many of the amazing celestial objects can be visible to the naked eye and suitable for the exciting field of astrophotography. The many activities that we have conducted in hotels and tourist locations include star-gazing sessions, astronomy courses for teachers, students and members of the public, astrophotography workshops, planetarium shows and many talks on the latest discoveries in astronomy and space exploration. Special events to observe lunar eclipses, meteor showers, lunar occultations of planets, comets, etc., have also been conducted and these events have also attracted a large audience. Since 2005, the "National Astronomy Conventions" have been held annually in University of Science Malaysia in Penang. These annual major events have attracted thousands of astro-tourists from all over Malaysia and neighbouring countries to take part in the many exciting events that were held during the conventions and at the same time getting to know better many of the other astronomy enthusiasts. Over the years, we have conducted many scientific expeditions to observe total and annular solar eclipses and rare astronomical phenomena in China, Australia, Thailand, Myanmar, Maldives and Indonesia. Astro-tourism is getting popular and it is not hard to see why – there is nothing more magical and amazing than to see with one's own eyes the stars, constellations, planets, and meteors and the Milky Way in a dark tourist location. Through a telescope one can also see star clusters, nebulae, galaxies, globular clusters and Messier Objects. After gazing at these beautiful objects one can also be surprised to know that our own planet Earth was created from the gas and dust that were ejected from earlier generations of stars that perished.

We have conducted astronomy activities in some of the hotels in Penang and Langkawi Island. During nighttime the hotel guests were shown how to use star-charts and almanacs to observe the stars and constellations. By using telescopes, they can also see with their own eyes many of the amazing celestial objects. Even during daytime they can see sunspots and solar flares with telescopes specially equipped with solar filters. An added attraction for astronomy enthusiasts in Malaysia is that we can see most of the 88 constellations that exist in the night sky including those in the northern and southern hemispheres

5. Proposal to make Balik Pulau in Penang to be the “Astronomy Town of Malaysia”

We are inspired by the agricultural town of Saadat Shahr in Iran which is well-known in the world as the “Astronomy Town of Iran”. The people of this town are fascinated by astronomy and stargazing. Women in the town has sold their jewelry, men have given part of their salary in order buy telescopes and build an observatory. During important astronomy events, the electricity supply to the town is cut off in order for the residents to enjoy the amazing spectacles in the night sky. Indeed many astronomy enthusiasts from around the world have visited this town and have captured wonderful pictures of the Milky Way Galaxy and many celestial objects. Following in the footsteps of Saadat Shahr, we intend to make Balik Pulau, a small town on the western coast of Penang Island to become the “Astronomy Town of Malaysia”. Applications for the funding of this project have been made to several governmental agencies. The duration of this project would be two years with real knowledge transfer that helps the community of Balik Pulau and also its education system. Members of the Astronomical Society of Penang with the collaboration of the astronomy community in Malaysia can go regularly to the community’s primary and secondary schools, colleges, residential areas, villages, fisherman villages and public places to give talks, conduct solar observation sessions, star-gazing sessions and planetarium shows. There would also be exhibitions of astrophotographs captured in the many dark sites in Balik Pulau by Malaysian astrophotographers. Many astronomy courses for school teachers, students and members of the public can be conducted. These courses mainly involve hands-on activities such as how to use star-charts, almanacs and how to set up and use telescopes to record beautiful astronomical images with digital cameras. Special events such as meteor showers, lunar eclipses and comet apparitions will be held in public areas. At the end of the second year, a large star-party will be held where everyone in Balik Pulau and the state of Penang will be invited to attend. Many of the astronomy outreach activities that were carried out by us were held in cities and large towns. By adopting a small town in Penang with schools and residents, it is possible to share our experience and expertise with these people from a simple to intermediate to advanced levels. It would create awareness and appreciation of the wonders of the universe in everyone in this community.

6. GMAC 2021

More and more Malaysians are keen to pursue an academic career in astronomy. Many Malaysians have obtained their PhD’s in astronomy and astrophysics in Malaysian universities and universities in the United States, Europe and Australia. Malaysian researchers have also joined collaborative international efforts to make recent important discoveries of gravitational waves (LIGO Project) and capturing the “First Image of a Black Hole (Event Horizon Telescope)” in the centre of the supergiant galaxy Messier Object 87. In 2019, the astronomy community in Malaysia got together and proposed to hold the “Global Malaysian Astronomy Convention 2020 (GMAC 2020)”. This major event was planned to be held in Kuala Lumpur and other major cities in Malaysia. Malaysian professional astronomers who are residing in countries around the world would return to Malaysia in March 2020 to join astronomers in Malaysia in a conference to share the results of their astronomical research. These astronomers will also give talks and have meet the people sessions in Kuala Lumpur and other major cities. The event was expected to have a great impact on the Malaysian people, especially many young Malaysians who are very curious to learn about astronomy but are not aware that many Malaysian professional astronomers exist. The large community of Malaysian amateur astronomers will also be involved in this event. However, due to the Covid-19 situation, this event has been postponed to 2021 and the astronomy community of Malaysia is anxiously waiting to participate in the “Global Malaysian Astronomy Convention 2021 (GMAC 2021)”

7. Astronomy for Everyone and in Every Aspect

Throughout the many years of our astronomy outreach activities in Penang and in Malaysia, in the large cities, small towns and remote aboriginal settlements, we could see in the eyes of the participants from the kids to parents and grand parents their excitement and wonder after gazing through our telescopes at the wonderful

objects of the Solar System and beyond. And we always get unending questions from them on: What is a black hole? How did the Earth and Moon formed? Which exoplanet can harbour life, if not intelligent life? I want to buy a telescope, can you advise me? etc., etc. etc. Many people have come to realize that whatever has happened to them in their everyday lives on Earth is not the whole picture. By using a telescope to gaze at the Moon craters, planets and uncountable celestial objects outside the Earth, they know that Earth is only a tiny part of the picture, the grand picture involves the Solar System, Milky Way Galaxy, galaxy clusters and galaxies at the edge of the visible universe as captured by the Hubble Space Telescope. The universe was created in a Big Bang 13.8 billion years ago and is still expanding furiously to meet its ultimate end in the Big Rip many years from now. Indeed many of these people come to know of mankind's place in the universe and that every object in the universe is somehow intimately connected to all other objects in the universe. And astronomy is related to many aspects of our daily lives. We give here two examples. Without the astronomical invention called the clock, we could not tell the exact time for our daily activities. Without the fleet of satellites in the Global Positioning System (GPS), we will be unable to know our exact location on the Earth's surface. Throughout history, astronomy has influenced the work of artists and poets. The discoveries of more than four thousand (4,000) exoplanets in the Milky Way Galaxy, many of them similar to Earth, has made many radio astronomers on Earth pointing their large telescopes at some of these exoplanets and listening to them day after day and perhaps soon be able to detect intelligent signals from extra-terrestrial civilizations on these exoplanets. The question of how life first appeared on Earth is not closed. In 1974, two British astronomers, Fred Hoyle and Chandra Wickramasinghe proposed the Panspermia Hypothesis.

Scientists have discovered organic material in meteorites and space dust that fell on the Earth and in comets. According to this hypothesis, life on Earth did not originate on the Earth but instead came from outer space! In the 4.6 billion years since the formation of the Earth many life forms including bacteria and viruses enter the Earth's atmosphere and fell onto the Earth's surface and oceans. These extra-terrestrial life forms later evolved into more advanced life forms that are currently found on Earth, These two astronomers further state that these extra-terrestrial life forms continue to fall onto the Earth that can give rise to epidemic outbreaks and new diseases.

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Invited Talks

Environmental Innovations

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1. An Overview

Global Warming due to greenhouse gas emission has been dramatically affecting human society and safety. Among its many harmful effects include the following: rising atmospheric temperatures, rising sea levels, changes in precipitation patterns, more droughts and heatwaves, and stronger hurricanes (Nasa, *The Effects of Climate Change*). The changes brought by this phenomenon will remain persistent unless collective action is taken. People should become more conscious of their actions and their subsequent effects-- or else humanity faces the danger of exacerbating the already degrading environment. Thus, stopping the irreversible environmental tragedy (and the possibility of human extinction) from happening should become an urgent priority for everybody if Earth and its people were to be saved from the repercussions of climate change.

Stewards of creation is tasked with safeguarding the environment and its creatures. Featuring citizens' environmental awareness and innovation of policies in any field or industry is the only way to attain a green environment and the only path to attain sustainable development. Developing awareness is essential for the movement towards sustainability. Humanity starts fixing the problems that they aggravated by starting to reach out to colleagues, family, and friends, then subsequently promoting a change of lifestyle among them (Pachamama Alliance, *Environmental Awareness*). The start of advocacy begins among households where sustainability practices are practiced in the smallest units of society: family.

2. Current Trends on Environmental Innovations

Almost everyone uses a computer or a personal device like a cell phone because of its availability in markets. Paper filing and data storage has been upgraded, subsequently saving trees in the process. Today, physical copies of documents have become less common. Companies have been switching to a paperless system of recording. Papers are not used as much as before, as modern technology developed computers to have the capacity to store huge chunks of data and to have an organized filing system. Retrieval of data is easier in this system because rummaging through different cabinets to look for certain data is no longer necessary. Sharing data is easier since it could be done instantly-- in a click of the "share" button. Furthermore, storing data in computers allows better office space management because storage space is no longer necessary (Mariz, *The Advantages of Digital Storage Devices for Businesses*).

Indeed, technology has revolutionized the way humans have forged their systems of data management. It has also paved the way for businesses to create smooth transactions with clients regardless of their location. Technology also began to attach to the lifestyle of people, from studying to watching shows online.

3. Current Issues and Challenges on Environmental Innovations

With the COVID-19 pandemic on the loose, companies began to rethink their business models. Many organizations were forced to adapt too quickly to address the disruptions of business operations. Other businesses have already failed to keep up with the trend of digitization because this change is overwhelming for them; they do not have the capability to adjust to the online environment. Some businesses remained resistant to this change, as they were used to the usual set-up of having workers physically around office space. Other businesses that cater to personal services like salons face a difficulty of continuing their operations as the contact between the employee and customer is high, thus posing a high risk of spreading the virus. As a result, many people have been displaced and lost their jobs.

Most countries in the world face a new set-up in place of their normal routines. Online learning, work from home, and virtual events, were among the changes implemented to prevent the spread of the virus (Marr, *How the COVID-19 Pandemic is Fast-Tracking Digital Transformation in Companies*). Groceries are also among those businesses that are making presence on the online market. Even doctor's consultations can be made through video conferencing to encourage people to stay indoors. All are creative ways to keep business operations running, yet these will only remain as temporary solutions. Many countries in the world, especially third world countries, face the issue of unstable internet connection. The underdeveloped sector of technology in these countries faces a tremendous amount of pressure to upgrade their services even when they are underprepared. Now, this big question remains: how can countries with limited resources keep their economies from collapsing?

4. Future Scope of Environmental Innovations

The COVID-19 pandemic may have been a major disruption to many businesses, but it allowed people to think innovatively. This pandemic paved way to groundbreaking improvements in the technological sector. As technology continues to progress, people will look back at this period, branding it not only as a time of suffering, but of flourishing: in the world of Application Development, Website Development, and also in the rising fields of Augmented Reality (AR), Virtual Reality (VR), and soon enough-- Artificial Intelligence (AI).

AI will dominate the world of business, but not in the immediate future as it is in its early incubation periods. When AI comes to its peak stages, most tasks will be automated, and manual labor will be obsolete (Ra, *The Rise of Technology and Impact on Skills*). There is the big possibility of jobs being replaced by AI because they are faster and more efficient than humans. Many people remain pessimistic as they bear the dilemma of losing jobs in the future, but little do they know that the development of technology also paves way to a new subset of jobs. On the other hand, people should not be too optimistic with technology as there is a long road ahead before achieving this *peak* of technology. Nonetheless, humans should bear in mind that technology possesses the potential to resolve the current world crises that everybody is experiencing. Then just maybe, the future is promising after all - despite the damage humanity left on the environment.

Now, it is up to every individual to work to keep this world running. Research on these will be useful and timely as well as challenging to all of us.

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Structural Equation Modeling (SEM) Approach in Educational and Psychological Research

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1. An Overview

Statistical analysis is an important research skill that needs to be acquired by quantitative researchers. In fact, statistical analysis supported by user-friendly software makes the analysis process more efficient and cost-effective. On the other hand, the increasing reliance on and acceptance of statistical analysis, as well as the advent of powerful computer systems that allow for handling large amounts of data, paved the way for the development of more advanced next-generation analysis techniques (Hair, Hult, Ringle, & Sarstedt, 2017). This session focuses on the use of second-generation statistical analysis technique, Structural Equation Modeling (SEM) approach (i.e., Partial Least Squares Structural Equation Modeling, PLS-SEM and Covariance-based Structural Equation Modeling, CB-SEM) in educational and psychological research.

2. Current Issues and Challenges of Statistical Analysis in Educational and Psychological Research

The statistical methods often used by social scientists (educationists and psychologists) are typically called first-generation techniques. These techniques include regression-based approaches (multiple regression, logistic regression, analysis of variance, and confirmatory factor analysis, CFA) and techniques such as exploratory factor analysis (EFA), cluster analysis, and multidimensional scaling. When applied to a research problem in education or psychology, these methods can be used to either confirm a priori established theory or identify data patterns and relationships. Specifically, these techniques are called 'confirmatory' when the researchers are testing the hypotheses of existing theories and concepts. The techniques are called 'exploratory' when the researchers are searching for latent patterns in the data in case there is no or only little prior knowledge on how the variables are related. However, it is worth to note that the distinction between confirmatory and exploratory is not always as clear-cut as it seems. Hence, for the past 20 years, many quantitative researchers have increasingly been turning to second-generation techniques (namely PLS-SEM and CB-SEM) to overcome the weaknesses of first-generation techniques.

3. Current Trends of Statistical Analysis in Educational and Psychological Research

What is Structural Equation Modeling (SEM)?

Structural Equation Modeling (SEM) is a second-generation data analysis technique commonly used in research related to sociology, psychology, and other social sciences. This analytical tool is rapidly growing in popularity due to its ability to overcome the weaknesses of first-generation methods preliminary in account for the measurement error in observed variables (Chin, 1998). SEM is a powerful multivariate analysis technique used to analyse structural relationships for a hypothesised model. In relation to this, multivariate analysis involves the application of statistical methods that simultaneously analyse multiple variables. The variables typically represent measurements. The measurements are often obtained from surveys or observations that are used to collect primary data, but they may also be obtained from databases consisting of secondary data.

SEM includes a diverse set of mathematical models which combine confirmatory factor analysis, path analysis, partial least squares path modeling, and latent growth modeling. According to Ullman and Bentler (2013), when examine the relationships among constructs, the relationships are free from measurement error because the error has been estimated and removed. Other than that, SEM is a robust statistical method as it confirms existing theories and concepts by testing the hypotheses. SEM is also capable in exploring new structural model by searching for patterns in the data although there is inadequate prior knowledge on how the variables are related.

SEM approach has been adopted to measure the multivariate relationship hypothesised in a structural model. According to Ullman and Bentler (2013), SEM is a collection of statistical technique that allows a set of multivariate relationships to be examined. It is referred to as causal modeling, causal analysis, simultaneous equation modeling, analysis of covariance structure, path analysis or confirmatory factor analysis. SEM is capable in modeling the latent variables by taking various forms of measurement error into account as well as to explore or confirm theory (Henseler, 2017). This approach has increased in popularity among researchers as it overcomes the weaknesses of using multiple regression analysis as the first-generation statistical method in measuring the interrelations between constructs. In conclusion, SEM enables researchers to incorporate unobservable variables measured indirectly by indicator variables and facilitates accounting for measurement error in observed variables.

PLS-SEM versus CB-SEM

Structural Equation Modeling (SEM) is among the most useful advanced statistical analysis techniques that have emerged in the social sciences in recent decades. SEM is a class of multivariate techniques that combine aspects of factor analysis and regression, enabling the researcher to simultaneously examine relationships among measured variables and latent variables as well as between latent variables. There are two types of SEM approaches, namely Covariance-based SEM (CB-SEM) and Partial Least Squares SEM (PLS-SEM) (Hair et al., 2017). CB-SEM is primarily used to confirm (or reject) theories (i.e., a set of systematic relationships between multiple variables that can be tested empirically). It does this by determining how well a hypothesized theoretical model can estimate the covariance matrix for a sample data set. CB-SEM also estimates model parameters by minimizing the discrepancy between the estimated and sample covariance matrices.

In contrast, PLS-SEM (PLS path modeling) emphasises on prediction and is primarily used to develop theories in exploratory research. It does this by focusing on explaining the variance in the endogenous construct when examining the model. PLS-SEM maximizes the explained variance of the endogenous construct by estimating partial model relationships. Besides, PLS-SEM is a soft modeling approach with criteria that are less stringent as compared to CB-SEM, e.g., it has no assumption towards the data distribution. However, CB-SEM requires the data to be normally distributed (Wong, 2013).

Both SEM approaches are precise in measuring interrelation among the latent constructs, however the research context will determine which approach is appropriately used. In other words, each approach is appropriate for a different research context, and researchers need to understand the differences in order to apply the method correctly. To answer the question of when to use PLS-SEM versus CB-SEM, researchers should focus on the characteristics and objectives that distinguish the two methods. In situations where theory is less developed, researchers should consider the use of PLS-SEM as an alternative approach to CB-SEM. This is particularly true if the primary objective of applying structural modeling is prediction and explanation of targeted endogenous constructs. Hence, researchers need to apply the SEM technique that best suits their research objective, data characteristics, and model setup.

PLS-SEM is an Ordinary Least Squares (OLS) regression-based estimation technique that focuses on the prediction of a specific set of hypothesised relationships and maximizes the explained variance in the endogenous variables. One of the reasons for choosing PLS-SEM approach is it reduces the measurement error (i.e., the difference

between the true value of a variable and the value obtained by a measurement) of a structural model. The measurement error includes poorly worded items in the questionnaire, misunderstanding towards the scaling approach, and wrong application of a statistical technique.

According to Hair et al. (2017), the PLS-SEM is primarily used to develop theories in exploratory research where there is a constrain in previous knowledge regarding the structural model relationships or measurement characteristics of the constructs. Furthermore, Memon, Ting, Ramayah, Chuah, and Cheah (2017) also suggested that PLS-SEM is suitable for research with primary focus to predict and explain the key target constructs. Although the hypothesised structural model is complex with many reflective measurement items, Hair et al. (2017) claimed that model complexity is generally not an issue for PLS-SEM approach as long as the sample size meets the minimum requirements. In contrast, estimation of complex models with many latent constructs and items is often impossible with CB-SEM. Furthermore, PLS-SEM also benefits from high efficiency in parameter estimation and has greater statistical power. It can administer complex models with many structural model relations as well as easily incorporate reflective and formative measurement models. Moreover, PLS-SEM is a suitable analytical method for models with many constructs and items (Hair et al., 2017). Becker, Hai, and Rigdon (2013) also claimed that PLS-SEM have an advantage over CB-SEM because they yield determinate predictions, while CB-SEM has factor indeterminacy.

Another constraint which hinders the usage of CB-SEM is regarding the sample size. In relation to the obstruction regarding limited sample population, it is therefore more suitable to apply PLS-SEM technique as this method does not require large sample size. According to Hair et al. (2017), PLS-SEM works efficiently in smaller sample size as the complexity of the structural model has little influence on the sample size requirements. Beyond that, the analysis procedure in PLS-SEM is more flexible because it is a non-parametric method which makes no assumptions towards the data distribution. It can manage extremely non-normal data with high level of skewness. In contrast, CB-SEM requires the data to be normally distributed.

Specifically, PLS-SEM has several advantages over CB-SEM in many situations commonly encountered in social sciences research- e.g., when sample sizes are small, the data are non-normally distributed, or when complex models with many indicators and model relationships are estimated. In addition, PLS-SEM can easily handle reflective and formative measurement models, as well as single-item constructs, with no identification problems. It can therefore be applied in a wide variety of research situations. Therefore, the PLS-SEM is the preferred method when the research objective is theory development and explanation of variance (prediction of the constructs). For this reason, PLS-SEM is regarded as a variance-based approach to SEM. However, PLS-SEM should not simply be viewed as a less stringent alternative to CB-SEM but rather as a complementary modeling approach to SEM. If correctly applied, PLS-SEM indeed can be a silver bullet in many research situations (Hair, Ringer, & Sarstedt, 2011). In general, the strengths of PLS-SEM are CB-SEM's weaknesses, and vice-versa. It is important that researchers understand the different applications each approach was developed for and use them accordingly.

Multi-stage PLS-SEM data analysis procedures

In PLS-SEM approach, the data analysing procedure must follow a multi-stage blueprint as suggested by Hair et al. (2017).

Stage 1: Specifying the Structural Model

Stage 2: Specifying the Measurement Models

Stage 3: Data Collection and Examination

Stage 4: Model Estimation and the PLS-SEM Algorithm

Stage 5: Evaluation of Measurement Models

Stage 5A: Assessing Results of Reflective Measurement Models

Stage 5B: Assessing Results of Formative Measurement Models

Stage 6: Assessing PLS-SEM Structural Model Results

Stage 1: Specifying the Structural Model

In this stage, preparation of a structural model is very crucial to analyse the interrelation among latent constructs. The structural model is a path model diagram, which relates latent constructs, based on logic and supported by theories from previous literature. According to Hair et al. (2017), path model is made up of two elements: (i) the structural model (inner model), which describes the relationships between the latent variables, and (ii) the measurement model (outer model), which describe the relationships between the latent variables and their measures (indicators).

The sequence for all the constructs in the hypothesised structural model is based on theories, logic, and past research reviews in the literature. The theories grounded in the path model are based on hypotheses that are logically linked together and were tested empirically to investigate the correlations among the hypothesised constructs as well as the supporting theories. The sequence of the constructs in a structural model is displayed from left to right, with independent (predictor) constructs on the left and dependent (outcome) variables on the right-hand side.

An illustration of a hypothesised structural model is shown in Figure 1. The hypothesized structural model consists of two exogenous latent constructs, an endogenous latent construct, and three mediators. The two former exogenous latent constructs are 'teacher self-efficacy beliefs' (TSEB) and 'teaching motivation' (TM) whereas the endogenous construct is 'behavioural intention in teaching science' (BIITS). The three dimensions of 'attitudes towards teaching science' (ATTS): 'cognitive belief in teaching science' (CBTS), 'affective states in teaching science' (ASTS), and 'perceived control in teaching science' (PCTS) act as the mediators.

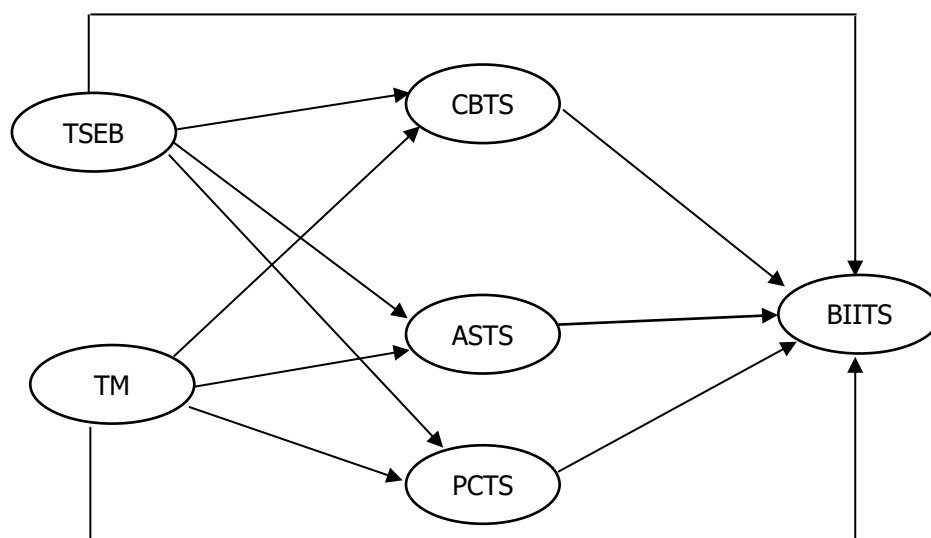


Figure 1. Path model for relationship between TSEB, TM, CBTS, ASTS, PCTS, and BIITS

Stage 2: Specifying the Measurement Models

The measurement models represent the relationships between constructs and their corresponding item variables. These item variables consist of all the items of the instrument used. The fundamental rule in determining these relationships is according to the measurement theory. The type of measurement model is based on the decision criteria of reflective or formative measurement model suggested by Jarvis, MacKenzie, and Podsakoff (2003) as well as MacKenzie, Podsakoff, and Jarvis (2005).

All constructs are drawn based on the decision criteria of reflective measurement model as suggested by previous literature. First, the direction of causality flows from the construct to the measures in the sense that the construct explains the variation in the measures for reflective measurement model. Second, the items in reflective measurement model are highly correlated and exhibit high levels of internal consistency reliability (Jarvis et al., 2003; MacKenzie et al., 2005; Williams, Vandenberg, & Edwards, 2009). According to Coltman, Devinney, Midgley, and Venaik (2008), reflective latent construct exists independent of the measures used and the items are interchangeable. This is also supported by Hair et al. (2017) in which they suggested deleting a reflective item does not change the conceptual domain of the latent construct. Conversely, MacKenzie et al. (2005) suggested the measures in formative measurement model jointly influence the composite latent construct. All items are completely uncorrelated and deleting a formative indicator from a measurement model caused damage to the model. This is also supported by Hair et al. (2017) in which they believed by deleting an item in the formative measurement model may change the conceptual domain of the latent construct. In addition, Coltman et al. (2008) suggested formative latent constructs is determined as a combination of its items, and hence, the items are not interchangeable. The guidelines for choosing the measurement model are shown in Table 1.

Table 1
Guidelines for Choosing the Measurement Model

Criterion	Decision
Causal priority between the indicator and the construct.	<ul style="list-style-type: none"> • From the construct to the indicators: reflective. • From the indicators to the construct: formative.
Is the construct a trait explaining the indicators or rather a combination of the indicators?	<ul style="list-style-type: none"> • If trait: reflective. • If combination: formative.
Do the indicators represent consequences or causes of the construct?	<ul style="list-style-type: none"> • If consequences: reflective. • If causes: formative.
Is it necessarily true that if the assessment of the trait changes, all items will change in a similar manner (assuming they are equally coded)?	<ul style="list-style-type: none"> • If yes: reflective. • If no: formative.
Are the items mutually interchangeable?	<ul style="list-style-type: none"> • If yes: reflective. • If no: formative.

Source: Hair et al. (2017)

Stage 3: Data Collection and Examination

According to Hair et al. (2017), first-generation statistical methods often had the general assumption that all data collected are error free. Conversely, the second-generation statistical methods emphasised more on identifying the error component found in the data and eliminate it from the analysis. There are a few error components that need to be screened which include the missing data, suspicious patterns, outliers, and data distribution.

Stage 4: PLS Path Model Estimation

Both structural and measurement models have to be estimated by the PLS-SEM algorithm's iterative procedures which involved two stages. In the first stage, the construct scores are estimated whereas outer loadings are calculated in the second stage. Besides outer loadings, the path coefficients and the resulting R^2 values of the endogenous latent variables have also been estimated in the second stage. The outer loadings (l) are referring to the relationships between the reflective measurement item variables with the latent constructs. These outer loadings are initially unknown but are later estimated by the PLS-SEM algorithm. Each of the outer loadings was estimated through single regression for each item variable on its corresponding construct. Similarly, the path

coefficients (i.e., the relationship between latent constructs) in the structural model were labeled as ρ coefficient. All these PLS-SEM algorithm procedures have been carried out by running SmartPLS Version 3.2.8 Software.

According to Hair et al. (2017), SmartPLS 3.2.8 is the most comprehensive and advanced programme in the regression estimation of the structural equation modeling. The path model estimation involves the assessment of structural model path coefficients, ρ value. When running the SmartPLS software, the algorithm calculates standardized coefficients approximately between -1 and +1 for respective relationship in the structural model and the measurement model. The path coefficient that display score close to the value of +1 indicates a strong positive relationship whereas the -1 value indicates negative relationship. The closer the estimated coefficients are to 0 value, the weaker are the relationships and generally are not statistically significant. The scores calculated by the algorithm are then used to estimate each partial regression model in the path model.

Stage 5a: Assessing PLS-SEM Results of the Reflective Measurement Models

The assessment of reflective measurement model is very crucial in PLS-SEM approach as it ensures the reliability and validity of the construct measures and therefore provides support for the path model estimation. The reflective measurement model is directly based on classical test theory. It enables us to compare the theoretically established measurement and structural models based on empirical sample data. Thus, the assessment of reflective measurement model determined how well the theory fits the data. The assessment of reflective measurement models includes indicator reliability, composite reliability, convergent validity, and discriminant validity (Table 2 & Table 3).

Table 2

Evaluation of the Measurement Models

Reflective Measurement Model	Formative Measurement Model
<ul style="list-style-type: none"> • Internal consistency (Cronbach’s alpha, composite reliability) • Convergent validity (indicator reliability, average variance extracted) • Discriminant validity 	<ul style="list-style-type: none"> • Convergent validity • Collinearity between indicators • Significance and relevance of outer weights

Source: Hair et al. (2017)

When comparing PLS-SEM with CB-SEM, the analysis procedure in PLS-SEM is more flexible because it is a nonparametric method which makes no assumptions towards the data distribution. However, researcher has to rely on procedures called ‘bootstrapping’ and ‘blindfolding’ to derive a distribution of the data. In bootstrapping, subsamples are randomly drawn from the original set of data. Each subsample is then used to estimate the model. This is a repetition process until a large number of random samples have been created (Hair et al., 2017). Blindfolding procedure is usually applied to endogenous constructs that have a reflective measurement model. It is a sample reuse technique that omits every d th data point in the endogenous construct’s indicators and estimates the parameters with the remaining data points. The systematic pattern of data point elimination and prediction depends on the omission distance (D) (Hair et al., 2014, 2017; Henseler, 2017).

Stage 5b: Assessing PLS-SEM Results of the Formative Measurement Models

The criteria for assessing reflective measurement models should not be applied to formative measurement models. With formative measures, the first step is to ensure content validity before collecting the data and estimating the PLS path model. After model estimation, the assessment continues with measures for convergent validity, the

significance and relevance of indicator weights, and the presence of collinearity among indicators (as shown in Table 2).

Stage 6: Assessing PLS-SEM Results of the Structural Model

Once the reliability and validity of the measurement model have been achieved, the following step is to evaluate the structural model. The main objective for conducting this assessment is to examine the predictive capabilities for endogenous construct. In addition, it also assesses the relationships between latent constructs in the structural model. When examining the structural model, one of the important aspects in PLS-SEM is to estimate the parameters so that the explained variance of the endogenous latent variable is maximized. This assessment follows the six-step systematic approach as shown in Figure 2.

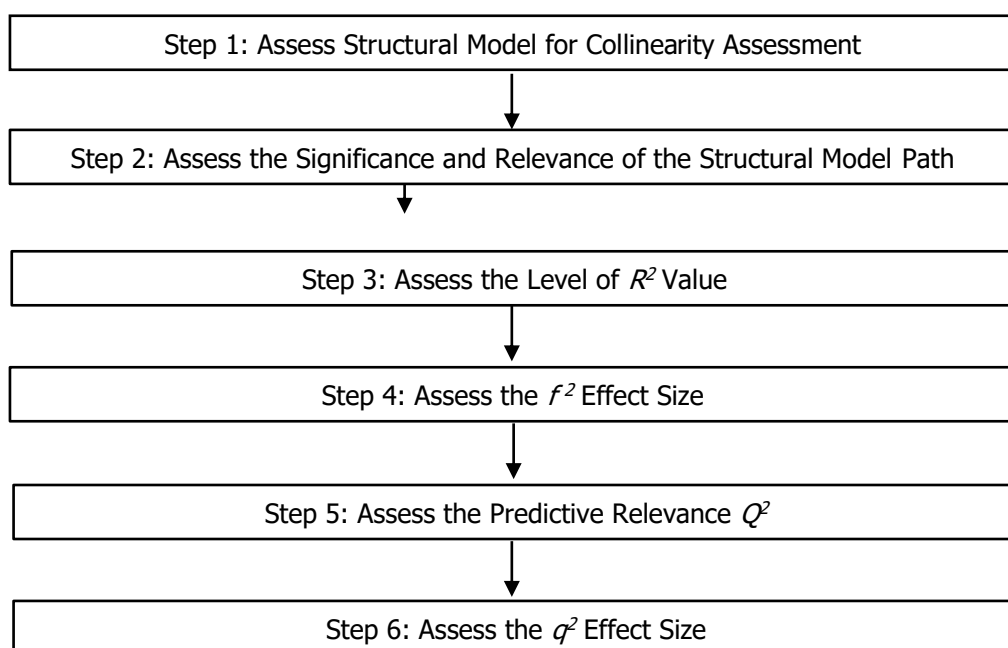


Figure 2. Steps for assessment of a structural model
Source: Hair et al. (2014, 2017)

The examination of collinearity issue for each set of predictors in the structural model will be performed. Each predictor construct’s tolerance (or Variance Inflation Factor, VIF) value should be higher than 0.20 (lower than 5). Otherwise, the construct has to be eliminated, merged into a single construct or creating higher-order constructs. The following steps include the assessment of the significance and relevance of the structural model path, the level of R^2 value, the f^2 effect sizes, the predictive relevance Q^2 , and the q^2 effect size (Table 4).

Table 3 : Summary Criteria for Measurement Model Assessment

Assessment	Criteria
Reflective Measurement Model	
Internal consistency reliability	Composite reliability <ul style="list-style-type: none"> • 0.60 – 0.70 accepted (Hair et al., 2017) • < 0.60 rejected (Hair et al., 2017)
Indicator reliability	Outer loading <ul style="list-style-type: none"> • > 0.70 accepted (Hair et al., 2017) • < 0.40 rejected (Hair et al., 2017)
Convergent validity	Average variance extracted (AVE) <ul style="list-style-type: none"> • > 0.50 (Hair et al., 2017)

Discriminant validity	<p>Cross loading</p> <ul style="list-style-type: none"> The indicator's outer loading on the associated construct should be greater than any of its cross-loadings on other constructs (Hair et al., 2017). <p>Fornell-Larcker criterion</p> <ul style="list-style-type: none"> The square root of each construct's AVE should be greater than its highest correlation with any other construct (Henseler et al., 2015) <p>Heterotrait-monotrait ratio (HTMT)</p> <ul style="list-style-type: none"> HTMT < 0.90 accepted (Hair et al., 2017) HTMT > 0.90 lack of discriminant validity (Hair et al., 2017)
Formative Measurement Model	
Convergent validity	<p>Redundancy analysis</p> <ul style="list-style-type: none"> > 0.80 accepted (Chin, 1998)
Collinearity of indicators	<ul style="list-style-type: none"> Tolerance value < 0.2 Variance inflation factor (VIF) > 5.0 Collinearity issue exist
Significance and relevance of the formative indicators	Outer weight and outer loading must be significant

Table 4 : Summary Criteria for Structural Model Assessment

Assessment	Criteria
Collinearity between prediction construct	<ul style="list-style-type: none"> Tolerance value < 0.2 VIF value > 5.0 Collinearity issue exist (Hair et al., 2017)
Significance and relevance of path coefficient	<p>Path coefficient ranges between -1 and +1</p> <ul style="list-style-type: none"> Path coefficient close to -1 represents strong negative relationship Path coefficient close to +1 represents strong positive relationship Path coefficient close to 0 represents weak and not significant relationship (Hair et al., 2017)
Coefficient of determination (R^2)	<ul style="list-style-type: none"> R^2 value of 0.26, 0.13 and 0.02 for the endogenous latent construct indicates 'large', 'medium', and 'small' (Cohen et al., 2011)
Effect size (f^2)	<ul style="list-style-type: none"> f^2 value of 0.35, 0.15 and 0.02 for the exogenous latent construct indicates 'large', 'medium', and 'small' (Cohen et al., 2011)
Predictive relevance (Q^2)	<ul style="list-style-type: none"> $Q^2 > 0$ indicates exogenous construct has predictive relevance towards endogenous construct $Q^2 < 0$ indicates exogenous construct has no predictive relevance towards endogenous construct
Effect size (q^2)	<ul style="list-style-type: none"> q^2 value of 0.35, 0.15 and 0.02 for the exogenous latent construct indicates 'large', 'medium', and 'small' (Hair et al., 2017)

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Artificial Intelligence: A Modern Approach

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An Overview and Future Aspects

Artificial intelligence (AI), has played an incredibly significant roles in Industry Revolution 4.0. AI has been called as machine intelligence, is intelligence demonstrated by machines, unlike the natural intelligence displayed by humans and animals. AI could easily perceive its environment and takes actions that maximize its chance of successfully achieving its goals. AI also used to describe machines (or computers) that mimic "cognitive" functions that humans associate with the human mind, such as "learning" and "problem solving". As machines become increasingly capable, tasks considered to require "intelligence" are often removed from the definition of AI, a phenomenon known as the AI effect. Modern machine capabilities generally classified as AI include successfully understanding human speech, competing at the highest level in strategic game systems, autonomously operating cars, intelligent routing in content delivery networks, and military simulations.

The current issues and challenges of AI will be discussed of which cover the algorithms, computational load, application, and learning. The traditional problems of AI research include reasoning, knowledge representation, planning, learning, natural language processing, perception and the ability to move and manipulate objects. General intelligence is among the field's long-term goals.

The future trends of AI are highlighted in robotics, smart manufacturing, Industry Revolution 4.0, and many industries. Approaches include statistical methods, computational intelligence, and traditional symbolic AI. Many tools are used in AI, including versions of search and mathematical optimization, artificial neural networks, and methods based on statistics, probability, and economics. The AI field draws upon computer science, information engineering, mathematics, psychology, linguistics, philosophy, and many other fields.

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Nanomaterial-Modified Electrodes for Biosensing

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1. An Overview

Biosensors are analytical devices that transduce biochemical signals into measurable electrical signals. One of the challenges in biosensor development is to transduce signals generated from biorecognition events. Nanomaterials from carbon-based materials such as graphene and its derivatives have been extensively used for improving sensitivity and lowering detection limits of biosensors owing to their ability to increase surface area for biomolecule attachment while improving electron-transfer kinetics at the surface of electrodes.

Nanomaterials deposited on electrodes are often in a composite form, where two or more materials are combined and deposited on electrode surfaces. For the past several years, our group has been focusing on understanding the synergistic properties of carbon-based nanomaterials with polymer – both conductive and non-conductive – for enhancing transduction of biorecognition events for applications in non-invasive diabetes monitoring (Abd-Wahab et.al, 2019), water-quality monitoring (Benoudjit et. al., 2018, 2020), and space biology (Park et. al., 2018).

2. Current Issues and Challenges with Nanomaterial-Based Biosensor Development

Challenges with biosensor development include the biorecognition and transduction parts. For biorecognition, researchers improve on methods of biomolecule immobilization on nanomaterial-decorated electrodes through specific surface chemistry; common examples of surface chemistry methods are avidin (streptavidin)-biotin chemistry and silane chemistry. These methods reduce non-specific bindings without disrupting signals from the biorecognition events.

Besides surface chemistry for effective biomolecule immobilization, challenges with biosensors can include the transducer component. A transducer for biosensors can include optical and electrochemical transducers, with the latter being the focus of our research group for the past 10 years. An electrochemical transducer can consist simply of an electrode made of carbon or gold, decorated with nanomaterials, and methods of nanomaterial deposition on electrodes can affect signal transduction. Furthermore, most research work on biosensors focuses more on the electrical and biorecognition component of biosensors, rather than understanding the materials chemistry of the nanomaterials on electrode surfaces. Our focus is to understand the materials chemistry when graphene and its derivatives are used in a composite form on electrode surfaces. Understanding the material-solution interface can allow for better strategies to improve signal transduction from biorecognition events.

We studied the effect of signal transduction from electrodes that are decorated with graphene and its derivatives in single or composite form, and the transduction results were used to further enhance biosensor performance for applications that require detection of minute amounts of analytes. We are pursuing non-invasive diabetes monitoring with nanomaterial-based glucose sensors; glucose molecules can now be detected in samples with glucose concentration 100x smaller than that in blood, such as in saliva.

3. Current Trends in Nanomaterial-Based Sensors and Future Direction

Nanomaterials-based biosensors allow for detection of analytes in lower concentration ranges, such as the case of non-invasive diabetes monitoring, removing the need for finger-pricking. Since nanomaterials can enhance

biosensor sensitivity and lower detection limit by a few orders of magnitude compared to conventional electrodes, detection of minute concentrations of analytes is made possible.

Current trends can include using nanomaterial-decorated electrodes with ion-selective material for detection of ions for water-quality monitoring and physiological sensing. We have utilized nanomaterial-based ion sensors in a mobile platform for water-quality monitoring of river water; the initial version of the technology was studied for deployment in potable water systems (Wu et. al, 2013) and small satellite missions (Park et. al., 2018). Furthermore, we utilized the ion sensors for monitoring health of embryo development by measuring potassium and calcium ions in amniotic fluids. These applications are made possible owing to enhanced sensor capability through use of nanomaterial-decorated electrodes.

4. Future Scope

Future work includes integrating these sensors with Internet of Things in a mobile/portable sensor format and scaling up the fabrication process of nanomaterial-decorated electrodes for commercialization.

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Modern Era of Computation

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1. An Overview

Computer and power of computation is expanding vary vastly. Initially the computer was evolved with the thought of computation for only numerical processing. The recent developments in the field of computer science are proven to be smarter and more applicable structures result from marrying the learning capability of the applications with the transparency and accuracy. Various application of numerical processing has been developed and explore. All these approaches of computation are considered as the hard computing. The hard computing has been used to solve the real world problems for them the deterministic model exists and outcome of the problem was certain. After that the new thought in computation has evolved with the concept of symbolic processing. It opens the doors for handling the real world's problems where no such deterministic model exists and outcome of the problem is uncertain. Therefore the concept of soft computing as a technique to solve such type of problems emerged. This soft computing further explores the possibility for machine learning and one of the powerful tools for Big Data analysis. The new age of computation is related with internet of things which includes the cloud computing and Big data analysis.

The new era of computation i.e. soft computing is an emerging tool for analyzing the Big data, mining of data, data science, business intelligence and knowledge empowerment. Current trends in computer sciences & applications and further illustrate how these various technologies integrate with social and economic factors to provide a thorough solution to the real-world problems of the human being in every domain of life. Although the very state forward answer for the latest trends in Computer science could be Machine learning, cloud computing and Artificial Intelligence. But basically, Industry build the software not only with what is new but by what customer problem can be solve easily and with good future scope and current market trends which covers customer requirements, this force towards innovation and create next generation products that can be quickly adopted for solving new use cases by Connecting to new data sources easily. Advances in computation offer unprecedented opportunities as well as new challenges in the international exchange of scientific data. Rapid improvements have led to ever greater computational speed, communication bandwidth, and storage capacity at costs within reach of even small scale users. Moreover technically advances in satellites, sensors, robotics and fiber optic and wireless telecommunications are extending the range of technologies affecting the acquisition, refinement, analysis, transmission and sharing of scientific data. Modern computations strengths are:

- Deep learning or Machine learning (ML).
- Block chain.
- Internet of things
- Robotics
- Big Data Analytics.
- Cloud Computing
- Cyber Security
- Virtual Reality
- Predictive Analytics
- Bio Computation
- Quantum computing

The emerging areas that are seeking attention of many researchers in the field of computer science are designed and developed according to the latest market trends. Now a day trends in information technologies are directly or indirectly associated with the customer centric approach. One of the latest technology like computational biology where in the gathering and processing of biological data with the use of computer programs. This technology covers under Bio Informatics, which works with the combination of computers and living beings. It converts the biological data into readable format. This is helping the medical science a lot. Another most promising technology of today is Data Science or Big Data. This field has a very large and promising scope of research and development considering the huge volume of data being produced by organizations and individually in different sectors worldwide. It deals with the storage processing and analyzing the massive data stored across the world in various organization and data centers.

2. Current Issues and Challenges

Although Big Data, Internet of Things (IOT) and cloud computing are three distinct approaches that have evolved independently, they are becoming more and more interconnected over time. The convergence of IOT, Big Data and clouds provides new opportunities and results in development of new applications in many fields, including business, healthcare, sciences and engineering. At the same time, various challenges are faced during processing and management of massive amounts of data, as well as during their storage in cloud environments. Cloud computing has emerged as an important computing paradigm, enabling ubiquitous convenient on-demand access through Internet to shared pool of configurable computing resources. In this paradigm, software (applications, databases, or other data), infrastructure and computing platforms are widely used as services for data storage, management and processing. They provide a number of benefits, including reduced IT costs, flexibility, as well as space and time complexity. To benefit, however, from numerous promises cloud computing offers, many issues have to be resolved, including architectural solutions, performance optimization, resource virtualization, providing reliability and security, ensuring privacy, etc.

Another significant technology trend that nowadays is gaining increasing attention is Internet of Things (IOT). In IOT, intelligent and self configuring embedded devices and sensors are interconnected in a dynamic and global network infrastructure, enabling scalability, flexibility, agility and ubiquity in fields of massive scale multimedia data processing, storage, access and communications. IOT is driving new interest in Big Data, by generation of enormous amount of new types of data being generated by sensors and other input devices, which have to be stored, processed and accessed. The need to monitor, analyze and act upon these data brings many issues like data confidentiality, data verification, authorization, data mining, secure communication and computation.

The future development of cloud computing systems is more and more influenced by Big Data and IoT. There are research and industrial works showing applications, services, experiments and simulations in the Cloud that support the cases related to IOT, Big Data and Security. Cloud users and cloud service providers face a variety of new challenges like encrypted data search, share, auditing, key management security and privacy. There is also a need for protocols that facilitate big data streaming from IOT to the cloud and QoS.

Deep Learning or Machine Learning is sub set of artificial intelligence and in today's trends it's one of most widely used computer science application, the ability of ML is to self-trend from data or able to learn from its own experiences, which can improve from application behavior or experience without being explicitly programmed. Machine learning focuses on the development of computer programs that can access data and use it learn for themselves.

In the integration of machine learning the evolutionary computation is a steadily increasing research discipline covering computer algorithms that are inspired by principles of natural evolution. The three main mechanisms that drive evolution forward are reproduction, mutation, and natural selection (i.e., the Darwinian principle of survival of the fittest). In the biological world these mechanisms enable life-forms to adapt to a particular environment over successive generations. The camel's hump, the eagle's eye, the dolphin's sonar, the human brain – they all can be seen as solutions to environmental problems that were generated by evolution. Evolutionary algorithms adopt these mechanisms of natural evolution in simplified ways and breed progressively better

solutions to a wide variety of complex optimization and design problems. Nowadays the distinction between these approaches is blurring, particularly as far as representation and operators are concerned. Most researchers agree that candidate solutions should be represented in whatever way best suits the problem at hand. In addition, several further approaches have emerged that adopt other mechanisms from nature; for example, ant colony optimization mimics the behavior of a colony of ants finding the shortest path from the nest to a location containing food, particle swarm optimization is motivated by the social behavior of organisms such as bird flocking and fish schooling, and artificial immune system methods are based on principles of immune system defenses against viruses. On the other side, most researchers agree that simple evolutionary algorithms usually cannot compete with more sophisticated optimization algorithms that are tailored towards a specific problem and exploit certain features of it. This led to the development of many hybrid approaches, where an evolutionary algorithm is combined with problem-specific variation operators, "intelligent" encodings, and/or clever local improvement or repair algorithms. In fact, most of today's state-of-the-art EA-based approaches for important practical problems are relatively complex, problem-specific hybrid systems. The possibility of effectively combining an EA-framework with other techniques is therefore often perceived as another important strength.

3. Current Trends

The world of computation with recent development is involving different new areas. It opens the doors for 4th industrial revolution. In this we have various new technologies, methods, problem solving agents and new virtual environment. The existence of newest trend of Virtual Reality cannot be ignored. The biggest stakeholders of VR applications are medical science, physical sciences, environment, businesses, space industry and entertainment industry. VR produces the set of the data which is used to develop new models training methods, communications and interaction. The major disadvantages in the use of VR application are time, cost and technological limitations. But because of its support system it is expected to become more affordable in future, today's generation is grown up having technology at their disposal. They are familiar with smart phones, tablets therefore VR Developments will also increase in number of professionals more acquainted with the technology.

Cloud Computing has already become the area of attention by most of the researcher and scientists. Cloud provider is basically data or internet provider. This plays an important role in various fields of business, computing security etc. This application works on the shared pools of configurable computer system resources and higher-level services that ease the managerial effort with leads to economics of scale and development. It helps in running business more efficiently. Cloud computing eliminates the capital expenses of buying hardware and software along with other related expenses. Business has become very flexible as cloud computing services are available on demand that leads to delivering right amount of IT resources resulting in scale elasticity. Lots of 'Racking and Stacking' task is being eliminated as cloud computing removes the needs for many of these tasks resulting in more time devotion towards more important business goals. Cloud computing services run on a worldwide network regularly upgraded data centers. This reduces network latency for application and improvises efficient computing hardware. It also helps in providing security to the data, apps from potential threats. However, several types of cloud computing is operational to help offer right solution for your needs like public, private and hybrid.

Besides this the main contributor in 4th industrial revolution is Artificial Intelligence and its applications in various domains. Artificial Intelligence, or AI, has already received a lot of buzz in recent years, but it continues to be a trend to watch because its effects on how we live, work, and play are only in the early stages. In addition, other branches of AI have developed, including Machine Learning, which we will go into below. AI refers to computer systems built to mimic human intelligence and perform tasks such as recognition of images, speech or patterns, and decision making. AI can do these tasks faster and more accurately than humans. Machine Learning is a subset of AI. With Machine Learning, computers are programmed to learn to do something they are not programmed to do: they learn by discovering patterns and insights from data. In general, we have two types of learning, supervised and unsupervised. While Machine Learning is a subset of AI, we also have subsets within the domain of Machine Learning, including neural networks, natural language processing (NLP), and deep learning. Each of these subsets offers an opportunity for specializing in a career field that will only grow. Like AI and Machine Learning, Robotic

Process Automation, or RPA, is another technology that is automating jobs. RPA is the use of software to automate business processes such as interpreting applications, processing transactions, dealing with data, and even replying to emails. RPA automates repetitive tasks that people used to do. These are not just the menial tasks of a low-paid worker: up to 45 percent of the activities we do can be automated, including the work of financial managers, doctors, and CEOs.

Cyber security might not seem like emerging technology, given that it has been around for a while, but it is evolving just as other technologies are. That's in part because threats are constantly new. The malevolent hackers who are trying to illegally access data are not going to give up any time soon, and they will continue to find ways to get through even the toughest security measures. It's also in part because new technology is being adapted to enhance security. As long as we have hackers, we will have cyber security as an emerging technology because it will constantly evolve to defend against those hackers. As proof of the strong need for cyber security professionals, the number of cyber security jobs is growing three times faster than other tech jobs. However, we're falling short when it comes to filling those jobs. As a result, it's predicted that we will have 3.5 million unfilled cyber security jobs by 2021.

In a similar way the block chaining is another thrust area in the new era of computation. Although most people think of block chain technology in relation to crypto currencies such as Bitcoin, block chain offers security that is useful in many other ways. In the simplest of terms, block chain can be described as data you can only add to, not take away from or change. Hence the term "chain" because you're making a chain of data. Not being able to change the previous blocks is what makes it so secure. In addition, block chains are consensus-driven, so no one entity can take control of the data. With block chain, you don't need a trusted third-party to oversee or validate transactions. Most of the industries are involving and implementing block chain, and as the use of block chain technology increases, so too does the demand for skilled professionals. According to Techcruch.com, block chain related jobs are the second- fastest growing category of jobs.

Many "things" are now being built with Wi-Fi connectivity, meaning they can be connected to the Internet and to each other. The issue arises here with this is to analysis the big data which will be emerged from this. The Data science, Big data analysis and Knowledge discovery are now becoming the new hot areas in the field of computer science. The Internet of Things is the future and has already enabled devices, home appliances, cars, and much more to be connected to and exchange data over the Internet. And we're only in the beginning stages of IOT the number of IOT devices reached 8.4 billion in 2017 is expected to reach 30 billion devices by 2020.

4. Future Scope

Trends in Computer Sciences & Applications changed drastically the life of one and all. Be it a student learning or business corporate or any other professional, computer science and its applications are extending their updated support system to give more effective performance infrastructure in every sphere. Recent developments give acceleration to the development of a Digital currency or digital money introduction in the form of digital, Block chain a digital ledger in which transactions made in crypto currency, Machine learning techniques and its applications in almost every domain of the life, Internet of things to makes the world without walls, Virtual reality with artificial life and the most recent development which is not being discussed yet is quantum computing. The contribution is endless and so the developments in this field are boundless. It is the time to watch the world with these new technologies of computation and adjust our self-according to them. Unfortunately as we adjust and adopt the new computation technology in the meantime the new technology emerges. Formerly a technology trend to watch, cloud computing has become mainstream, with major players Amazon Web Services, Microsoft Azure and Google Cloud dominating the market. The adoption of cloud computing is still growing, as more and more businesses migrate to a cloud solution. But it's no longer the emerging technology. As the quantity of data we're dealing with continues to increase, we've realized the shortcomings of cloud computing in some situations. Edge computing is designed to help solve some of those problems as a way to bypass the latency caused by cloud computing and getting data to a data center for processing. It can exist "on the edge," if you will, closer to where computing needs to happen. For this reason, edge computing can be used to process time-sensitive data in remote locations with limited or no connectivity to a centralized location. In those situations, edge computing can

act like mini datacenters. Edge computing will increase as the use of the Internet of Things (IoT) devices. Now it explores another problem for determining the meaning, discovery of knowledge, predication of patterns and uses of the information. It is quite obvious that the existing technology cannot find the solution of this. Therefore it opens the doors are new methods like Data mining, machine learning, knowledge management and virtual reality. Virtual Reality (VR) immerses the user in an environment while Augment Reality (AR) enhances their environment. Both VR and AR have enormous potential in training, entertainment, education, marketing, and even rehabilitation after an injury. Either could be used to train doctors to do surgery, offer museum-goers a deeper experience, enhance theme parks, or even enhance marketing. There are major players in the VR market, like Google, Samsung, and Oculus, but plenty of startups are forming and they will be hiring, and the demand for professionals with VR and AR skills will only increase.

The new computation era which is now knocking the doors is quantum computing, due its ability to larger capacity of carrying and holding information in more secure way. In 5G, cloud technologies have become a critical part of radio access network (RAN) management e.g. our 5G v RAN solution. The ability to orchestrate both equipment and functions is enabling more automatized and intelligent forms of network management, from network set up to alarm management, license renewal and more. Such tasks, for example, can now be performed more efficiently by intelligent agents that make optimized decisions in real time and under unpredictable circumstances. However, those intelligent agents need to analyze sheer volume of data rates. The compute power required for such tasks surpass the capabilities of even the most state-of-art devices we have today. One solution comes in the form of quantum computer technology. Built using a quantum processor, a quantum computer (QC) can potentially reduce execution time to hours and days for problems that would previously have taken hundreds of years to solve on our best supercomputers, also known as classical computers. The basic element of a QC is the quantum bit (known as a qubit). Quantum bits are the quantum analog of the classical bits and thus the basic unit of quantum information. Whereas in the classical domain, they function as a two-level system, in this case, the qubits must obey the laws of quantum mechanics.

Although technologies are emerging and evolving all around us, these technologies offer promising career potential now and for the foreseeable future. And all these are suffering from a shortage of skilled workers, meaning the time is right for you to choose one, get trained, and get on board at the early stages of the technology, positioning you for success now and in the future.

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Harnessing Local Potential to Enrich STEM Education

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An Overview

Industrial Revolution 4.0 that marked by rapid development in technology information has reshaped human civilization. Cyber technology creates the world become borderless, timeless and even stateless and offer multitude opportunities and interlinked challenges in addressing global issues such as climate change, global health epidemics and pandemic, demographic changes that dominated by productive population. This unprecedented situation required new solutions, advanced skills and strategic approach to deal with. In education sector, Science, Technology, Engineering and Mathematics (STEM) has proven to be an effective approach that train student to dealt with situation whilst provide enough space to develop the 21 Century Skills that equip them to thrive in their future life which more complex and competitive.

STEM Education requires student to identify the problem and find the solution that enable student to think scientifically and enhance creativity skill and cultivate sense of innovation. Optimizing technology in STEM Education can foster dynamic and personalized learning environment that drive a students' stronger outcome. A successful STEM program always incorporate with active learning activities in which collaboration and communication play important role

Effective problem solving and thinking depend on to what extend content knowledge is indexed and organized that can achieve by making teaching materials as contextual as possible. This will enrich students' knowledge structure that help them to address and solve (complex) problems. Bringing local potential to the class also will intensify active learning and help student to develop their own understanding that will contribute to the variety of the projects and innovation.

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Effective Prevention Strategies to Reduce Spread of COVID-19

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1. An Overview

Wearing a mask and testing everyone who has been in contact with COVID-19 patients are effective prevention strategies to reduce the spread of COVID-19. Wrong prevention strategies are responsible for the higher rate of covid-19 infection in the second wave of covid-19 in some countries, where asymptomatic carriers (silent carriers) are not tested and isolated, resulting in accumulation many silent carriers. These silent carriers caused a high degree of infection in these countries in the second wave of covid-19. Western countries, such as the United States, the United Kingdom and Italy, have not tested everyone who has been exposed to covid19 patients. They just test those who have symptoms of covid19. Therefore, we call these countries symptom prevention countries. But China and South Korea tested all people who had contact with covid19 patients, even if they were not sick (asymptomatic). Therefore, we call these countries virus prevention countries. Experts now believe that China and South Korea's virus prevention strategy is more efficient at curbing the spread of the virus. Research teams think that mild or no symptoms might be passing the virus to 60% of all infections. A new study pins down the source of the 'rapid spread' of the coronavirus in China previously— people with little or no symptoms. A New US research [Renyi Zhang, et al 2020] has found that wearing a face mask can significantly decrease a person's chance of becoming infected with the Covid-19 virus, and even when used alone is more effective at preventing the spread of the virus than other protective methods. Other mitigation measures, such as social distancing implemented in the United States, are insufficient by themselves in protecting the public.

2. Current Issue and Challenge

After Wuhan reported a cluster just six new cases on the weekend of May 9, after 35 days without reporting any new infections in the city. We see that the China city of Wuhan has tested its entire population of 11 million people for COVID-19, The mass testing campaign (11 million people) ended up reporting 206 cases of active COVID-19 infections, all of which were classified as asymptomatic. The question is, why did the city test everyone if so few people (six new cases) are positive? Because testing 11 million people requires a lot of money and resources. The answer is that China's goal is to identify all asymptomatic patients (silent carriers) in China. In this way, China will not cause any serious infection to the subsequent covid19 wave. China's top respiratory disease expert Zhong Nanshan said "Right now ... the fatality rate is only 0.9 or 1 per cent," he said. "I suppose we don't have too many asymptomatic patients. If we did, they would be transmitting (the virus) to other people and pushing the number (of confirmed cases). Zhong Nanshan also said asymptomatic infection is highly contagious. Even where isolation is implemented, the RO value may reach 3 or even 3.5, which means that one person can infect 3 to 3.5 people. This number is very high.

The study of Clinical Characteristics of 24 Asymptomatic Infections with COVID-19 Screened among Close Contacts in Nanjing, China [Zhiliang Hu, et al 2020] examines the history of close relationships of diagnosed patients, detects 24 non-symptomatic patients, and reveals that COVID-19 patients do not have symptoms that could potentially provoke others. The importance of this study is to know that patients with COVID-19 are not symptomatic, highly contagious, the duration of the infection may be 3 to 4 weeks, and that their infected patients may have severe disease.

3. Current Trends

A study, Face Masks Considerably Reduce COVID-19 Cases in Germany: A Synthetic Control Method Approach [Timo Mitze, et al 2020], The city of Jena has seen no new infections for eight days since making masks mandatory. The news will raise hopes masks could be effective in containing the virus and add to calls for them to be made mandatory elsewhere. Since then, Germans face fines of up to \$5,000 as wearing a face mask becomes mandatory. The latest report from the University of Maryland [Chris Carroll, 2020] also mentioned that wearing masks in public may help slow the process of the COVID-19 pandemic. Research reports published in natural medicine [Nancy H. L. Leung, et al 2020], the result identified seasonal human coronaviruses, influenza viruses and rhinoviruses in the exhaled breath and coughs of children and adults with acute respiratory illness. Surgical face masks significantly reduced detection of influenza virus RNA in respiratory droplets and coronavirus RNA in aerosols, with a marginally significant reduction in coronavirus RNA in respiratory droplets.

A research, also shows widespread mask-wearing could prevent Covid-19 second waves. The research, A modelling framework to assess the likely effectiveness of facemasks in combination with 'lock-down' in managing the COVID-19 pandemic [Richard O. J. H. Stutt, et al 2020]. Led by scientists at the Britain's Cambridge and Greenwich Universities, suggests lockdowns alone will not stop the resurgence of the new SARS-CoV-2 coronavirus, but that even homemade masks can dramatically reduce transmission rates if enough people wear them in public. Lead author, Richard Stutt, part of a team that usually models the spread of crop diseases at Cambridge's department of plant sciences, said: "Our analyses support the immediate and universal adoption of face masks by the public. Study also shows 100% face mask use could crush second, third COVID-19 wave. A research, Face Masks Against COVID-19: An Evidence Review [Jeremy Howard, et al 2020] also recommend that public officials and governments strongly encourage the use of widespread face masks in public, including the use of appropriate regulation.

WHO updates Covid-19 advice to encourage wearing masks in public. The WHO's technical lead expert on Covid-19, Maria Van Kerkhove, told Reuters in an interview. "We are advising governments to encourage that the general public wear a mask. And we specify a fabric mask - that is, a non-medical mask," "We have new research findings," she added. "We have evidence now that if this is done properly it can provide a barrier ... for potentially infectious droplets." WHO Sets 6 Conditions For Ending A Coronavirus Lockdown. Disease transmission is under control, which is a top priority before any country lifts the lockdowns. Non-mandatory masks difficult to prevent the indirect transmission of the covid-19 virus. Therefore, disease transmission is difficult to control. A study [Jing Cai, et al 2020] data indicated that indirect transmission of the causative virus occurred, perhaps resulting from virus contamination of common objects, virus aerosolization in a confined space, or spread from asymptomatic infected persons.

4. Future Scope

In response, the World Health Organization wants everyone to stay at home and play video games. In addition, one of the conditions for the World Health Organization to end the coronavirus lockdown is for the community to be fully educated, engaged and empowered to live under a new normal. Therefore, it is important to create a new game and well-educated everyone knows how to prevent COVID-19 infection (<https://youtu.be/u9uA7HZGW7w>). The new game must educate everyone about the importance of two effective prevention strategies: wearing a mask and testing everyone who has been in contact with COVID-19 patients. The new game also must educate everyone that other methods are also essential to prevent COVID-19. Prevention strategies can be divided into two types: external prevention and internal prevention. External prevention such as

wearing masks, avoiding crowded places and garbage, petting animals, coughing, sneezing, and remember to wash your hands with soapy water. If it is not necessary, do not go to the hospital, if necessary; do not take the elderly and children. Internal prevention such as enhance the body's immune system through food or sunlight. Lack of sunlight can lead to reduced levels of vitamin D and melatonin, both of which require sunlight to produce. Lack of sunlight can damage our immune system, which in turn reduces our ability to resist viruses. Reducing stress, adequate sleep and regular exercise can also strengthen the body's immune system.

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System Analysis Design for application in Business Scenario

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1. An Overview

It is important for a company to weigh the pros and cons of changing their current systems already in place. Identifying the value of the new system is incredibly important for this process to be successful. Just like building your dream home, you want to make sure it's an improvement from your current home. Systems development is a systematic process, which includes phases such as planning, analysis, design, deployment, and maintenance. Here, in this tutorial, we will primarily focus on –

- Systems analysis
- Systems design

Systems Analysis

It is a process of collecting and interpreting facts, identifying the problems, and decomposition of a system into its components. System analysis is conducted for the purpose of studying a system or its parts in order to identify its objectives. It is a problem solving technique that improves the system and ensures that all the components of the system work efficiently to accomplish their purpose. Analysis specifies what the system should do.

Systems Design

It is a process of planning a new business system or replacing an existing system by defining its components or modules to satisfy the specific requirements. Before planning, you need to understand the old system thoroughly and determine how computers can best be used in order to operate efficiently. System Design focuses on how to accomplish the objective of the system. System Analysis and Design (SAD) mainly focuses on –

- Systems
- Processes
- Technology

Businesses must first identify what their needs are, and they can do this by asking the following questions:

- Value do we want to bring to the organization
- Is it to improve efficiency in the workplace
- Want to change our current processes
- Results are we trying to achieve
- Budgetary concerns

This stage involves all levels of the organization, to collaborate the business needs and the overall ability to develop the new information system.



Figure 1: Steps in System Analysis and Design

2. Planning and Analysing

Once the business needs are set, planning and analysis begins. This process should begin by identifying the extent to which they are trying to use this new system. This process is similar to a blueprint one might have for a home, where you lay out the big picture. Part of determining this is identifying who the users of the new system will be and what the system will be used for as well as addressing any privacy concerns. This initial part is important to make sure that the business objectives are being met, and it lays the foundation for the 'big picture'. By looking into the needs of the users of the system, this helps identify the reach or span in which the new system will be used. It determines the cross functionality of the system and if it will be used for one or many departments. Some questions one might ask include the following:

- What data should we store, and how does that, in turn, provide information to the company?
- Do we want the marketing department information to be integrated with the sales departments?

Asking questions like this will help to identify the 'who' and 'what' the system will be used for. Part of this stage should also address any privacy concerns the company may have as far as who should or should not have access to the information. Certain information is more sensitive than others and only certain users should be given specific access.

3. Designing a System

This phase will start by researching what necessary hardware and/or software is needed to use the system. At this point, the company will look at their physical structure and find ways to mimic this and any new changes in the new information system. Questions asked during this phase include the following:

- How do we want to set up and store the data we need?
- How should we capture the data?
- How can we ensure that the information is accurate or complete?

Once this is answered, logical design is also incredibly important to make the system logical to daily users. This system should be used to improve organization systems, and consideration for ease of use and user trainability are essential in this phase.

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Transformative Education and Climate Change

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1. Overview

Climate change has become the most serious environmental problem in the 21st century. Its impact includes among others threatening the agriculture yield and uncertainty in weather patterns. It is also a common perception that solutions to the climate change problems are the responsibilities of the scientists and government (Mochizuki & Bryan 2015; Heiss 2010). Thus, technical skills -i.e. scientific and technological knowledge as well as policies that could mitigate the impact of climate change should and is given priority to many countries.

The reality is that a citizen in any country need to be aware that they are part of the problem and solution to the climate change phenomena (Todd 2017). In other words, that requires more than technical skills to address climate change related issues. For example, adopting an environmental conservation behavior, which encompasses mitigation and adaptation strategies to global warming impact, would entail citizens demonstrating soft skills and values (such as intercultural understandings and self-disciplined) in realizing such an action for local and global good. Thus, strengthening capacity building in terms of global competencies (knowledge, cognitive skills and values) related to climate change education, especially among the future generations namely school students, is vital.

2. Current Issues and Challenges in Climate Change

It has been argued that the National Climate Change (CC) Policies of a country only target the public and industry but not education (Heiss 2010). It has been found that educational policy is not aligned with country's CC policies (Bieler et al. 2017) Thus, the lack of congruence between educational and CC policy, is one of the probable reason that the climate change policies have been insufficient to sensitize people to the significance of the problem in particular activating people to take action (Korkmaz 2018).

While there is no specific form of climate change education, countries often promote environmental education (EE) as part of CC education (Mohd Nizam 2018). Based on his review, of climate change education through Education for Sustainable Development (ESD), the EE initiative however has limitations: 1) it focuses only on environmental care thus shallow engagement with CC education and 2) studies (e.g. Yaakob, Ismal & Razak 2012; Syed Abdullah & Halim 2010) showed that the implementation of EE is ineffective and as a result level of commitment towards environment is low.

3. Current Trends in Climate Change in Relation to Education

One of the precursors to becoming an active ecological citizen, at the global level, is to develop global competencies. Global competencies (UNESCO 2013) include dimensions of 1) cognitive (knowledge and critical thinking about global to local issues, and the interconnectedness), 2) socio- emotional (possess values and, solidarity and respect for diversity) and c) behavioral (acting responsibility at all levels towards the global good). Malaysia is embarking on the development of global competencies among the school students thorough the formal schooling namely the school curriculum. The initiative has just begun and the competencies are being infused thorough out the curricula- in the form of pedagogical approach that addresses climate change issues or the inculcation of civic values in relevant subjects.

One may have to review the effectiveness of implicit inculcation in ensuring global competencies are acquired, internalized and practiced. Often civic values as found in global competencies of an ecological citizen (such as empathy and respect), are not measured in the examinations. In addition, learning experiences that are

participatory, engaging with authentic climate change scenarios, and deliberations on contrast perspectives are necessary for enabling students to think critically about complex issues central to living in a diverse global society, such as issues pertaining to human rights or social justice as a result of the impact of climate change (Martin & Baildon 2016; Monroe et al. 2017).

4.0 Future Scope of Climate Change in Relation to Education

Monroe et al (2017) suggest that there is need for transformative climate change education which involve encouraging students to change the society and commit to act for global good. To this end, Todd (2017) argued that having a positive disposition and affect toward people of diverse backgrounds, will inspire globally competent individuals use their knowledge and skills to take action for global good. While, Stapleton (2015) has demonstrated that action can be developed through experiential learning.

Thus, research on transformative education should focus on the competencies and civic values (knowledge, cognitive skills, socio emotion skills) that contribute changes in behavioral in relation to climate change. One particular research agenda would be to identify competences and civic values at the local level of a particular country as well as, if needed, based on culture or ethnic group of the society. As suggested by (Rohan, 2000) one's values are closely associated with worldviews, that influence much of an individual perceptions of the world, their behavior, and their decision-making criteria.

Another research focus, would be to determine the climate change literacy of an individual. A positive climate literacy is hypothesized to link with a pro environmental behavior. A climate literacy society should encompass at all levels of the society from pre schooling age all the way up to the adults. An early inculcation of a positive climate literacy would be an antecedent factor to mitigate social values and outlook (such as high level of socio economic status) that might contribute to the cause of climate change. Lastly, the role of social media in mitigating or promoting pro environmental behavior also can be explored further.

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New Normal – Teachers’ Approach for Remote Learnings

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An Overview and Future Aspects

Under the current scenario, all teachers and educators need to rethink the way how to deliver in making sure students are learning. This will include preparing resources and assessment strategies. Many will need to shift to the New Norma to remote teaching & learning and remote assessments. By all means, skills on how to develop and manage these digital learning materials are crucial to be acquired by all teachers. The choice of remote teaching & learning and remote assessments may define our response to the current crisis. All resources prepared, marking rubrics depend on kind of assessments chosen should be aligned with learning outcomes. The main findings from Research done by Teacher Professionalism Division, MOE Malaysia show that 43.75% of teachers are not yet proficient in developing digital learning materials, a total of 52.87% of teachers are low in digital application knowledge and 58.02% low in digital application skills. A total of 85.59% of teachers need training in maintaining student interest during digital learning. The implications of this study suggest that teachers need training in the aspects studied.

Social Entrepreneurship

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1. An Overview

Social Entrepreneurship is one the rise, stimulated by the demands of the rising demand of developing countries to a better living and working condition and an increase of conscientious consumerism in the developed nations. The term was 1st coined in 1972 by banks that social issues can be resolved through managerial practices and businesses (Nicholas, 2006).

Jean-Baptiste Say 1990's quote best describe ,entrepreneurship "It is venture to advance shifts economic resources out of an area of lower and into an area of higher productivity and greater yield". Entrepreneurship connotes the entrepreneurship spirit of sensing the gap in the community 's needs, thinking outside of the box, determination to intervene through creating a sustainable development (SDG) that impacts the community and the world. The three dimension of SDG identified by the United Nations comprises of 17 sustainable are economic, social and environmental. Instead of the traditional notion of profit maximizing and market driven context in entrepreneurship, there is a paradigm shift of success in social entrepreneurship is a mission driven non-profit organization or with a profit as a byproduct or hybrid model that thrives on social improvement (Dees, 1998).

As a catalyst to social change, a social entrepreneur is driven by social goal (Peredo & McLean, 2006) and have five main criteria. Firstly, a social entrepreneur has the talent to identify market failure that is holding humanity back by adopting a mission that create and sustains social value. This is followed by continuously pursuing opportunities to improve to serve the mission through tailoring and implementing solutions. Besides that, engaging in a process of continuous improvement by learning, adapting and usage of market driven strategies to tackle the social woes. In addition, the social entrepreneur's passion will not be curtailed by the limited resources. Lastly, he or she has a sense of heightened of accountability of the constituencies served and for the outcomes created (Dees, 1984).

In the local arena, Caring Mom, E home Makers, EPIC Homes, Native, Teach for Malaysia, KakiSeni, and Soup Kitchen. This session focuses on topics pertaining to the journey of a few social entrepreneurs in Malaysia by highlighting the skills set essential to enable aspiring social entrepreneurship to make an impact to the community as well as the issue that hinders more matured social enterprise to scale up and expand their work to the community

2. Current Issues and Challenges on Social Entrepreneurship

Currently, there are about 20,000 social enterprises in Malaysia, including those operated on a voluntary basis, with about 64% based in the Klang Valley. Based on the survey of 132 social enterprise in Malaysia, a majority of them quite newly incorporated with young leader whom are between 30's to 40's and are located in Klang Valley ship is entering its fourth decade the enterprises and is not growing at a pace to catch up to solve the escalating problems of the world. In also does not have a mechanism to propel and scale up matured social enterprise to deepen their impact to the community. In Malaysia, most of the social enterprise has lack of legal

definition and recognition as a business entity. As result they operate in many other legal forms governed by various regulation and acts.

Dzuleira observed that social entrepreneurship is still in its infancy here, and people often confuse a social enterprise with a charity. But that is fundamentally wrong. Generally, to be recognized as a social enterprise, companies have to hit three main criteria:

1. The ends: the social goal of the company must be measurable,
2. The means: the company must be selling a product or a service,
3. Have a sound financial approach

Without a viable business model, it won't be sustainable in the long run. Failure Institute reported that a whopping 38.3% of social enterprises in Mexico fail within a year, so these problems aren't unique to Malaysia alone. MaGIC, as part of the Ministry of Entrepreneur Development (MED), worked to develop the Social Enterprise Accreditation (SE.A). Getting accredited offers a wide variety of benefits such as tax incentives and a listing on a public directory. The SE.A also allows social enterprises to access more support and growth opportunities, and prove their credibility. In the same Mexican study, failure to either retain or hire talents is also one of the main reasons a social enterprise will fail.

The other challenge that social enterprise is facing in Malaysia is the lack of a conducive funding ecosystem and many are supported through charity, foundation work and corporate social responsibility are early as 2013, the United Nations survey focused on all three dimensions of sustainable development—economic, social and environmental. The survey results show that more than 1 billion people are still living in extreme poverty, and income inequality within and among many countries has been rising; at the same time, unsustainable consumption and production patterns have resulted in huge economic and social costs and may endanger life on the planet. Achieving sustainable development will require global actions to deliver on the legitimate aspiration towards further economic and social progress, requiring growth and employment, and at the same time strengthening environmental protection. Sustainable development will need to be inclusive and take special care of the needs of the poorest and most vulnerable. Strategies need to be ambitious, action-oriented and collaborative, and to adapt to different levels of development. They will need to systemically change consumption and production patterns, and might entail, significant price corrections; encourage the preservation of natural endowments; reduce inequality; and strengthen economic governance.

In agriculture, organic agriculture is becoming more popular because consumers are demanding healthful and environmentally friendly food. This shift in consumer behavior is good news, but unfortunately, increased demand for organic foods has attracted large agribusiness corporations that intend to profit from the trend. However, while organic agriculture may produce lower yields when compared to conventional agriculture especially at the start, organic farming is often more profitable, delivers more environmental benefits, and is healthier in terms of increased nutritional benefit and reduced dietary pesticide exposure. It is now being viewed as an additional option to conventional or 'chemical' agriculture and not just for the niche market.

3. Current Trends on Social Entrepreneurship

Recognizing the need to tackle the socio economic fall back of COVID 19 which affects people from all walks of life .Social enterprise is environment issues as well as the need to sustain development and growth, the Philippines came up with the Sustainable Development Strategy (*PA 21 PSDN*). The nation for the Sustainable Development Strategy includes assimilating environmental considerations in administration, apposite pricing of natural

resources, conservation of biodiversity, rehabilitation of ecosystems, control of population growth and human resources development, inducing growth in rural areas, promotion of environmental education, strengthening citizens' participation, and promoting small to medium-sized enterprises and sustainable agricultural and forestry practices (*Belinda Yuen*).

As a trend, organic farming is the subject of extensive research in northern countries, especially in Europe (Kilcher, 2007). As cited by Kilcher (2007) a wide range of studies have demonstrated the advantageous aspects of this system in terms of ecosystem functioning, soil fertility conservation and economic impact. NGOs and farmers' groups are increasingly adopting organic techniques as a method of improving productivity and food security in these systems.

According to Rouse (u/d) product lifecycle sustainability is an approach to managing the stages of a product's existence so that any negative impact on the environment is minimized. The degree of sustainability is largely determined during the beginning of life (BOL) stage of the product lifecycle, in which the product is designed and developed. At this stage, decisions about materials and processes required to create the product can have a significant impact on the product's environmental footprint.

4. Future Scope of Social Entrepreneurship

To advance the role of social enterprises in Malaysia, the government should:

- Provide matching grants to social enterprises that will enable them to expand their business and provide employment for more youths and graduates;
- Encourage both public and private sector investments in social enterprises (as the third sector) where the returns are fixed to performance or outcome;
- Establish a Social Enterprise Agency or Commission, whose role is to provide technical advice and reduce entry barriers for social entrepreneurs in the country as well as to promote social enterprises as employers;
- Work with social enterprises to provide employment for people with special needs;
- Extend the Employment Retention Programme and Wage Subsidy Programme to social enterprises; and
- Provide additional and focused support to women entrepreneurs in social enterprises, as they are critical employers of their compatriots especially those from the B40 group. Citizens demand for a more sustainable, equitable world from companies and institutions.

There is a need for deeper analysis of food and agriculture, technology, pharmaceuticals and healthcare, energy and utilities, and services. Severe weather events (hurricane, fires) continue to show the economic costs of climate change. These events affect industry's ability to help people recover, disrupting supply chains and adding to food insecurity (Littan, 2018). With increasingly global supply chains running across multiple borders, improving resilience to extreme weather is not only important, but urgent. This should include the sustainability of supply chains – from transportation to water and energy conservation

Consumers demand for organic food is growing universally, partly due to consumers concerns about safety. Increased domestic and international demand for organic products, along with environmental and safety issues have stimulated policymakers and governments in some parts of the world to provide incentives for converting from conventional to organic farming. Future researches should focus on this topic not only as a need but as a necessity. Another interesting topic is the economic and environmental potential of new technology from artificial intelligence to autonomous vehicles and renewable energy. The scope is enormous. But unless it is

properly managed and regulated, it will create risk, unintended and adverse impacts, such as unemployment and growing inequality. Sustainability management will continue to face and solve climate change, energy, food production, water scarcity, biodiversity, changing demographics, geopolitical instability, inequality and global equity.

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Technology based Human Values integrated Sustainable Education

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An Overview and Future Aspects

Education in engineering and technology faculties fail to evaluate the bioethical aspects of new innovations. There are organizations that tend to manipulate and control the use of technology, which increases negative social impact. Philosophical grounds on the use of technology for the benefit of society and its implications are important. Human values and the potential of humans to either bring progress to both environment and society or destruction to both the environment and societies are matters that needs consideration. When technology and engineering deconstruct social systems governments and authorities of public services have the responsibility to collaborate to understand what is best for the vast majority and there is no harm on the lower socio economic groups. The study discusses on some important bioethical issues related to use of technology specifically to big data and artificial intelligence.

It is important that engineers and technologists involve in dialogue with bioethicists, environmentalists and social scientists through collaboration and decision making to understand the deeper consequences of the ways that innovations will impact the communities they are in.

Re-Inventing Education in the Digital Age during COVID-19

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1. An Overview

COVID-19, about which still little is unknown has been declared a Public Health Emergency of International Concern (PHEIC) as the virus has spread to many countries and territories. About COVID it is known that it is transmitted through direct contact with respiratory droplets of an infected person. This pandemic has caused immense effect on people, families and communities. The life seems to be paused due to the world wide lockdown. All the sectors including education sector are to the utmost grinding halt because of they are not ready to meet the challenge of giving protection to students and safe educational facilities required to set up during COVID19. More than 300 million student's education have been disrupted by the spread of COVID. School and Universities haven't faced this level of disruption in generations. It is important to remember that COVID does not differentiate between boarders, ethnicities, status, age or gender.[1] Our young generation is ground-breaking problem solvers and the coming age of specialists, parental figures, researcher etc. Around the globe governments are putting forth attempts to moderate the quick effect of school terminations, especially for more helpless and impeded networks, and to encourage the coherence of instruction for all through far off learning. The challenge during COVID19 presents the chance to learn, develop empathy and increase resilience for shaping carrying community.

2. Digital Education: New World of Learning

"A school is not paradise, but school is a place where paradise can be created". It continued in the same vein with the thought, "The classroom with all its limitations, remains a location of great possibility". [2] In the past few months, the traditional Classroom has converted into Zoom, Google Meet, Microsoft team. From pedagogy to 'panicgogy'. In this hastily made transition the process of teaching and learning however, has also changed due to lockdown 'work from home' trend converted into Online (to be made simple) perhaps never to return to whatever was known of teaching and learning for generations. Oscar Wilde once said, *"Education is an admirable thing, but it is well to remember from time to time that nothing that is worth learning can be taught"*. Covid-19 pandemic is clearly a sign of changing times. It has brought glaring changes across several sectors. Education is one of them. The outbreak of coronavirus resulted in the closure of schools and colleges to counter the threat of the deadly virus students are confined to their homes without a clear-cut plan on how to continue their learning. The inaccessibility to physical classrooms accelerated a new educational pedagogy, with digital at its heart. Realizing that uninterrupted learning for students is the need of the hour, educational institutions have been quick to reinvent the education delivery to students. In '*Live With COVID*' era many alternatives had been introduced to substitute the old style of working of man- machine and knowledge delivery. Being 'leader' is a challenge at the best of time, but even more so in a crisis situation like pandemic COVID 19, and this situation every teacher took a challenge to come up to the expectation of students and their parents with their teaching pedagogy in this 'New World' of learning. The field of teaching and learning also can't detach itself from such other options and radical changes are occurring in the instructive field. Every challenge opens up a new opportunity! During the "*keep social distance*" period education has many possibilities and challenges. Various learning platforms proliferate an opportunity to reach out to students in remote locations. Virtual lessons have become a popular reality, but it has its own limitations too.

3. Digitalization of Education: A Challenge

"Education is not just about classes. It is about interactions, broadening of ideas, free-flowing open discussions, debates, and mentoring of each student. While trying to do all of this, a lot gets lost in translation on the online platform.'[3] In a situation when all school, Universities are closed it's a biggest challenge for the teachers to engage the students for leaning and switch from in person to online teaching which is undoubtedly virtually limitless. Adapting self and making students acclimatize to this 'New World' of teaching and learning is a biggest

challenge because virtually teaching and learning does not mean simplifying the content, rather it is a challenge for the teachers as every single topic cannot be covered in the course. Digitalization of education is a challenge for teachers as well as for students, to simplify, there are few challenges outlined :

Challenge for Teachers:

- Online teaching takes time and practice
- There is little consensus on how students can be evaluated in a fair manner
- Inability to have a face-to-face connect with students and facilitate free conversations, discussions, and mentoring
- Inability to reach all students because of technological limitations

Challenge for Students:

- Lack of free flow conversations, debates, and discussions
- Technological difficulties related to weak devices or access to the internet
- Getting used to learning and being evaluated online
- Studying while living at home, with family and other distractions

The virtual replication of the online classes has actually resulted in bored students and exhausted teachers. It is basically an assurance of some level of engagement between the teachers and students. Online education system requires a robust digital infrastructure which goes beyond virtual classrooms that includes labs, assessments, examinations, tools for communication and collaboration, and provide analytics for instructors, institutions, students and parents. In the new era of digitalization, the role of the teacher will get redefined, as the role of knowledge-holder will no longer fit for the purpose of the future.

4. Future Scope

Change is desirable; change is inevitable. Change in fact has been forced upon us. Regardless of whether the new ways of teaching & learning will be adapted by the coming generation or will be ignored will choose whether the future generation will stun us by ignoring or criticizing or accept the digital way of learning will in fact decide the future of the coming generation Tomorrow will be a new dawn and the decision solely lies in our own hands. Concurrently, educationists will have to latch on to caring for students as whole people; fostering community and connections that facilitate learning; working to understand each student's context; collaborating with students on their learning; learning from students; responding with flexibility; engaging in conversations about the 'difficulty of now'; challenging students to learn, not just ride out the semester; avoiding isolation and collaboration within faculties; and using students and teaching colleagues as resources and sounding boards [4] In the time to come it is for sure lots has to, and will, change in the field of education, and learning. There is no going back to the 'pre-crisis' time (Pre COVID19), that is presently left behind. It is required to relinquish the course curriculum to keep pace with the digital era. The educators need to re-learn the new teaching learning strategies, and the expectations of the students, as it is the high time to interrogate the supposition of students regarding their educational requirements from teachers. With the advent of technology, the students can access the information easily and there is nothing left on the teacher's part to teach them, despite that it is required to understand the '*covering the content*' and '*content delivery*' by the teachers. In no time, the traditional chalk-talk teaching model transformed into one that is driven by technology and focuses on skill development. This has resulted in new education trends emerging to stay in the post-Covid-19 world. It is also important to say that the physical classrooms will not go away any time soon, and so what is needed is a blended learning model that incorporates both online and classroom teaching and doesn't segregate them into two different watertight compartments.

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Mathematics Curriculum Review by Advancing the Use of Learning Design Map

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An Overview and Future Aspects

This talk focuses on documentation of various junior and secondary school mathematics teaching and learning design using Learning Design Map (LDMap) based on eXtensible Markup Language (XML). The prototype has enabled the data of learning designs to be accessible and transferable across platforms (Internet, Web-based, Mobile, Windows, Mac, Linux, etc). Advancing the use of LDMap would enable this XML-based map to be more useful for mathematics teachers. One of possible achievements is in curriculum review. Empowering mathematics teachers in curriculum review is inline with teachers as curriculum evaluator paradigm. Curriculum review is a long process. Typically, the people responsible for these activities are one or two people (coordinators) who are responsible for this and it can be burdensome. Computer-based support would be helpful for curriculum review, and this study proposes initial and background to a new computer-based method for curriculum review using Learning Designs Maps (LDMaps). The LDMaps have already been developed to document expected mathematics teaching and learning experiences as required by curriculum. The proposed method can disperse the process allowing the responsible coordinators to conduct the simple task of collating available LDMaps for the review.

Health informatics support for occurrence administration using Artificial Intelligence and deep Learning - COVID-19 Pandemic Response

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An Overview and Future Aspects

The outbreaks of COVID-19 epidemic have caused worldwide health concerns since December 2019. As concluded in the studies that around 30% of patients have the critical illness and have the challenging conditions to recover. It also concluded in the research that 62% is the mortality rate from the patients those were having the critical conditions. It's now becomes very challenging and difficult to identify the patients from the infectious crowds. Now it becomes urgent to deal with this challenging situation based on the clinical data by using Artificial Intelligence, Machine Learning and decision support system. This study towards the possible solution to deal with this kind of pandemic based on the clinical data using machine learning that helps to early diagnosis and treatment of critically ill patients without failure that definitely reduce the morality rate.

Enhancing Stem Literacy Considering Reading and Arts: The Recent Initiative of MOE Malaysia

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An Overview

MOE Malaysia is currently promoting STEM for all with STEM programmes that engage and inspire students of all abilities and interest. This is to nurture STEM-literate students who are capable of logical thinking, adept at using technology, have the skills to solve problems, innovate, create new ideas, design or invent new products. These skills shall be acquired through an integrated learning of science, technology, engineering and mathematics, and a teaching and learning process that apply the real world context through open ended exploration and hands-on approach.

Elements of reading and arts are given special consideration in MOE Malaysia's STEM Education Initiative. Students need to read to become literate in STEM. In arts, creativity and aesthetic values are important part of STEM education. Thus, there are specific non formal programmes under STEM education initiative that emphasise on STEM plus reading and arts. Among the programmes are Hero to Superhero, SAM Labs STEM Challenge and Mymerits Contest Outreach.

This colloquium discuss the effort by MOE Malaysia to enhance STEM literacy by giving special consideration to reading and arts especially in non formal STEM programmes.

Co-Chair Talks

Session Theme: Pedagogy and Teacher Education

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1. An Overview

Pedagogy, in its general sense, is widely perceived as the method, and practice, of teaching. In other words, pedagogy is the know-how of teaching that encompasses, but not restricted to, the teaching theories, teaching and learning styles, teaching approaches, lesson planning, and assessment. Shulman (1987) demarcates the pedagogical knowledge from that of content knowledge. However, he advocates that each subject teacher needs to have what he termed as pedagogical content knowledge – the ability to foster understanding of concepts within the subject area of specialisation which the teacher has a deep understanding. According to Schulman (1987), pedagogical content knowledge includes

... the most regularly taught topics in one's subject area, the most useful forms of representation of those ideas, the most powerful analogies, illustrations, examples, explanations, and demonstrations - in a word, the ways of representing the subject that make it comprehensible to others. . .(It also includes an understanding of what makes the learning of specific topics easy or difficult: the conceptions and preconceptions that students of different ages and backgrounds bring with them to learning (p. 9).

Teacher education, meanwhile, connotes the preparation of staff for a professional role as a reflective practitioner. Mulenga (2020) reckons that teacher education and training aims at producing quality teachers so as to achieve effective curriculum implementation in schools. Interestingly, in the US, teacher education has replaced the commonly used term, teacher training because the latter gives the impression of involving training the staff to undertake relatively routine task, and that in-service teacher education and pre-service teacher education are the two major components of teacher education.

This session focusses on the topics that pertain to a range of pedagogical approaches, methods, models and strategies of which some authors reported on the effectiveness of certain pedagogical approaches while others advocated for an eclectic approach in teaching and learning within their own areas of specialisation. Additionally, the topics on teacher education are also covered from differing angles in terms of pre-service as well as in-service teacher education.

2. Current Issues and Challenges on Pedagogy and Teacher Education

Research has clearly indicated that a quality pre-service teacher education leads to quality teaching in schools by pre-service teachers who had undergone quality teacher education program (i.e., Hollins, 2011; Paranjodi, Jusoh, & Abdullah, 2017). By means of extrapolation, a quality in-service teacher education would also enhance the pedagogical efficacy of the serving teachers who had successfully undergone the quality in-service professional development program and this, in turn, leads to better teaching and meaningful learning of students. In other words, if and only if the pre-service as well as in-service teacher education were improved, then better and effective teaching would be ubiquitous (Ong et al., 2017; Ong et al., 2019). The effectiveness of teachers is thus considered to be the fundamental to school improvement (Roberts-Hull, Jensen, & Cooper, 2015).

However, the current scenario indicates that many teachers are not pedagogically well-ground and that the teacher education programs are inadequate. For example, the poor pre-service teacher education programs are attributed, among others, to the use of weak pedagogy (Feiman-Nemser, 2001; Zeichner, 2006), teaching practices that were not up-to-date, not based on research, or not properly understood by those who were teaching the pre-service teachers (Teacher Education Ministerial Advisory Group [TEMAG], 2014), and ill-equipping beginning teachers with the skills and ability of continually analysing and developing their own practices (Griffin et al., 2013; Hattie, 2009). Another important point to note in this current

pandemic, declared by World Health Organisation (WHO) due to the global outbreak of novel coronavirus that sees many countries declared lock-down with closures of, among others, universities and schools, teachers are struggling in conducting online classes which Kamenetz (2020) terms it as "panic-gogy".

3. Current Trends on Pedagogy And Teacher Education

Therefore, on the basis of the current scenario of the on-going pandemic which requires online teaching and learning, and also the digitalization as well as the Industrial Revolution 4.0 (IR 4.0) era in which we live in, the demand for science and technology-based talents is crucially needed (Alcacer & Cruz-Machado, 2019). Hence, the current and future trends of pedagogical approaches need to be conceptualised and propagated.

These pedagogical needs should be well integrated and incorporated into the teacher education programs. By so doing, future teachers would be well-prepared to effectively implement the curriculum in their respective schools.

4. Future Scope of Pedagogy and Teacher Education

The future, undeniably, is uncertain, just as we are currently facing a pandemic which was not imaginable prior to welcoming the year of 2020. Besides, many employers and bosses are complaining that the current workers in the workforce have not been adequate prepared in their undergraduate studies. Therefore, we must be mindful in re-thinking, re-conceptualising, and revamping (or, re-tweaking, if you like) the current teacher education programs so that when these pre-service teachers go into the schools, colleges, or institutions to teach, they are thoroughly equipped and are malleable, agile, and adaptable in the sense that they are could be easily re-skilled in today's and (future's) world of artificial intelligence, robotics, and the Fourth/Fifth/Sixth Industrial Revolution.

In addition to the IT skills, it is proposed that students should be taught learning how to learn and to solve problems and make decision, instead of learning to memorize facts and figures, and to regurgitate when being tested. These skills and abilities should be infused into the curriculum with a plethora of pertinent pedagogical approaches. Equally, it is proposed that we should bring in the working world into education when re-looking and re-framing the current curricula and teacher education programs so that students and future teachers are adequately prepared for a future world. Hence, future pedagogy needs to be researched and conceptualised and these findings could be incorporated into the future teacher education programs.

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Session Theme: Computational Thinking, Digital Technology & Engineering Education

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1. An Overview

Computational Thinking, Digital Technology and Engineering Education are among the subject discussed in this 21st learning century aligning with the fourth industrial revolution to transform customers/societal needs and provide them with satisfaction in line with change in various trends and behaviours, make it inevitable for the industries to invent cutting-edge products, goods and services that would convey exponential progress in their market. Computational Thinking commonly abbreviated as CT refers to the process of applying critical thinking and creative skills to solve complex problems algorithmically. In the process learners are expected to utilize computing strategies combined with critical thinking ability to identify and understand the problem of the digital age and proper an effective solution. In computational thinking, computer scientist approaches issues through problem-solving skills and activities following a laid down principles and guidelines that are algorithmic and heuristic [1]. Hence in computational thinking human brain and computer are of greater concerns. Digital Technologies are new brand components of ICTs supported with sophisticated machinery that could fast-track a huge amount of data and process it to the required output within a very limited time. Engineering Education refers to an educational domain that involves activities of acquiring knowledge, skills, principles and practices that are enshrined in the professional practice of engineering [2]. Engineering Education is the deliberate attempt on imparting knowledge, skills and experience that deals with the creative application of scientific and technological principles in designing and developing machines, facilities, manufacturing processes, structures that could simply and beautify the work of human and solve problems of life.

This session focuses on topics pertaining to Integration of Computational Thinking Skills in Teaching and Learning Programming using EZ-Prog among Matriculation Student, Professional Development Model for Teachers in Ipad Integration, Integration of Robotics into STEM Education for Facilitating Environmental Sustainability, Flexibility of the Photovoice Research Approach in Mathematics Education, Developing Science Comics for Elementary School Students on Animal Diversity, The Representation of Elementary Student at Cross-Age About Science Phenomenon and How to Make it Better?, Predominant Chemical Substances Causing Environmental Degradation as a Result of Climate Change: A Systematic Review, A Preliminary Study for Designing and Developing Augmented Reality-Based Module for Teaching Chemical Bonding in Nigerian Secondary Schools.

2. Current Issues and Challenges on Computational Thinking, Digital Technology and Engineering Education

Despite the significance of CT, issues and challenges are surrounding the domain which include but not limited to; Agent-based thinking challenges such as difficulty to understand how individual agent interaction generate agent behavior changes; programming challenges which involve students' inability to understand and meaning of computational constructs, inability to reuse code, methodological detect, find root causes and find out how to solve them; issues with a semantic domain, computational primitive, procedurally challenges, modularity challenges and debugging challenges[2]. This challenges would no doubt influence the nature of content and outcomes in the engineering education domain geared toward digital world. The digital technologies are comprehensive and nowadays use by an individual in all settings to create an impact on where, why, who and how learners could learner and understand a situation within a short period. Some of these digital technologies include

computers, tablets, laptops, smartphone and mobile phones supported with inbuilt applications and software. Using these technologies connection would be made to huge range of digital resources and services smartly, effortlessly, rapidly and cost effectively. Even though digital technologies are crucial to human and economic development, some of the challenging issues/tasks associated with the field include lack of clear vision to a digital customer journey, individual and organizational resistance to change, leveraging and ineffective gathering and flexibility and stackness of developmental processes in technology [3].

3. Current Trends on Computational Thinking, Digital Technology and Engineering Education

The current trends regarding computational thinking and the digital economy are directed toward the attainment of industrial revolution 4.0 goals. The goal aims to design and develop machines that could produce a range of products to transform customers' needs and satisfy them resulting from a change in latest trends and behaviours, make it inevitable for the industries to innovate cutting-edge products and services that would bring exponential growth in their market [4]. Industrial revolution 4.0 aimed at producing products and services through intelligent processes and procedures. The target is changing the entire value chain to enable proper and easy communication among customers, machines, workers, and resources [5]. Some of the components that that attracted the attention of researchers currently regarding computational thinking, digital technologies and engineering education Artificial intelligence, Robotics Process Automation, Machine Learning, Internet of Things, Virtual Reality and Augmented Reality, Cloud computing.

4. Future Scope of Computational Thinking, Digital Technology and Engineering Education

Due to the crucial role played by computers and computational thing and digital technologies in engineering education, the schools' curriculum in the future are expected to accommodate content such as increasing focus on the programming and coding, Maker spaces, coding for 3D printers, solving real world-problems and less emphasis would be given to subject content. Regarding the digital technologies, in a study carried out by Pieter, Renate, Ceulemans and Ionnides [6] the digital technologies would gradually and increasingly penetrate all parts of the society most particularly education. Hence deciding the core values in education requires a clear understanding of these technologies to grant students, teachers and educational institution an opportunity to judge which skills are required by the society and improve teaching and learning processes. Also due to the diversity, complexity and speed of development of societal issues/problems coupled with demand for education and educationist to fully develop a proactive and sustainable strategy that could deal with challenges of life, educational institutions are challenged to develop an inter-institutional approach that could make the technologies work in better and proactive ways.

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Session Theme: Business, Economics and Tourism

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1. An Overview

Tourism businesses have been enjoying a consistent growth for the last six decades and has become one of the most important drivers of economic growth in many countries and regions. The importance of tourism has been known in vitalising economy, social and cultural significance while offering opportunities for sustainable and inclusive development. Tourism advocates consistently needed to develop and implement integrated and forward-looking policies in ensuring the growth that able to sustain benefits for the tourists, local community and destinations.

2. Current Issues and Challenges

The year 2020 has been everyone's worst nightmare for businesses especially for those in the tourism industry. The nature of tourism industry made it very vulnerable to the uncertain economic outlook caused by external shocks such as health crises i.e. pandemic and extreme weather events. The lockdown due to the pandemic almost halted global travel where some airlines completely stopped flying with many hotels and restaurants have to be temporarily closed. In response to the pandemic, governments around the world are adjusting their policies and putting in place strategies so that tourism businesses and local community are able to develop resilience towards the current downturn in the industry.

3. Current Trends

There are two prominent current trends for the year 2020, which are the rise of ecotourism and the digitisation of tourism. These two trends are already on the rise many years ago and its development this year has been propelled with incredible speed with the current global health crises. Ecotourism will enjoy more limelight as sustainability agenda continues to be pushed by United Nations. The decade of Sustainable Development Goals directly promotes ecotourism as solution provider to local community development, conservation of the natural resources and developing rural or urban destinations. Digitalisation in tourism, in the beginning, is looking into transforming and reshaping the industry that enables consumers to travel in extraordinary numbers and giving most tourism businesses an instant access to global markets. Nowadays, returning the confidence in travel during the pandemic area will be largely depending on digitisation such as developing e-health passport, live-streaming for pre- and post- travel purchase decision in enhancing tourism experience or data security. Tourism businesses that do not invest in digitalisation may have trouble in surviving or thriving in the industry. Governments have to play the prime role in creating the right ecosystem to maximise opportunities for businesses in digital transformation while protecting consumers for new and different challenges from this transformation.

4. Future Scope

The public and private sector in many countries will strive to create more sustainable tourism industry in the future. Climate change was and still the biggest threat to the global community and now the global health crises has added to the burden. Since the impact of the global health crises has brought tourism to a halt, the industry has started to respond with promoting low impact tourism such as ecotourism and ensuring safe yet efficient travel through digitisation. These are added to the effort in strengthening local tourism market, which is the regularity in any crises for this industry. It will be a while before tourism industry return back to what was known as 'normal'.

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Session Theme: Mathematics Mobile Applications (MMA)

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1. An Overview

Developed countries are not left behind from technology. Education in developed countries is based on technology. Pertaining to this matter, numerous technologies have been innovated by experts for educators to make daily lessons fascinating. Among those, mobile phones have new features that are made to suit education, especially in mathematics. The available software and online applications for mathematics classroom are GeoGebra, MathRush, MobileMath, Studierstube, Angle Tool, Video, Algosketch, Multiplication Genius, Mad Math, Pop Math, Flash to Pass, Math Drills, Math Magic, Flowmath and Multiplication Flashcards to Go, Sara Skates, Birthday Café, Jungle Gym, BubbleFun, Breakfast Time, Lemonade Stand, Photo Friends and ParkPlay, AGILMAT, Web-based Mathematics Education (WME) system, and 4MALITY. According to Handal, El-Khoury, Campbell and Cavanagh (2013), all these applications were categorised into nine; (1) emulation, (2) simulation, (3) guided discovery, (4) measurement, (5) drawing/graphing, (6) composing, (7) informative, (8) drill and practice, and (9) tutorial apps. The studies by Drigas and Pappas (2015) revealed that mobile learning applications motivate students, make mathematics courses more fun and interactive than ordinary teaching practices.

2. Current Issues and Challenges on Mathematics Mobile Applications

Besides, the need for mobile applications in the classroom requires further study as many applications can be found in the search engine, which helps in the mathematics classroom. Some of the ASEAN countries allow students to bring their gadgets to the classroom for learning. Research has proved that 92 % of the learners were in favour of learning after using mobile applications (Hamat, Embi & Hassan, 2012). Meanwhile, the participants revealed that they prefer to learn by mobile applications. Rationally as the mobile applications help the students understand more with the aid of audio (native speaker audio) and the sample graphics have been displayed in the applications. The users were also stated to be happy with high applications (Chachil, Rias, Engkamat, & Sarkawi, 2015). The achievement of students in Math Education increased by using mobile phones in the classroom (Kachepa & Jere, 2014). The word mobile learning is intended to provide students with information through wireless Internet and mobile devices, including cell phones, personal digital assistants (PDAs), smartphones and tablet PCs.

Statistics is regarded a teaching and learning activity that is very complicated. Researchers performed various research on the attitudes of students towards statistics to strengthen the statistical learning and teaching processes, and the results showed that it could affect the thinking process of students as well as their academic performance (Zhang et al., 2012). Many of the applications need to be paid and mostly focused on notes. Only a handful of applications have both notes and calculator capabilities, which requires an internet connection and are not user friendly. Consequently, based on several evaluations of mobile applications for a statistics course, students should have a mobile learning application that has almost all the functionality of statistical software packages, free and can be used everywhere, anywhere and anytime without concerning about internet connectivity. In the future, more versions should be created so they can discuss all the topics in the Statistics Course.

3. Current Trends on Mathematics Mobile Applications

Mathematics subject consists of four major branches, which are number, algebra, geometry, and statistics. Mobile applications in these four branches playing an essential role in promoting mathematics lesson among students in the World. The mobile applications help the teachers to identify the topic and relevant applications on a specific topic to make the lesson more meaningful. Recently, many online learning applications and tools for mathematics have been developed and presented. Such learning applications could be used at anytime and anywhere by the students, via portable devices using wireless communication. Researchers throughout the world conducted much research on the usage and mobile applications in education, especially mathematics.

The review of mobile applications revealed that the process of learning to happen anytime and anywhere. A study conducted by Botzer et al. (2007) with the samples of four female students using phone applications revealed that mobile phone applications encourage students' engagement in learning mathematics and promote better mathematics' achievement among students.

In another study, scholars studied the use of mathematics software in the tablet for primary school students. This study was participated by 60 students of 4th grade from Pennsylvania. This software allowed the teachers to monitor their students' performance and how the students engage with the given task. The findings of this study showed that mathematics teachers were facing problems when integrating their curriculum into the application of mathematics software system. Still, the teachers mentioned that the software promotes teaching skills (Petty et al., 2007).

PDA's (Personal Digital Assistants) also playing a crucial role in promoting mathematics learning among students. Wachira et al. (2009) conducted a study integrating inquiry-based mathematics in PDA involving ratio, data analysis, measurement, and geometry. This study was participated by 20 mathematics trainee teachers from Midwestern University. At the end of the slot, the participants were given opportunities to state their views on the usage of PDA in teaching and learning mathematics. The findings informed that most of the participants commented that the PDA was an exciting and valuable technology aid for mathematics lessons. Besides, they wanted to explore further the PDA to create more compelling experiences for their students.

Wang et al. (2003) developed an open Mathematics Education (WME) program based on the Internet, using standard Internet technologies. This system allows users to create unlimited mathematics lessons and materials. The system also connected to Mathematical Education Markup Language (MeML) and delivered pages. Besides, mathematics teachers benefit from the system by enhancing mathematics lessons using technology.

In the year 2007, Tomas, Leal, and Domingues innovated another web application called AGILMAT. AGILMAT mainly designed to help students in high schools for topic algebra. This application auto-generate questions based on students' capabilities and preferences. Besides, teachers can alter the problems by changing their values. This innovation favour to mathematics teachers to assign algebra task to students based on students level and capabilities.

Edwards et al . (2010) invented 4MALITY, which is known as the Web-based mathematics tutoring framework. 4MALITY modifies by using the Artificial Intelligence Judgment System according to the level of students' knowledge. The program consisted of four types of learning styles: Clarify questions about the language used, computational mathematical activity, methods for evaluating and problem-solving, and computational visual approaches. Mathematics eachers can make use of the full advantage of 4MALITY when preparing their lessons.

4. Future Scope of Mathematics Mobile Applications

The emergence of applications in the education field has contributed to the development of new methods of learning. There are fun games on mobile devices, especially for mathematics education that engage the students in a positive thinking process and help them appreciate issues from a different viewpoint. Besides, students, these days are usually very fond of learning online. It is where applications from libraries and applications from book searches come into the picture. These applications search for the right study material in the mobile application pure for the students. It brings them closer to the content they research and allows them to segregate their study materials over the Internet.

Furthermore, many other student-related activities can be achieved via mobile apps, such as online school payments and payments for other purposes. It saves the time to wait in a line at school and pay the fees for different purposes. Also, the attendance-management apps control student attendance so that teachers can keep a close eye on the students. It can be argued that institutes can't pay equal attention to all students according to conventional methods. Today, however, they can all be reached out. School communication applications enable each student to be given information; they can inform them about new schedules, various forums, different conferences, and social school activities.

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Session Theme: Computational Mathematics -Research and Education

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1. An Overview

The scope of iCon-MESSSH'20 encompasses a wide range of challenges in the area of the Academics and Industry, and this session focuses on topics of Computational Mathematics. The research of Computational Mathematics is an important foundation for the application of computers in Management, Engineering, Science, Social Science and Humanities. The United Nations defined the goals of our society as the followings in [1].

The Sustainable Development Goals are the blueprint to achieve a better and more sustainable future for all. They address the global challenges we face, including those related to poverty, inequality, climate change, environmental degradation, peace and justice. The 17 Goals are all interconnected, and in order to leave no one behind, it is important that we achieve them all by 2030. The goal of this session is to contribute to the need of society mentioned above by the application of computers. Computational Mathematics is the research field where computing plays a central and essential role. Branches related to computational mathematics are:

- Numerical methods used in solving mathematical problems
- Stochastic methods used in probability and statistics
- Computer simulation methods used in the fields of science and technology
- Computer-assisted research in various areas of mathematics

See [2] and [3] for the details of the contents of these branches.

Recently, we have got a new branch that is closely related to computational mathematics, and it is computer-based mathematics that is a new approach to mathematics education. In computer-based mathematics, students can use mathematics software that can do many kinds of calculation including differential calculus, symbolic calculation etc. With computer-based mathematics, we can educate young people so that they can meet the need of the modern world.

2. Current Issues and Challenges in Computational Mathematics

One of the most important topics of computational mathematics is mathematical modeling of the problem. Solving real world problems consists of two steps. The first step is to make a mathematical model from the original real world problem, and the second step is to convert a mathematical model to a problem that can be calculated by computers. This is also true for the application of the artificial intelligence to the real-world problems.

In May 1997, a computer chess system Deep Blue defeated a reigning world champion in a match under standard chess tournament rule, but at that time, many people thought that it would take many decades before the time for a Go computer system to defeat human Go champions came, since Go has a lot more complicated data structure as a game.

In 2017 a computer Go system AlphaGo Master beat Ke Jie, the world No.1 ranked player at the time in a three-game match, and this shocked many researchers of artificial intelligence. The researchers who made the computer Go system used the technology called "deep learning".

Since professional chess players and Go players are one of the most intelligent people in the world, many people thought that AI (the artificial intelligence) defeated human beings in intelligence. In a sense, this is true. AI really defeated human being in the most well known and intelligently difficult games, but we have to know that the implementations of Games such as chess and Go in computer system are relatively easy compared to the implementation of problems in other research fields. Chess and Go are called combinatorial games, and combinatorial games are one of the branches of mathematics where computers are very powerful tools.

On the other hand, it is quite difficult to deal with problems in other field by computer. For example, the basics of college mathematics such as continuity of functions or cardinals of sets are very difficult to be implemented in computers. Therefore, if we want to use AI for our research in varieties of branches, we have to convert problems into problems that can be calculated by computers.

Since, it is quite difficult to convert real world problem to a problem computable by computer, the modern world needs mathematics education in which students can learn to make use of the power of computers. Conrad Wolfram who is one of the best known leader of computer-based mathematics said "The maths taught around the world today does not fit how it is used in the real world. Computation technology is more accessible than ever before, but no curriculum in the world assumes it exists. Instead, it is focussed on the mechanics of hand calculation, rather than the essence of real-world maths" in [4].

3. Future Scope of Computational Mathematics

The modern world is full of difficult problems to be dealt with human beings, and some scientists thought the destiny of human being is at the stake. Human being should solve these problem with its utmost intelligent power. Since computers have given human being in modern world an intelligent power that could not be imagined in the past world, and hence the role of computational mathematics is crucial in solving difficult problems.

The basic research and the application of computational mathematics are most important themes in the Academics and Industry. Because there are too many difficult problem for computational mathematics, cooperation of researchers are more important than the competition between researchers. The education of students who are to do research of computational mathematics is becoming more and more important. Computer-based mathematics can be a crucial element of the future mathematics education. The idea of computer-based mathematics is that even high school students can study a real world problem if they use a good mathematics software. In this way, computer-based mathematics can prepare students for their future. For the detail of computer-based mathematics, see [5].

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PART - A
STEAM

The Effect of Prior Programming Experience on the Use of Binary Tree Learning System to Promote Algorithmic Thinking in Computational Thinking

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Abstract: This study examines how block-type programming experiences and coding experiences with programming languages affect the computational thinking scores on the binary tree (yes/no chart), which is useful in fostering algorithmic thinking in computational thinking. We developed a binary tree system based on the figure classification to foster algorithmic thinking, which is one of computational thinking. It evaluated its effectiveness and the impact of block-type programming experiences such as Scratch and coding experiences in programming languages C, Java, Python, etc. CT scores increased significantly, and the time it took to answer the problem (answer time) decreased significantly in pre and post the system experience. However, there was no difference in CT scores and answer time with or without prior programming experience (block programming or coding experience). Therefore, it is suggested that the promotion of algorithmic thinking, a type of computational thinking using a binary tree, is valid regardless of whether students have any programming experience.

Keywords: Algorithmic Thinking, Binary Tree, Computational Thinking, Figure Classification, Yes/No Chart

Mathematical Games of Dice - A Research Based Calculations Using Computer Algebra Systems

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Abstract: In this paper, a game in which each player throws several dice is examined. The winner is the player whose sum of the dice he/she throws is higher than that of any other player. This rule makes it a straightforward game, but certain facts on the probability of winning are discovered. First, a variation of the game in which players use three standard (6-faced) dice or a 20-faced die is studied. It is found that if player α with three standard dice plays against player β with a 20-faced die in a two-player game, the probability of winning is the same for each. Conversely, the player with the 20-faced die has a better chance of winning when the number of players participating in the game is greater than two. The game is also studied using different dice, which leads to the discovery of a sufficient condition of dice combinations for a player to increase the likelihood of winning against more than one other player. These mathematical facts are described via the computer algebra system Mathematica. There does not appear to be a game with the same mathematical structure as the game treated in this article, although it is natural to select a person out of many people by random methods. Furthermore, it is essential to know the advantages and disadvantages of the selection process of a person in such a process. Thus, the topic treated in this article is worth studying.

Keywords: Computer algebra system, n-faced dice, probability theory, sum of dice.

A Variant of Bogus Nim - Experimental Mathematics Approach

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Abstract: The authors present the result of research on a winning strategy of mathematical game calculated by computer. They used "Bogus Nim with a push" as their topic. In Bogus Nim, there are coins on a strip of squares, and you have at most one coin on a square. Two players take turns, and slide a coin leftward as far as possible, up to, but not onto or over, the next coin, not off the end of the strip. The player loses the game when he or she cannot move a coin anymore. "Bogus Nim with a push" is a game proposed by the authors. In this game, players can move one of the coins at a time as in Bogus Nim or two coins simultaneously by pushing a coin with another coin when they are adjacent. When this game use two coins, the authors discovered formulas of Grundy numbers by computer calculations, and confirmed these formulas for the game on a strip of certain size. With formulas of Grundy number, we have a complete understanding of mathematical structure of the game, and hence they have a winning strategy. As for the game of three coins, they could not find formulas of Grundy numbers, but they discovered formulas for P-positions that are previous player's winning positions. Since the mathematical proof is not complete, the result is a discovery in "experimental mathematics". In this study, we present sample calculation code using computer algebra system Mathematica.

Keywords: Bogus Nim, Experimental Mathematics, Nim, Grundy number

Flexibility of the Photovoice Qualitative Research Approach in Mathematics Educations

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Abstract: The paper aimed at exploring the flexibility of the photovoice qualitative data collection approach, the approach was predominantly used in the health sector. The researchers are intending to explain the use of the approach in the area of mathematics educations. The researchers reviewed some past researches conducted using the approach in the health sector. Photovoice is a process whereby people can describe, identify and come out with some possible solution to the particular problem of a certain phenomenon with the use of specific photographs technique and analyzed the photographs with the help of interview techniques. The researchers employed the explanatory qualitative research design. Past researches on Photovoice were analyzed and discussed purposely to unveil the flexibility of Photovoice in some areas of mathematics educations. The advantages, limitations, and steps involved in conducting the approach in mathematics education were also addressed. Some areas where the approach is applicable in mathematics educations were highlighted and discussed. Among the area, the approach is flexible include; classroom management, students' behavior in the mathematics classroom, students with a learning disability, among other areas.

Keywords: Mathematics, Education, Flexibility, Photovoice

A Preliminary Study for Designing and Developing Augmented Reality-Based Module for Teaching Chemical Bonding in Nigerian Secondary Schools

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Abstract: The conventional strategies for teaching chemical bonding in Nigerian secondary schools, mostly utilizes two-dimensional images and structures either on paper sketches or boards drawing. As a result of these adverse situations, chemistry students in Nigeria have no background knowledge and skills in 3D chemical structures and could influence their visualization skills in learning abstract concepts. In this regard, it is considered imperative to adopt digital technologies such as augmented reality to convert the two-dimensional structure to three-dimensional. This study investigated the chemistry teacher's opinion on the need for designing and developing an augmented reality module for teaching and learning chemical bonding Nigerian secondary school. It involved descriptive research design with a questionnaire validated by three experts in chemistry and technology education as well as thirty (30) chemistry teachers as respondents from the schools under Sokoto State Ministry of Science and Technology selected using a purposive sampling technique. Their responses were analysed using descriptive statistics. Most of the respondents indicated low spatial visualization skills, spatial reasoning skills and achievement among the students due to low clarity of dimensions of images utilize. They further agreed that it is suitable to incorporate three-dimensional and digital graphics into the real-world learning environment for chemical bonding and use of a mobile phone to present the chemical bonding mechanisms, shapes and structures even though 90% of them are not aware of the augmented reality and its principle guidelines in teaching.

Keywords: Preliminary studies, Chemical bonding, Augmented reality, Strategy, Module

Professional Development Model for Science Teachers in iPad Integration

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Abstract: The purpose of this research is to develop a professional development that could guide the teachers to design their own teaching practices which could move towards the iPad and thinking skills integration. The researcher will study and compare the previous professional developments and theoretical frameworks used in iPad-related research to construct a professional development model that could allow Science teachers to plan, implement and evaluate their own iPad lessons while taking into the account of curriculum needs. Henceforth, this research uses the design-based research to improve the educational practices of teachers in iPad and thinking skills integration while contributing new elements to the theory based on the collaboration between the researcher and teachers. The researcher would integrate a variety of research methods and approaches from both qualitative and quantitative research paradigms, depending on the needs of the research.

Keywords: professional development, thinking skills, iPad integration, Science teachers

Integration of Computational Thinking Skills in Teaching and Learning Programming using *EZ-Prog* among Matriculation Student

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Abstract: Excellent academic achievement can have a great impact on matriculation students and influence their decision-making in the next step at the university and the future. However, poor problem-solving skills in programming subjects makes it difficult to make good decisions. Therefore, this study was conducted to identify the effect of using EZ-Prog in programming problem-solving learning among matriculation students. EZ-Prog is built by integrating computational thinking skills. Students are guided to use EZ-Prog during the programming problem-solving process. The study population came from the Kolej Matrikulasi Johor (KMJ) and the sample involved was the 91 students from the One-Year Science Program, Module Two. The experiments were conducted in three weeks. The pretest and posttest question set consisted of three subjective questions and classified into three levels of difficulty according to Bloom's Taxonomy. Data were analyzed using SPSS. The results showed that there was a significant difference between the pre and posttest results after using the EZ-Prog. This demonstrates the EZ-Prog technique used in learning programming problem-solving learning enhances student problem-solving skills and computational thinking skills. The implications of this study indicate that EZ-Prog can be used in learning and teaching algorithms, especially programming problems. Finally, the positive findings from the use of EZ-Prog indicate that this technique can be used as an innovative in teaching programming as it enhances problem-solving skills and computational thinking skills among students. This method is not limited to matriculation students, but also all students that learn a programming language and not limited to one programming language.

Keywords: Algorithms, Polya Model, Problem Solving Skill, Computational Thinking Skill, Programming Problem Solving, Programming, Computer Science, Computational Thinking, STEM.

Predominant Chemical Substances Causing Environmental Degradation as a Result of Climate Change: A Systematic Review

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Abstract: Chemical particles and molecules (especially gases) in the air affect climate and interact chemically in heretofore unrecognized ways with atmospheric, stratospheric and tropospheric gases. These This study intended to find out the most reported chemical substances causing climate change as a result of human activities on the planet and to discuss their chemical processes and the consequences of their formations and destructions resulting to climate change. Thus, the study adopted a systematic review of articles published between 2009 to 2019. After a series of screening, about 15 articles were selected from the search result of nine search engines and journals. The findings indicated that the predominant chemical compounds and molecules causing climate change include hydroxyl (OH), carbon dioxide (CO₂), Non-Methane Hydrocarbons (NMHC) and Greenhouse gases like methane (CH₄), water vapour (H₂O), ozone (O₃) and nitrous oxide (NO_x = NO + NO₂). It also indicated that researchers focus on the chemistry and processes of chemical substances in stratosphere, troposphere and atmosphere.

Keywords: Climate Change, Greenhouse Gases, Atmosphere, Ozone, Global Warming

Developing Science Comics for Elementary School Students on Animal Diversity

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Abstract: This study aims to explore how the feasibility of science comic is developed in fourth grade science learning about animal diversity. This study uses research and development based on the ADDIE development model (Analysis, Design, Development, Implementation, and Evaluation). The instruments for data collection were questionnaires for product validation with experts, teachers, and students. Data analysis techniques used were validation test using 4 point Likert scales, and the data analysis for product trial was the 5 point Likert scales. The results showed that the media and content validation of science comics were valid. The teacher also gave positive respond to the science comics that have been developed with the category of very feasible, and this result was also similar to students' respond to the questionnaire. In the pilot test, the teacher and students also gave a similar result to the quality of science comics. This finding indicates that the science comics are feasible and can be used by students as a learning instruction. While, this study recommend that further research can conduct a study to test the effectiveness of student learning by using science comics.

Keywords: Animal diversity; media; science comics; science learning

The Representation of Elementary Student at Cross-Age About Science Phenomenon and How to Make it Better?

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Abstract: Misconceptions about the phenomenon of science are experienced by early childhood to adulthood and are not easy to change. The purpose of this study was to determine the conception of children aged 9-15 years about several scientific phenomena related to physics and biology. This research uses survey method with cross-sectional design. The research instrument was in the form of a three-tier conception test about the phenomenon of science. Participants answer questions online using Google Form. The data obtained include the participants' identities (name, gender, class and school) and their answers to the problem of natural phenomena (true or false, confidence in the answers and underlying reasons). The results showed that the majority of children aged 9-15 years experienced misconception about free fall, gravity in outerspace, and sinking and floating. To be able to provide their conceptual change, one alternative learning strategy recommended is cognitive conflict aided by visual multimedia and supported by hands-on activities.

Keywords: misconception, science phenomenon, conceptual change, cognitive conflict

Integration of Robotics into STEM Education for Facilitating Environmental Sustainability

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Abstract: This day, increasing attention demonstrated in developing innovative tools for improved teaching and learning of Science, Technology, Engineering, and Math (STEM) for environmental sustainability made robotics not only an outstanding tool for hands-on learning but of general topics in secondary school education. Robotics help learners transmute abstract scientific, engineering and technological concepts into concrete one for the understanding real-world environment, hence countries like China, Japan, Russia and the United State of America organized robotic competitions for secondary school STEM subjects to cultivate in students, the intelligence and talent in the future/upcoming generation. This study is a quantitative research that investigated the feasibility of integrating robotics into STEM education to facilitate classroom instruction in secondary schools. The undergraduate and postgraduate students of two technological-based universities from different continents were chosen as the respondents of the study. The study which adopts purposive sampling technique distributed Online Survey to 357 respondents for which 197 responses were retrieved and are analysed using statistical package for social science 25.0. The results indicated that majority of the respondents (mode, 5) agreed that robotics could be used to teach programming, problem-solving science, engineering, technology, design and even music and art to learners at all levels of their secondary school education. Moreover, over 80% strongly agreed that integrating robotics in teaching and learning processes would facilitate classroom instructions in secondary school. Thus, it is high time for educators to encourage the development and implementation of robotics in secondary school's instructional processes.

Keywords: Robotics, secondary school, classroom instruction, science, technology, engineering

Research on the Technology System of Improving The Livability of Traditional Residential Architecture Based On The Construction Dimension - Taking Zhangzhou Area of Fujian Province as an Example

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Abstract: in historical districts, traditional villages and other areas with historical features, a large number of ordinary traditional architecture with general features form the foundation of the overall features, which is the bearing space for the living and living functions of community residents, but there is a general contradiction between retaining the traditional features and improving the livable life. Based on a large number of research on traditional architecture in Fujian, this study takes traditional architecture in Zhangzhou as the specific research object, takes the perspective of 'the observer' of researchers and the perspective of 'the inhabitant' of users, returns to the origin and residential attribute of traditional architecture construction, aims at improving livable environment, takes construction as the technical path, and combines the management and control means of historical areas to explore a kind of original houses The concise upgrading technical system of the principle and basic technical requirements can effectively improve the living environment of traditional residential buildings under the guidance of the government and the residents as the main body of repair, avoid the negative construction that damages the historical style and provide technical support for the coexistence and development of the traditional residential style and modern life style.

Keywords: historical area; regional architecture; construction technology; Fujian traditional architecture; Zhangzhou traditional architecture; traditional architecture repair technology; livable environment

Applying STEM Concepts to Make a Blind Stick through Engineering Design Process

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Abstract. The purpose of this study is to describe a STEM learning process that enable students to apply STEM concepts through engineering design process. Through a qualitative methodology using a case study design, we analyzed multiple data source. A teacher and 30 students of grade 12 participated in this study. This research data was collected through observation, interviews, and documentation. The results showed that students succeed to make a blind stick in a STEM learning process. It was possible because the teacher optimizing engineering design process, especially research step, and scaffolding technique. Through these combinations, students had opportunity to understand and apply the STEM concepts that necessary to design and create a blind stick. However, students have different attempt to finish the project.

Keywords: STEM, real-world problem, secondary

The Effects of Space-Time Cognitive Teaching Method Toward Performance of Long Jump Technique

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Abstract. Objective: The understanding and memory of the concept of action space-time cues can better promote learning effect, and athlete's perception of motion space-time procedure is an important factor affecting skills performance. Therefore, there is a high interest in the study of training methods that can improve these attributes. One such training method is the space-time cognitive teaching method, which was uses on the experiment of long jump teaching. The studies attempted to compare the effects of Space-time Cognitive Teaching Methods with Traditional Long Jump Teaching Method toward students' long jump skills performance and the perceptive ability. Method: Thirty-six male subjects in college sports were randomly divided into space-time cognitive teaching group (n=18) and traditional long jump teaching group (n=18) to participate in the 12 weeks long jump technology teaching program. Results: Before the start of the teaching plan, there was no significant difference in the basic physical quality of the space-time cognitive teaching group and the traditional long jump teaching group ($p>.05$). After the completion of the teaching plan, there was no significant difference between the long jump standard scores (measuring the distance score) of the two groups ($p>.05$). However, there were significant differences in the impact of the long jump technical evaluation score and observation, analysis and problem-solving performance ($p<.05$). The second result show that space-time cognitive teaching methods is more effective than traditional long jump teaching method in improving the long jump technique to evaluate score and the cognitive ability of observe, analyse and solve the problem ($p<.05$). Conclusions: The space-time cognitive teaching method are more effective than the traditional teaching methods in improving students' long jump skills performance and the perceptive ability to observe, analyze and solve problems.

Keywords: Space-time cognition, long jump score, perceptive ability

Examining the STEM-Science Achievement Test (SSAT) Using Rasch Dichotomous Measurement Model

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Abstract: The main purpose of this study is to develop a valid and reliable instrument for measuring the STEM-Science Achievement Test (SSAT) of primary school students in Malaysia. The instrument was developed by researcher with the integration of STEM elements and by referring to the Malaysia National Curriculum Standard. The development focused on six topics in science Year 4 (Y4) primary syllabus; Scientific Skills, Life Processes of Human, Properties of Materials, Measurement, Solar System, and Importance of Technologies in Life, and six topics in science Year 5 (Y5) primary syllabus; Rules and Regulation in Science Lab, Life Processes of Plants, Acid and Alkali, Electricity, Earth and Space Science, and Technology and Sustainable Life. There are 226 of Year 4 and 226 of Year 5 primary school students in Sabah responded to the instrument developed to test their STEM-Science knowledge. Rasch Dichotomous Measurement Model approach was used to evaluate the validity and reliability of the SSAT. The validity (item polarity (PTMEA-CORR), Principal Component Analysis of Residuals (PCAR), Mean Squared (MNSQ) infit and outfit) and the reliability (Cronbach's alpha, item reliability and item separation) were being assessed. The results Rasch Dichotomous Measurement Model analysis show that all scales were unidimensional for objective and subjective items. For objective items, the Cronbach's Alpha is .81 (Y4) and .83 (Y5), Item Reliability is .95 (Y4) and .95 (Y5) whereas Item Separation is 4.21 (Y4) and 4.25 (Y5). For item validity, PTMEA CORR were found positive varies between; .03 to .44 (Y4) and .05 to .47 (Y5) after item deletion has been made. Principal Component Analysis of Residuals (PCAR) showed that raw variance explained by measures in Eigenvalue unit is 9.8 (Y4) and 10.7 (Y5), variance unexplained is 60.0 (Y4) and 58.0 (Y5) and variance unexplained in Contrast 1 is 5.1 (Y4) and 3.7 (Y5) respectively. Standardised Residual Correlation for Year 4 and Year 5 objective items showed satisfactory value for none of item correlation exceed control level of .7. There are 5 items misfit in year 4 and 12 item misfit in year 5 objectives test and items need to be revised. For subjective items, the Cronbach's Alpha is .78 (Y4) and .84 (Y5), item reliability is .91 (Y4) and .93 (Y5) whereas item separation is 3.27 (Y4) and 3.56 (Y5). For item validity, PTMEA CORR were found positive varies between 0.0 to 0.50 (Y4) and 0.01 to 0.54 (Y5) with no item deletion. Principal Component Analysis of Residuals (PCAR) showed that raw variance explained by measures in Eigenvalue unit is 22.9 (Y4) and 14.1 (Y5), variance unexplained is 96 (Y4) and 70 (Y5) and variance unexplained in Contrast 1 is 4.5 (Y4) and 3.0 (Y5) respectively. Standardised residual correlation for Year 4 and Year 5 subjective items showed satisfactory value for none of item standardised residual correlation exceed control level of 0.7. The assessment of SSAT has shown that the instrument is a valid and reliable to measure Malaysian primary students' knowledge in STEM-Science.

Keywords: STEM, Science, Primary School, Validation, Rasch Measurement Model, Achievement Instrument

PART - B
Educational Technologies

Developing Robotics Competition-based Learning Module: A Design and Development Research (DDR) Approach

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Abstract: This research aims to design and develop a training module that integrates Science, Technology, Engineering and Mathematics (STEM) and robotics competition to promote students' interest in STEM careers. In this research, the Type 2 design and development research (DDR) approach proposed by Richey and Klein (2007) was used. This research design consists of three phases of development consisting of Phase I Needs analysis phase, Phase II Design and development design phase and Phase III Implementation and assessment phase. Therefore, the methodology of this study focuses on the study objectives which are to propose a Robotics Competition-based Learning (R-CBL) framework and to develop Robot Olympics STEM (RO-STEM) Module based on the proposed framework, and lastly to assess the effectiveness of the module in term of students' interest in a STEM career. The researcher discusses a detailed perspective of the methodology in this research design, including participants and setting, instrumentation, procedures, and data analysis. In Phase I, document analysis and needs questionnaire were used to obtain the qualitative and quantitative data. In Phase II, Fuzzy Delphi analysis and Modified Nominal Group Technique were used to in design and developing the module. Lastly, in Phase III, a quasi-experimental one-group pretest-posttest design was carried out to assess the functionality of the module.

Keywords: STEM, Design Development Research, Robotics Competition

Exploring Problems in Learning Biology: Students' and Teachers' Perspectives, in Perak, Malaysia

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Abstract: Biology is one of the science subjects that has small number of student enrolment and is known as a hard subject where abstract concepts were generally taught. These abstract concepts contributed to the difficulties in learning biology and low interest among the students. A qualitative approach was utilized to answer the research questions. Individual interviews with ten students and four biology teachers, and document analysis of ten students' biology notebooks were carried out to collect the data needed. Findings of the study reveals that four major factors; teacher, parents, self and infrastructure contributed the problems faced by the students in learning biology. The findings of the study will be beneficial to the students and biology teachers as the causes that contribute to the problems in learning biology can be identified and rectified so that student's negative perception on biology can be changed.

Keywords: Biology, Exploring problems in Learning Biology, Learning Biology, Problems in Learning Biology

Lifelong Learning in the Era of IR4.0: A Concept Analysis

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Abstract: To remain competitive and to stay relevant in the era of IR4.0, lifelong learning is indispensable. This paper is consonant with the various initiatives by the Malaysian government and the UNESCO to constantly reskilling and upskilling the workforce and enculturating a 'Nation of Lifelong Learners'. There is a need for a clear and common understanding of the concept of lifelong learning to assist in the development of effective model and strategies to create a culture of lifelong learning in higher education institutions. The concept of lifelong learning will be examined based on the method developed by Walker and Avant (1995) that identifies the attributes, antecedents and effects of lifelong learning constructed upon the findings of literature review. This study will be useful to Malaysia's education policy to raise the quality of employable workforce and to develop solutions for Malaysians to keep abreast of the technological shift in the era of IR4.0.

Keywords: Lifelong Learning, IR4.0, Higher Education Institutions, Malaysia

Initiatives of Malaysian higher education in embracing IR4.0

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Abstract: Global economy is changing rapidly in the fourth industrial revolution (4IR). The prosperity of a nation's economy is closely linked to its successful education system to build human capital that is employable in the 4IR environments. In considering this scenario, higher education must surf the waves of change. This paper aims to scrutinise the initiatives launched by the Government of Malaysia to develop an education system that is future ready. The higher education sector plays a pivotal role in preparing graduates with ways of thinking and working that are in demand in the 4IR era. The fourth industrial revolution and its significant implications for the future of work present the higher education sector with a unique opportunity to create a culture of lifelong learning to ensure the continued relevance of the global workforce. With this in mind, the global 4IR trend in other nations will also be reviewed in this paper.

Keywords: Malaysia, Higher Education, IR4.0, Lifelong Learning

Visual Learning Tools for Sports and Physical Health Education: A Reflective Study and Challenges for the Ways Forward

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Abstract: Sports have gained a prominent place in societies that are strongly influenced by the national movement and policies. It is believed that sports as part of physical science/health education is the best mode to produce physically and mentally active students. This article illustrates the experience of the first author as an amateur footballer who explored various ways of improving sport science training in football supported by e-tools/blended-mode platforms through two cycles of collaborative reflective practices anchoring on the framework of sports science of human movement and health psychology. Elaboration is made on how self-directed/self-accessed/self-paced visual learning and e-tools could affect self-confidence and motivation of amateur athlete. During first cycle, systematic review was conducted to exemplify how technology-enhanced visual learning (VL) and e-tools displaying biostatistical data were used for sports especially football playing. In the subsequent cycle, data were collected and analysed using mixed-methods on how selected VL/e-tools were used to observe and illustrate two patterns of human's movement in football playing. The challenges faced to groom amateur footballers are elaborated with suggestions for the ways forward to incorporate advanced technology in the IR4.0 era for research and development activities in sports and physical health education.

Keywords: Visual learning, physical education, health psychology, motivation, human's movement in football, computer science in sports, IR4.0 tools

Predicting the Hindrances of Virtual Learning Environment among Teachers from Vernacular Schools

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Abstract: The capabilities of Virtual Learning Environment (VLE) in education have delivered effective and enthusiastic teaching and learning environment. Thus, the aim of the study is to investigate the hindrances of vernacular school teachers in using the VLE as a teaching mechanism. The unified theory of acceptance and use of technology (UTAUT) and the Self Determination Theory (SDT) have been integrated to ascertain the real problem faced by the teachers in using VLE. Utilizing an explanatory sequential mixed methods design, 60 teachers were adopted using a stratified random sampling technique in the first phase while three teachers were selected in the second phase using a purposive sampling technique. The results indicate that there is a significant relationship between the self-determination and the use of VLE. The qualitative result from the interviews revealed the accessibility and workloads were contributed to the downfall of VLE usage. More investigation is needed on the proper planning and policy to ensure the continued use of VLE.

Keywords: Virtual Learning Environment, UTAUT, SDT, Teachers, Vernacular School.

Psychometric Properties of Computational Thinking Using Artec-Robo for STEM Education (CTARS)

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Abstract: Science, Technology, Engineering, and Mathematics (STEM) is part of the 21st Century curriculum that promoting Computational Thinking. Various curriculum activities are still conducting using robotics to promote STEM education among students. Therefore, Artec-Robo is playing a crucial role in fostering Computational Thinking through STEM Education. This study aims to develop and validate instruments to measure teachers' perceptions of Computational Thinking Using Artec-Robo for STEM Education (CTARS). A total of 15 items was produced by using the literature review. As for the sample of this study, 33 educators who attended a workshop on Computational Thinking Using Artec-Robo for STEM education had participated in this study. The instrument was validated by three experts. The data was analyzed using Partial Least Square (PLS), Structural Equation Modeling (SEM). The exploratory factor analysis (EFA) was run to confirm that the data support the selected scale for the present study. The findings of the study revealed that the CTARS instrument is valid and reliable, with a Cronbach's alpha value of 0.889. Besides, the results also informed that the total variance extracted by the items within the constructs was 62.23%. The Artec-Robo plays a great role in promoting Computational Thinking in STEM education. The CTARS instrument contributes to the knowledge of literature for future researchers.

Keywords: Computational Thinking, Artec -Robo, STEM

The Effectiveness of the Use of the 'Fix Me' Multiplication Board in Mastering Multiplication Among Primary Tamil School Students

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Abstract: The skill to master multiplication is essential for students in topics related to multiplication and division. Survey results have revealed that students have not mastered multiplication skills. Initial reviews were carried out by checking students' work, using questionnaires, and carrying out observations and interviews. To overcome problems pertaining to multiplication, nine students from selected from primary Tamil school. The researchers innovatively adapted the circle map to create the 'Fix Me' multiplication board. The activity was carried out for 30 minutes during school hours, whereby the students copy and complete the 'Fix Me' multiplication board. This innovative kit was made of merely polystyrene, colored papers, and discarded boxes. The use of the QR code in this kit helped students to solve questions involving multiplication. The innovative material helped students master multiplication and instilled an interest to master multiplication. This board will be helping mathematics teachers to make sure their students master multiplication easily.

Keywords: Circle Map, Mastering Multiplication, 'Fix Me' Multiplication Board.

Factors Influencing Tamil Reading Problems among Slow Learners from Primary School Students

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Abstract: Reading skills are a basic Tamil language skill for elementary school students. Every student has the right to receive reading skills in primary school to achieve great success in the future. This study aimed to identify the factors that cause problems in reading Tamil among primary school students. The respondents consisted of 20 teachers who teach Tamil in a district in Negeri Sembilan. This study was a descriptive survey using questionnaires that included Tamil language readings in schools, students' basic knowledge, and problems encountered during teaching and learning (PdPc) in the classroom and beyond the classroom. The findings of the research data using Statistical Package for the Social Science (SPSS) software were used to obtain percentages and mean. In conclusion, to address the problem of Tamil language reading, teachers need to diversify their teaching methods to solve the problems of reading, and the Tamil language needed to be added to the Intervention class time-table as an Intervention programme which has an effective impact on our nation's education.

Keywords: Reading problems, quantitative studies, Tamil (BT), Teaching and Learning (PdPc).

Examining a 5E Inquiry Learning Module for Malaysian Science Teachers: A Needs Analysis

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Abstract: The Ministry of Education has advocated the use inquiry learning in the teaching and learning of science across grade levels. Additionally, in certain state and district education offices, a 5E inquiry learning template has been prepared for science teachers, purportedly to assist them in their lesson planning, with the assumption that science teachers know and are able to apply the 5E inquiry learning. While we appreciate the high regards the state and district education officers have on science teachers with respect to science pedagogical approaches, a need analysis study, nevertheless, is pertinent to ascertain if there is truly a need for a module on 5E inquiry learning. An 8-item questionnaire was developed and found to be valid and reliable for research purposes. The questionnaire was distributed to 52 science teachers (26 males, 26 females; 34 primary, 18 secondary). The findings indicate that the science teachers self-perceived a fundamental need for coaching on the use of 5E inquiry learning. Equally, they perceived that there is a dire need for a 5E inquiry learning module. Given that there are no significant differences in perceptions across the items between the male and female teachers ($p > .05$), and also between the primary and secondary science teachers ($p > .05$), it can be concluded that the crucial need for a module on 5E inquiry learning exists regardless of gender and of the level of students they teach.

Keywords: 5E Inquiry learning, needs analysis, science teaching

A Conceptual Framework to Design and Develop Dyscalculic Checklist Instrument for Dyscalculic Pupils

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Abstract: This study aims to design and develop a checklist for dyscalculia based on Piaget's Cognitive Theory, Sweller's Cognitive Load Theory, Bruner's Constructivist Theory, and Siemen's Connectivist Theory. This paper presented the literature review on Cognitive Theory, Cognitive Load Theory, Constructivist Theory, Connectivist Theory, design and development research (DDR), fuzzy delphi method (FDM), nominal group technique (NGT), and dyscalculia. The purpose of this study is to design a conceptual framework for Dyscalculia Checklist Instrument (DCI) for dyscalculic pupils. Four main constructs in DCI are number sense, working memory, accurate or fluent calculation, and mathematics reasoning and word reasoning. This study is DDR in nature. Hence, the three phases in this study are needs analysis, design and development, and evaluation. After the three phases of DDR, the end product will be a checklist for dyscalculia entitled DCI.

Keywords: Dyscalculia, Checklist, Design and Development Research (DDR), Fuzzy Delphi Method (FDM), Nominal Group Technique (NGT)

Knowledge Mapping of Preschool Teacher Research - A Visual Analysis Using Citespace

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Abstract: Using Citespace, a visual analysis software, to conduct data analysis on 7,467 kinds of literature about preschool teachers from the web of science core collection (2010-2019). The results show that current research topics of preschool teachers mainly focus on professional development, teacher-child relationship, and self-regulation. On the whole, the research on preschool teachers shows a rising research trend, with European and American countries ranking first, and a large number of core authors.

Keywords: Preschool Teacher Research, Visual analysis, Citespace

Attitudes of General Children Parents to Preschool Inclusive Education

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Abstract: This study used 10 general children's parents in small and medium-sized cities in China as the target, and interviews were used to explore the understanding of ordinary children's parents on preschool inclusive education. The results show that general children's parents have insufficient understanding of children with special needs and preschool inclusive education. Although they support emotional integration education emotionally, they believe that there are still many difficulties in carrying out preschool inclusive education.

Keywords: General children parents, Preschool inclusive education, Children with special needs, Kindergarten

Exploring of Parents Cultivate - The Independence and Concentration of Preschoolers

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Abstract: Early childhood is the key period for the formation of young children's social behaviors and abilities. Cultivation of the two most basic abilities of independence and concentration is the key that preschoolers can smoothly transition from kindergarten to primary education. Using well-defined content analysis and interview method, the results obtained show that it is important for cultivating the two abilities, parents hold different attitudes towards the cultivating of these two abilities, and cultivating independence and concentration strategies of preschoolers. The study has some implications for parents to better do preschoolers' school readiness.

Keywords: Preschoolers, Parents, Independence, Concentration

The Effect of Functional Strength Training on Teenagers Throwing Athletes

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Abstract: For throwing events, traditional strength training is indispensable, but long-term broad muscle group training can easily lead to injuries; At the same time, the training of non-professional teams lacks the conditioning of teenagers athletes' bodies and cannot effectively cooperate Daily training is supplemented with targeted nutrition, so there will be athletes' physical impairment in the middle and later stages of their careers; in order to avoid the frequent occurrence of such conditions, proper addition of functional strength training (FST) during training can better reduce such This situation explores the role of Functional strength training (FST) for teenagers throwers.

Keywords: Throwing Athletes, Functional strength training (FST), Teenagers.

The Construction of Normal System and Mechanism of Physical Fitness Monitoring in the National Fitness

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Abstract: In the work of constitution monitoring in colleges and universities in China, an incentive mechanism should be put in place to monitor students' constitutions, to achieve a lawful supervision mechanism and a people-oriented supervision mechanism. The basic principle of the constitution monitoring mechanism of school students' constitution includes the management mechanism and the operation mechanism. Constructing different principles under different mechanisms; To construct the system, responsibility and organization of student constitution monitoring; We will build a macro mechanism that functions as an operational regulation mechanism, a macro-control mechanism, a conditional guarantee mechanism, a scientific early warning mechanism, a self-regulation mechanism, and other operational mechanisms. We will bring into full play the advantages of school students' health monitoring and management, and fully establish a more scientific and optimized normal system.

Keywords: National Fitness, College Physical Fitness Monitoring, Institutional Mechanisms, Normalization

Forest School Concept Based on Indigenous Knowledge for Orang Asli Schools - From an Expert's Perspective

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Abstract: Indigenous people or *Orang Asli* children in Malaysia experience difficulty in understanding the standard curriculum. The syllabus of schools seems not to match the intellectual understanding of *Orang Asli* children, resulting in loss of interest in class and refusal to go to school. This paper discusses the importance of introducing the Forest School concept in the education of *Orang Asli* children from an expert perspective. Experts in the indigenous field and community leaders were interviewed. Twelve respondents were selected using a purposive sampling technique. The average age of the interview subjects was 55, with a range of 45 to 65 years old. Semi-structured interviews were recorded with the subject's consent and later verbatim transcribed, compiled and compared using protocol interview as an instrument. Five themes were thematically interpreted. The results indicated the need to (1) maintaining the identity of *Orang Asli*, (2) ensuring indigenous knowledge is not forgotten by the *Orang Asli* children, (3) preserving forests for sustainability and (5) upholding the *Orang Asli* children sense of belonging. This paper asserts that through Forest School, it is essential to learn and assimilate the modern world while maintaining their identity as *Orang Asli*. Indigenous knowledge needs to be incorporated into primary schools' syllabus to ensure that *Orang Asli* children learn about their heritage and sustainability in forests. Orang Asli schools must also conduct teaching and learning activities according to the interest of Orang Asli children to strengthen their sense of belonging. The outcome is that Orang Asli children will keen and enthusiastic to learn the knowledge given during teaching and learning as it relates to their environment. This study has implications in the future by providing greater depth in understanding the ramifications of the forest school outlook to teaching and learning within the setting of the primary school.

Keywords: education, Forest School, indigenous knowledge, Orang Asli, sustainability

The Effect of Employing the 5E Inquiry Learning Model on the Learning of Acid and Alkali among Year 3 Malaysian Students

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Abstract: This paper aims to gauge the extent to which the 5E Inquiry Learning Model as opposed to the traditional method is effective in boosting the achievement in science among Year 3 students using the learning context of acid and alkali. This research utilized the non-randomized pre-post quasi-experimental intervention design. A total of 65 students -- 33 and 32 in the experimental and control groups respectively -- from two intact classes of Year 3 in a national school at Kuala Lumpur participated in this study. The intervention for the experimental group involved the use of the 5E Inquiry Learning Model while the control group, by contrast, followed through the teacher-centred traditional method. The science achievement for acid and alkali was gauged using a test that comprises 20 multiple-choice items and 34 structured items that require only filling in the blanks which are scored dichotomously. The test is suitable for research purposes as it has sufficient content validity and KR-20 reliability of 0.86. Initial screening of the pretest data shows a non-significant difference [$t(63) = 0.54, p = .59 > .05$] between the experimental and control pretest means. Hence, an independent samples t-test could be used to analyse the posttest means. The finding shows a significant difference between the experimental and control posttest means [$t(63) = 7.86, p = .00 < .001$]. This empirical study clearly shows the positive effect of using the 5E Inquiry Learning Model.

Keywords: Inquiry Learning, 5E, Primary Science, Acid and Alkali.

STAD Cooperative Learning Model: It's Effect on the Achievement of Zoology Among Pre-Service Biology Teachers in Indonesia

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Abstract: The STAD or "Student Teams-Achievement Divisions" cooperative learning model was investigated on its effectiveness in augmenting the Zoology achievement in pre-service Biology Education Program in Indonesia. More specifically, the comparative effect of STAD versus the conventional method on Zoology achievement through the learning of *Agnatha* and *Placodermi* in Vertebrate Zoology was investigated. Employing a quasi-experimental design over a one-week intervention, 30 pre-service Biology teachers in the Experimental Group were taught using the STAD model while 34 of their peers in the Control Group was taught using the teacher-centred conventional method. The effect of STAD was measured using a researcher-developed zoology achievement test with sufficient validity and reliability. Analyzed using the ANCOVA, the findings indicated that the Experimental Group performed significantly better than the Control Group. Further, an effect size of 0.6 shows that the average person in the experimental group scored better than 73 percent of all the participants in the control group. The findings are discussed in terms of in-service science teacher education.

Keywords: Co-operative learning, STAD or Student Teams-Achievement Divisions, science education, zoology, pre-service Biology teachers

Managing Technology-enhanced Innovation Programs: Framework, Exemplars and Future Directions

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Abstract: Managing international programmes sustainably has been the concerns of most educational institutions. The responsibility is even greater if the programmes aim at enhancing innovative output supported by technology. This article reports on the authors' experiences in managing four international programmes with development of framework of practice through mixed-research methods. Cross-Case Analysis (CCA) will be made to examine the attributes related to innovation management through STEM education related approaches. Within-Case Analysis (WCA) will be reported to showcase exemplary practice of each programme organised. Exemplary Case Analysis (ECA) will be elaborated with composite framework illustrating how these four international programmes could be organized by supporting one another from theory to practice. Finally future directions will be discussed on continuing efforts to promote creativity that contribute to human resource development (HRD) through sustainable implementation.

Keywords: Blended-learning, Technology-enhanced Innovation, Science Olympiads, Young Scientists' Events, HRD, sustainability.

PART - C
Management and Humanities

Jinan City's traffic flow: What netizens say?

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Abstract: The purpose of the study is, seeking the potential of using social media's posts help authorities to monitor the road traffic condition. Qualitative data were gathered from social media. A descriptive analysis has been processed, followed by the thematic clusters data coding technique. Some of the trend and pattern can be seen from the data.

Keywords: Destination Management, Traffic Flow, Thematic Clusters, Jinan, China

Role of Knowledge Management in Coastal Tourism Towards Sustainable Development Goals in Sabah, Malaysia

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Abstract: Tourism has emerged as a major sector of global economy, generating 319 million jobs and 10.4 % of GDP, and supporting merchandise exports worth US\$1.7 trillion. These facts and figures justify a focused attention on tourism development under the United Nations Sustainable Development Goals (SDGs) for realizing its full economic potential. Malaysia has pledged to implement the SDGs for the socio-economic benefits. Policies are being laid down for promoting sustainable tourism. With a vast coastline and rich natural resources, Malaysia offers opportunities for achieving the targets of SDG14. A knowledge-based development of this tourism sub-sector will help the coastal communities and contribute to national economy. The existing infrastructure and trained human resources can aid in transformation of tourism with more sustainable practices. Such practices will generate income and dissuade the coastal communities from unsustainable exploitation of marine environmental resources in favor of higher income that sustainable tourism will generate. This paper is based on a general survey of the status of nature-based tourism in coastal areas of Sabah. Observations were focused on existing infrastructure in tourism hotspots, trend of exploitation of natural resources and feedback from tourists. The work also involved review of documents related to SDG targets for making progress in implementation. This paper discusses ways and means of promoting nature-based tourism through knowledge-based plans and strategies. These include follow-up action on: regulating the tourism according to carrying capacity of tourism hotspots, diversification of tourism sub-sectors, linking socio-economic benefits with environmental conservation, academia-industry cooperation, academia-community interaction, and application of knowledge management tools to properly shape development of nature tourism in coastal areas. The role of institutions of higher education in addressing the challenges in developing sustainable tourism, adapting the DPSIR framework to local conditions and constructing models of tourism compatible with the SDGs have been highlighted in this paper.

Keywords: Sustainable tourism, coastal areas, tourism hotspots, knowledge management, societal benefits

Urban Ecotourism Destination: Exploring the Potential of Kota Kinabalu City, Sabah, Malaysia

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Abstract: Ecotourism concept which refers to tourism activities in natural, undisturbed ecosystem often misfits with urban environment, however not impossible. Although Sabah is well known for its ecotourism market, the urban ecotourism concept in Kota Kinabalu city has never been explored. Current ecotourism destinations in Sabah faced carrying capacity issues thus need to explore new destinations. This paper analyzed local Kota Kinabalu resident and tourist' perception and value pertaining to the potential of Kota Kinabalu city as an urban ecotourism destination and how preservation of green spaces in cities supports sustainability using multi-methodology. Findings showed that Kota Kinabalu is highly potential as an urban ecotourism destination, and study results could assist decision makers in the local tourism industry in making tourism development decisions.

Keywords: Urban Ecotourism, Green Space Conservation, Sustainable Tourism, Tourism Development, Destination Competitiveness

Perception of the Locals Towards the Image of The Spa and Their Intention to Visit

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Abstract: The spa industry has been one of the most successful attractions having the potential to be a lucrative sector in the future and is expected to make the tourism industry the main fifth revenue earner for Malaysia by the year 2020. The Ministry of Tourism and Culture (MOTAC) in Malaysia has set up a Transformation Plan 2020 to achieve 36 million tourist arrival and aim to receive RM168 billion by the year 2020. MOTAC also predicted the spa industry will provide about 3,540 jobs by 2020. In Malaysia, this industry is still in its infancy stage but being one of the emerging industries globally, has huge setbacks which need to be given attention to. However, the wrong impression about the image of the spa industry is the main problem faced by the spa operators. The general perception of the public tends to think that this industry is comparable to a prostitution joint. If MOTAC intends to make the spa industry as the fifth income earner for the country, a study to change the local community perception about the image of the spa and to encourage them to visit and work in the spa is of high importance. This research has explored the perceptions of the local community towards the image of the spa in Malaysia with Sabah in particular. As this is an exploratory research, qualitative method is used for this study. The result of the research suggests that there is dynamic change in the perception towards the image of the spa industry in Sabah from mainly negative to mainly positive.

Keywords: Spa, Image, Perception, Tourism

Tagal Ecotourism and Empowerment for Local Community: Case Study of Tagal Ecotourism Tinopikon Park, Notoruss Penampang, Sabah

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Abstract: This study addresses *tagal* as an ecotourism product that is uniquely for Sabah. It is a community-based ecotourism venture that is influenced by the Dusun ethnic's traditional law. The traditional principle of *tagal* is focuses primarily on individual exploitation of riverine resources and it was later transformed into a community enterprise of *tagal* ecotourism. The Department of Fisheries Sabah (DoFS) together with the local communities joined effort to create a 'smart partnership system', an instrument that was not only to help revived the river fish stock but it had also led to the birth of tagal ecotourism product. There were 536 tagal sites sanctioned by Department Fisheries Sabah in 2015 and most of these *tagal* sites were transformed into community based tagal ecotourism sites. *Tagal* ecotourism helped to generate income through jobs creation and has uplifted the local's economic level. The objective of this study is to explore the process and outcome of empowerment particularly to the *tagal* local community of ecotourism Tinopikon Park, Notoruss Penampang, Sabah, Malaysia. The methodology approaches used is qualitative where interview is chosen as the data collection method and thematic clustering as data analysis. The study suggested that there are strong favourable result of empowerment on the process and outcome at the research site.

Keywords: Ecotourism, tagal, empowerment, local community

Students' Perception and Their Commitment to Work in Tourism and Hospitality Industry

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Abstract: The tourism and hospitality sector has been recognised as one of the fastest-growing and largest growing industries in the world, providing opportunities for job prospects, driving exports, and creating tremendous prosperity around the globe. The study aims to examine students' perception and their commitment to work in tourism and hospitality industry after graduation. Data were collected using a set of questionnaires. Non-probability sampling technique was used in selecting the 117 respondents from East Malaysia polytechnics who are majoring in tourism and hospitality programme with working experience in the sector. The data were analysed using the SPSS 25.0 and presented in frequency and percentages. The findings showed that the industry person congeniality has a significant medium relationship with a commitment to work in the tourism and hospitality industry. The study has some implication for industry person congeniality, promotion opportunities, managers and commitment to work in the tourism and hospitality industry

Keywords: Student's perception, work commitment, tourism, and hospitality industry

Character Assessment for Heritage Landscape Resource at World Heritage Site

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Abstract: Heritage landscape a great variety of unique landscapes can be identified with distinctive regions of earth with historical value, unchanged, rare and pre-existing species of the present and the future. Heritage landscape perspectives are important to recognize, preserve, enhance and enrich the landscape values associated with heritage history. The aim of this paper is to contribute a comprehensive, holistic character assessment for the perspective of heritage landscape resources. Some parameters to consider in determining a landscape heritage resources. The parameters are divided into five sections and sub-topics are linear considered. The approach is a continuation of the findings of three main categories of criteria assessment, i.e. primary, secondary and minor. The research involved four categories of stakeholders as respondents, which is Government, Non-Governmental Organizations or NGOs, such as Mountain Guides, Visitors and Local. Methodology approach is a mixed method (qualitative and quantitative) of findings validated through triangulation data. Privileges of heritage landscape evaluation criteria can be used as a guide for evaluating heritage landscape resources and assisting local authorities as an alternative to developing policies and guidelines for public heritage sites.

Keywords: Heritage Landscape, Heritage Landscape Resource, Criteria and Character Assessment.

Success Indicators for Bukit Gemok as an Ecotourism Site

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Abstract: Malaysia well-known with ecotourism since tourism directed towards exotic natural environments and local government intended to support conservation efforts and observe wildlife. Ecotourism is very important for the development of tourism in Malaysia and its act to balance between human and environment in the world. As we know, Bukit Gemok once had very rich wildlife. In the last century, there are a lot of extinct species of wild animal in this forest. There are gibbons, sambar deer, elephants at the foothills and orang utans up on the trees. But, unfortunately forest round the hill being cut down due to improper planning of development. The objectives of this research is to determine the potential indicators in develop Bukit Gemok as an ecotourism destination, to determine the suitability of the activities in Bukit Gemok and to determine the acceptance level of public towards the Bukit Gemok to develop as ecotourism site. The method that has been use for this research is qualitative method and the result showed that all objectives has been answer. There are twelve respondent show positive respond to the issue. There are fifteen indicators has been found in this research. The indicators of this research could help Bukit Gemok in manage and plan for their marketing strategies. Meanwhile, the limitation of this research is measurable of the indicators, the indicators will be more meaningful if could be implacable in the site.

Keywords: Success indicators, indicators. Ecotourism, Bukit Gemok.

Promotional Practices Analytics of Retail Store in Oman: A Case Study

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Abstract: Promotion have brought opportunities and challenges in the business. Companies are creating the best strategies in promoting their products thru technology, quality and other various methods in order impress and attract the target audience. The main purpose of this study is to assess the promotional practices of the three branches of Carrefour in order to evaluate if the current practices are still effective to the different type of shoppers and determine in order to remove those ineffective and not attune practices and develop a new style, also this evaluate the problems encounter for every promotional mix in order to design a controllable measure in order design a solution. The findings revealed as assessed by the administration level and rank & file level management all promotional practices by the three branches of Carrefour were effective and accordance to the new technology, it also shows that although it is effective still there is a need for the companies to innovate new and ensure that each strategy is align to the current market trend. Finding also shows as assessed by the respondent as of the problems encountered on their current promotional mix some problems were related to customer response based on the current strategies. Therefore, it is empirical to evaluate advantages and disadvantages, cause and effect of the newly created strategies in order lessen the problem instead intensify it. Despite the success of the companies in supermarket industry business, still there is a need for them assess all moves and conduct an environmental survey in order to come-up of advance and effective strategies.

Keywords: Promotion, Retail Store, Advertising, Personal Selling, Public Relation, Digital Marketing, Sales Promotion.

Exemplification of Entrepreneurial Intentions and Competencies of Business Students in Oman

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Abstract: The focused of this study was to establish a roadmap on the entrepreneurial intentions of the business students in different universities and colleges in Oman, to evaluate if the program has impact in their intentions of doing business. Identified the important competencies of an entrepreneur and to evaluate their ideas on how to apply this in the future in order to develop concrete compass to success. The researcher utilized the descriptive survey method in conducting the study. The study showed the majority of the students who are taking business program has most likely similar in intention in which most of them rated agreed in general. It was also found out that most of them has a common rating when it comes to the importance of competencies in becoming an entrepreneur, however in the profile of the respondents revealed that age, income and experience were most likely give you an easy access-opportunity to become an entrepreneur since you have the basic tool already.

Keywords: Entrepreneur, Competence, Intention, Exemplification, Business students.

Emerging Trend of Education during and Post COVID 19: A New Challenge

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Abstract: According to Oscar Wilde, "*Education is an admirable thing, but it is well to remember from time to time that nothing that is worth knowing can be taught.*" Education plays a prominent role in every individual's life, rather it can be counted as a fundamental right of every individual. Due to the spread of COVID 19, a pandemic, the life seems to be paused due to the nationwide lockdown, which has caused immense effect on people, families and communities. All the sectors including the education sector are to the utmost grinding halt because they are not ready to meet the challenge of giving protection to students and safe educational facilities required to set up during COVID19. Schools and Universities have not faced this level of disruption in generations as now due to the spread of COVID more than 300 million students' education have been disrupted. At the end of February as alarm bells began to sound on the growing spread of COVID 19 its impact on education has gone far beyond the school closure. Outside Asia different continents like Africa, North America, South America, Europe etc. have announced to shut down their schools, and more than 60 countries in all continents have announced lockdown and closure of schools impacting almost a billion students across the globe that have seen their schools close for varied lengths of time. As an alternative way of learning across the globe online learning platforms have been launched, E classrooms have been created for students and teachers, still there is something unknown that is not giving the desired output in the teaching learning process. This paper aims to highlight the impact of COVID 19 on education globally, primarily focusing on exploring the challenges while adapting innovative ways of teaching and learning.

Keywords: Education, Online teaching, Learning, Challenge, Process, Innovative Learning

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Dr. R.C. Singh is Professor of Physics in School of Basic Sciences and Research, Sharda University (India). Dr. Singh obtained his doctorate from Banaras Hindu University (BHU), Varanasi in theoretical Condensed Matter Physics. He obtained his B.Sc. (Hons.) and M.Sc. degrees also in Physics from Banaras Hindu University. Dr. Singh has published more than 20 research papers in peer-reviewed international journals and conference proceedings. He has authored one book and co-edited five conference proceedings. His area of research interest includes study of phase transitions in molecular liquids using density-functional theory, Time-series analysis using wavelets and Biometrics. Dr. Singh is a reviewer of several international journals and has attended and organized many national and international Conferences, Seminars, Workshops and Short-Term programme. Dr. Singh has successfully completed three Research Projects sponsored by the Department of Science and Technology (Govt. of India), New Delhi.

Dr. Singh has extensively travelled to many countries for delivering talks, research and promoting Indian education abroad. Some notable visits include a short tenure at The Abdus Salam International Centre for Theoretical Physics (ICTP), (Italy); Technical University of Munich (Germany); Fraunhofer Institute (Germany); University of Kaiserslautern (Germany); University of Osnabrueck (Germany); Doppler Institute of Mathematical Physics, Prague (Czech Republic); Istanbul Aydin University (Turkey); University of British Columbia, Vancouver (Canada); Hermon College, Cambridge (UK) and Cambridge University (UK). While on his tours for research and academic discussions, Dr. Singh has also used these opportunities to build collaborative arrangements with institutions abroad and his University in India. His focus on multi-lateral exchange of ideas and collaboration in research has paid rich dividends in terms of reputed Scientists visiting India and Indian students joining international teams in pioneering areas of basic research.

Dr. Singh has been awarded Research Associateship by Council of Scientific and Industrial Research (CSIR), New Delhi and Short Term Visitor status in The Abdus Salam International Centre for Theoretical Physics (Italy). He was conferred the "Bharat Vidya Shikshamoni Award" by the International Institute of Education and Management, New Delhi, and the "Pride of International Education Excellence Award" which was presented during Indo-Nepal Friendship Summit in Kathmandu by the Intellectual People and Economic Growth Association, New Delhi. He is also recipient of the "Star of Asia Award" by International Business Council, New Delhi and the Global Achievers Foundation, New Delhi conferred on him "Bharat Vidyashri Samman Puraskar" which was presented by Hon'ble Chief Minister of Uttarakhand Shri Harish Rawat at Dehradun. Recently, National & International Compendium, New Delhi presented "Lifetime Achievement Award" to Dr. Singh for his contribution in the field of education.

Administrative experience of Dr. Singh has been diverse. He was the Head of the Department of Applied Sciences, Chief Hostel Warden, Chief Proctor, Dean Students Welfare, Dean Academics, Founder Controller of Examinations of Sharda University, Director Academics and Director of Engineering Institutions during 1997-2015.

Dr. Singh has established himself as a mentor, teacher, leader and an innovator. His responsibilities include providing leadership in research as well as planning for academics at Undergraduate and Postgraduate level. He is known for his exemplary contribution through his dedication, commitment, innovative approach and high integrity. He is a blend of Indian values and international exposure and has dedicated himself to the cause of technical education, meaningful science and research and an astute administrator with interest of students as the foremost priority. Dr. Singh is a strategist, a methodical planner and a composed implementer and has the uncanny ability to create a team of leaders.



Dr. Rohit Khokher is a Professor of Computer Science and Engineering and working as Chief Technology Officer (CTO) in Vidya Prakashan Mandir (P) Ltd., India. He obtained his Master Degree in Computer Systems Engineering from University of South Australia, Australia and Ph.D. from Sharda University, India. Dr. Khokher has a rich experience of industry, academics and administration.

He has made significant contribution in area of his research at national and international level through research publications, attending and organized national and international seminars, conferences and delivering talks in more than 1000 Schools, Institutes and Universities around the globe. Dr. Khokher has visited many universities and academic institutions in Australia, Mauritius, Singapore, Dubai, Indonesia, Thailand etc. for delivering talks and academic collaborations. Dr. Khokher is associated with many professional bodies, which include Society for Research Development (Life Member), Computer Society of India (Member), International Association of Computer Science and Information Technology, Singapore (Member), etc. to promote innovative ideas and research through out the globe.

Dr. Khokher is known for his virtues as a mentor, teacher, leader, manager, an orator and an innovator. He not only professes the values of Indian culture but he himself practices many of the fundamental principles of humanity and society, while dedicating himself to the cause of technical education, meaningful science and research.



Professor Rajendra Kumar is Vice President and Editor at Society for Research Development, India. He has served in various prestigious Institutions in India as Professor, Computer Science & Engineering.

He has been Member of Board of Studies of Uttar Pradesh Technical University, Lucknow (now Dr. APJ Abdul Kalam Technical University, Lucknow). He is Life Member of Society for Research Development; member of Computer Society of India, IENG, AASCIT, IAENG Hongkong, IACSIT Singapore, IDES, UACEE, SCIEL, and many more.

He is Reviewer and member of Editorial Board of several Journals worldwide. He has published and presented several research papers in Countries like Singapore, Malaysia, United Arab Emirates, Thailand, Indonesia in different International conferences.

He is author of five text books Theory of Automata, Languages & Computation from McGraw Hill Education, Computer Graphics from Vikas Publishing, Human Computer Interaction from Firewall Media, Information and Communication Technologies for University Science Press, and Modeling and Simulation Concept from University Science Press. He has published two monographs from Lambert Academic Publishing Germany entitled Latent Fingerprint Matching, and Instruction Level Parallelism. Apart from this, he has published study material for Maharashtra Dayanand University, Raichak; Mahatma Gandhi University, Kerala and Chaudhary Devi Lal University, Sirsa. He has edited five proceeding books of international conferences held in Kuala Lumpur (02), Bangkok, Bali, and Phuket.

His research area includes Theoretical Computer Science, e-commerce, Biometric systems, Compiler Design, Multimedia Systems and Software Engineering.

