HRDF CLAIMABLE

2024

7TH NPreUS
National Pre-University Seminar

14 OGOS 2024
BANGI RESORT HOTEL

"MELONJAKKAN ASPIRASI PENDIDIKAN PRA-UNIVERSITI YANG MAMPAN"

ANJURAN

UNIVERSITI ISLAM SELANGOR
PUSAT MATRIKULASI
MATRICULATION CENTRE

KUISCELL
THE CELL OF WISDOM

CFS
CENTRE FOR FOUNDATION STUDIES
INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA

UMS
UNIVERSITI MALAYSIA SABAH

UniSHAMS

E-PROSIDING

Isi Kandungan

Dekan Pusat Matrikulasi
En Nor Effendy bin Ahmad Sokri

Assalamualaikum warahmatullahi wabarakatuh dan salam sejahtera.

Saya bersyukur kepada Allah SWT dan berterima kasih atas peluang ini untuk menyampaikan beberapa kata. National Pre-University Seminar diadakan setiap tahun, dan Alhamdulillah, tahun ini kita dapat berkumpul sekali lagi dalam 7th NPreUS 2024, yang bertemakan "Melonjakkan Aspirasi Pendidikan Pra-Universiti Yang Mampan".

Seminar ini menjadi platform penting bagi ahli akademik dari pelbagai disiplin untuk berkongsi penemuan ilmiah terkini. Saya yakin bahawa pengetahuan yang diperoleh akan memacu penambahbaikan dan mengukuhkan budaya penyelidikan sepanjang hayat.

Akhir kata, tahniah dan terima kasih kepada semua yang terlibat, termasuk institusi pengajian tinggi, pembentang, penyelidik, pelajar, guru, dan seluruh tenaga kerja 7th NPreUS 2024. Semoga usaha ini mendapat ganjaran terbaik dari-Nya, dan kita bertemu lagi tahun hadapan, Insya-Allah.

Terima kasih..

Pengarah Seminar

Pn. Nurul Nadirah binti Zakaria

Assalamualaikum warahmatullahi wabarakatuh dan salam sejahtera.

Syukur kepada Allah SWT atas kejayaan penerbitan buku program ini, hasil daripada National Pre-University Seminar (NPreUS) Kali Ke-7 2024 (7th NPreUS 2024) yang bertemakan "Melonjakkan Aspirasi Pendidikan Pra-Universiti Yang Mampan." Buku program ini menghimpunkan abstrak penyelidikan yang dibentangkan sepanjang seminar, yang buat pertama kalinya diadakan secara hibrid.

Kami mengalu-alukan kehadiran para tetamu, rakan kerjasama, penceramah utama, pembentang, dan peserta seminar, serta mengucapkan setinggi-tinggi penghargaan kepada semua pihak yang terlibat, termasuk penaja yang telah menyumbang kepada kelancaran NPreUS kali ke-7 ini.

Akhir kata, diharapkan e-book ini memberi manfaat kepada komuniti akademik dan profesional serta mendorong kemajuan pendidikan pra-universiti di negara kita.

Salam hormat dan terima kasih.

Tentatif Program

TENTATIF PROGRAM
7th NATIONAL PRE-UNIVERSITY SEMINAR 2024 (7th NPreUS 2024)

Tarikh : 14 Ogos 2024 (Rabu) Tempat: Bangi Resort Hotel, Bangi	
Masa	**Atur Cara**
08.00 – 09.00 pagi	Pendaftaran Pembentang dan Peserta
09.00 – 10.00 pagi	Sesi 1: Pembentangan Selari 1 (dalam talian)
	Kehadiran Jemputan VIP
10.00 – 10.15 pagi	Ucapan Pengerusi Majlis Bacaan Doa **Encik Mohammad Zariff Afiq bin Zuriman**
	Ucapan Pengarah 7th NPreUS 2024 **Puan Nurul Nadirah binti Zakaria** (Membentuk Minda Pelajar Melalui Aspirasi Pendidikan Pra-Universiti)
10.15 – 10.30 pagi	Ucapan Dekan Pusat Matrikulasi **Encik Nor Effendy bin Ahmad Sokri** (Pembinaan Jati Diri Siswa Melalui Pendidikan Pra-universiti)
10.30 – 11.15 pagi	Ucaptama: **Dr. Mohd Faeez bin Ilias** (Cabaran Mengaspirasikan Pendidikan Pra-universiti Masa Kini) Universiti Islam Selangor (UIS)
11.15 – 11.30 pagi	Ucapan Perasmian 7th NPreUS 2024 Oleh: **YBhg Dato' Prof. Dr. Mohd Farid Ravi bin Abdullah** Naib Canselor, Universiti Islam Selangor (UIS)
11.30 – 11.45 pagi	Penyampaian Cenderahati
11.45 – 12.00 tengah hari	Persembahan Montaj dan Sesi Fotografi / *screen capture*
12.00 – 2.30 petang	Makan tengahari, rehat dan solat zuhur
2.30 – 4.30 petang	Sesi 2: Pembentangan Selari 2 (bersemuka)
5.00 petang	Bersurai

Jadual Pembentang Selari

BILIK SELARI 1 (ONLINE)
TARIKH: 14 OGOS 2024
MASA: 9.00-10.00 PAGI
PLATFORM: MICROSOFT TEAMS

	TAJUK	PEMBENTANG	INSTITUSI
1	INTEGRASI ICT DALAM PENGAJARAN DAN PEMBELAJARAN DALAM KALANGAN GURU SEKOLAH RENDAH AGAMA RINCHING HILIR BANGI	NORMAH BINTI HUSIN	UIS
2	THE PERCEPTION OF STUDENTS TOWARD LEARNING SPANISH LANGUAGE AMONG UNIVERSITY STUDENTS	HARYANTIE BINTI GOPOIT	UMS
3	MENINGKATKAN KOMPETENSI PELAJAR PENDIDIKAN PRA-UNIVERSITI DENGAN PROGRAM KEMASYARAKATAN	NORHAYATI BINTI AHMAD	UniSHAMS
4	ESCALATING STUDENTS' PERFORMANCE IN BIOLOGY SUBJECT THROUGH BIO-WONDERS FLIP	NURULHIDAYATI BINTI RUSLAI	UIAM

BILIK SELARI 2 (ONLINE)
TARIKH: 14 OGOS 2024
MASA: 9.00-10.00 PAGI
PLATFORM: MICROSOFT TEAMS

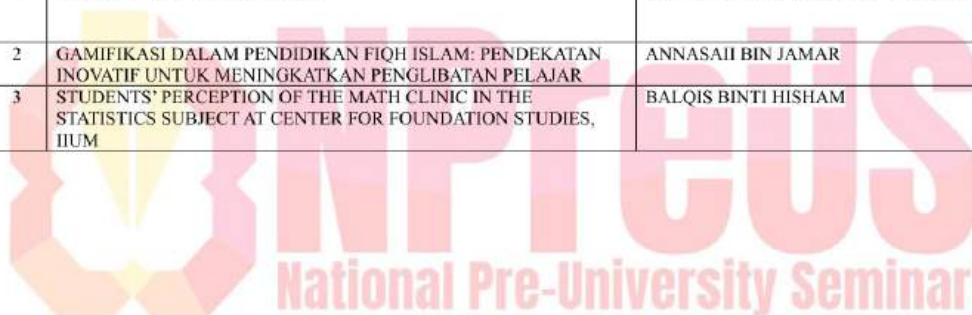|	TAJUK	PEMBENTANG	INSTITUSI
1	PENDIDIKAN STEM DAN TEKNOLOGI MULTIMEDIA: TINJAUAN AWAL	SITI ZAHARAH MOHID	UIS
2	PERSEPSI DAN MOTIVASI PELAJAR PRASISWAZAH TERHADAP PEMBELAJARAN DIGITAL BAHASA KADAZAN DUSUN	FLORINA JUMIL	UMS
3	MAD TA'ZIM: KAJIAN BERDASARKAN TURUQ RIWAYAT HAFS AN 'ASIM	MUHD THORIQ ASSHIDDIQ BIN CHE	UniSHAMS

BILIK SELARI 3 (ONLINE)
TARIKH: 14 OGOS 2024
MASA: 9.00-10.00 PAGI
PLATFORM: MICROSOFT TEAMS

	TAJUK	PEMBENTANG	INSTITUSI
1	ANALYSIS AND DETERMINATION OF FACTORS ASSOCIATED WITH STUDENT PERFORMANCE BASED ON COMPOSITE ASSESSMENT SCORES	SUHAILA BAHROM	UIAM
2	PEMERKASAAN PENDIDIK MELALUI IMPAK TRANSFORMASI KEPIMPINAN MEMACU MOTIVASI PENSYARAH DI KOLEJ KOMUNITI WILAYAH UTARA	YUSRI AZAL BIN MD YUSOF	KOLEJ KOMUNITI JERAI
3	PERLINDUNGAN PENGGUNA E-PEMBAYARAN: TINJAUAN KEPERLUAN PENDIDIKAN AWAL KEPADA PELAJAR PRA-UNIVERSITI	NURUL ASIKIN BINTI ABDUL RAZAK	UIS
4	KAEDAH NYANYIAN ALTERNATIF MUDAH MENGINGAT FORMULA TATABAHASA ARAB DI PPIB, UMS	NOR AIN BINTI MANAP	UMS

BILIK SELARI 4 (ONLINE)
TARIKH: 14 OGOS 2024
MASA: 9.00-10.00 PAGI
PLATFORM: MICROSOFT TEAMS

	TAJUK	PEMBENTANG	INSTITUSI
1	NOOR FADZILAH AB RAHMAN	A REVIEW ON ENHANCING ACADEMIC	UIS
2	GAMIFIKASI DALAM PENDIDIKAN FIQH ISLAM: PENDEKATAN INOVATIF UNTUK MENINGKATKAN PENGLIBATAN PELAJAR	ANNASAII BIN JAMAR	UIS
3	STUDENTS' PERCEPTION OF THE MATH CLINIC IN THE STATISTICS SUBJECT AT CENTER FOR FOUNDATION STUDIES, IIUM	BALQIS BINTI HISHAM	UIAM

BILIK SELARI 5
TARIKH: 14 OGOS 2024
MASA: 2.30-5.00 PETANG
TEMPAT: BILIK SEMINAR CEMPAKA 1

	TAJUK	PEMBENTANG	INSTITUSI
1	MOTIVASI PELAJAR TERHADAP KEINGINAN MELANJUTKAN PENGAJIAN DI PERINGKAT UNIVERSITI: KAJIAN LEPAS	NURUL NADIRAH BINTI ZAKARIA	UIS
2	KATA SERAPAN ARAB DALAM BAHASA MELAYU DAN IMPLIKASINYA	NOR EFFENDY BIN AHMAD SOKRI	UIS
3	PEMBELAJARAN BAHASA ARAB DI UIS; KAJIAN PENGGUNAAN APLIKASI PENTERJEMAHAN UNTUK PEMBELAJARAN BAHASA ARAB DI KALANGAN PELAJAR PUSAT MATRIKULASI, UNIVERSITI ISLAM SELANGOR	MUHAMMAD SIRAJUDDIN BIN NIK AB HADI	UIS
4	FOSTERING STUDY SKILLS FOR THE 21ST CENTURY IN HIGHER EDUCATION	NUJAIDAH BINTI NUWAIRI	UIS
5	PANDANGAN PENSYARAH TERHADAP PENGGUNAAN APLIKASI VISUAL DALAM PEMBELAJARAN KONSEP DAN ASAS STATISTIK	NURKALIZA BINTI KHALID	UIS
6	ANALYZING THE IMPACT OF ARABIYATUNA BOARD GAMES IN ENHANCING ARABIC VOCABULARIES: A CASE STUDY	ABDUL HADI BIN ABDUL RAHIM	UIAM/UIS
7	PENERAPAN KERANGKA AL-MABĀDI'AL-'ASHARAH DALAM PEMBELAJARAN PELAJAR MATRIKULASI DI UNIVERSITI ISLAM SELANGOR	MUHAMMAD TAQIUDDIN BIN ABDUL RAHIM	UIS

BILIK SELARI 6
TARIKH: 14 OGOS 2024
MASA: 2.30-5.00 PETANG
TEMPAT: BILIK SEMINAR CEMPAKA 2

	TAJUK	PEMBENTANG	INSTITUSI
1	ILMU PENGAJIAN ISLAM: INTEGRASI ALIRAN KLASIK DAN MODEN DALAM PROSES PEMBELAJARAN DAN PENGAJARAN	HAZIRAH BINTI ZAINOL AZAM	UIS
2	PEMPENGARUH AGAMA MEDIA SOSIAL DALAM PANDANGAN MAHASISWA MATRIKULASI UIS: TINJAUAN DAN ANALISIS	MUHAMAD HILMEE BIN IZANEE	UIS
3	KECERDASAN BUATAN (AI) DAN MANUSIA DALAM PERSPEKTIF KOMUNIKASI	ZATI IWANI BINTI ISMAHADI	UIS
4	MEMAHAMI PENGALAMAN HIDUP WANITA OBESITI DAN STRATEGI DALAM MENGATASI STIGMA	ALYA BINTI AHMAD	UIS
5	PERSEPSI PELAJAR PRA-UNIVERSITI TERHADAP PEMBELAJARAN DALAM TALIAN	NURMAIZATUL HAZIRAH BINTI MUSTAFFA	UIS
6	INSTILLING STUDENTS' ENGAGEMENT IN IMPROVING A SUSTAINABLE PRE-UNIVERSITY EDUCATION IN MATRICULATION CENTRE OF ISLAMIC SELANGOR UNIVERSITY (MCISU)	NUR 'ATIQAH JAMILAH BINTI ABDULLAH	UIS
7	PENGARUH TEKNOLOGI MAKLUMAT TERHADAP PEMBELAJARAN PELAJAR PRA UNIVERSITI	NUR HASHIMA BINTI MOHAMED	UIS
8	IMPAK PENGGUNAAN APLIKASI TIKTOK TERHADAP GAYA HIDUP PELAJAR PUSAT MATRIKULASI, UIS	SAIDATUL KHATIJAH BINTI ISMAIL	UIS

	TAJUK	PEMBENTANG	INSTITUSI
1	KECERDASAN BUATAN (AI) DALAM PENGAJARAN DAN PEMBELAJARAN BAHASA INGGERIS	ZULIFAH RINI BINTI MOHD ZULKIFLI	UIS
2	MASYARAKAT BEBAS TUNAI (CASHLESS SOCIETY) DI KALANGAN PELAJAR TEKNOLOGI MAKLUMAT (IT) DI UNIVERSITI ISLAM SELANGOR (UIS)	MUHAMMAD FANSURI BIN MOHD ZAHARI	UIS
3	KESAN PEMBELAJARAN KOPERATIF TERHADAP KONSEP KENDIRI BAGI SUBJEK PRINSIP PERAKAUNAN DI PUSAT MATRIKULASI, UNIVERSITI ISLAM SELANGOR	NUR FADHLINA MOHAMAD ZABIDEY	UIS
4	ANALISIS SEMANTIK AT-TANKIR DALAM SURAH AL-HIJR	MOHAMMAD ZARIFF AFIQ BIN ZURIMAN	UIS
	ENHANCING PRE-UNIVERSITY CURRICULA: MEETING GLOBAL DEMANDS IN HIGHER EDUCATION AND CAREER READINESS	NIK ZURAIHAN BINTI NIK MAT KAMIL	UIS
6	PENGETAHUAN KOSA KATA BAHASA ARAB DALAM KALANGAN PELAJAR PUSAT MATRIKULASI UNIVERSITI ISLAM SELANGOR	NOOR HAZLEENA BINTI MOHD NOR HAZLEE	UIS
7	PENGETAHUAN KOSA KATA BAHASA ARAB DALAM KALANGAN PELAJAR PUSAT MATRIKULASI UNIVERSITI ISLAM SELANGOR	HAKIMI BIN ABD HALIM	UIS
8	LANGUAGE LEARNING STRATEGIES USED BY UIS MATRICULATION STUDENTS	MIMIE SYAWALISA BINTI SALEHUDIN	UIS

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Jawatankuasa Pelaksana

AHLI JAWATANKUASA
7th NATIONAL PRE-UNIVERSITY SEMINAR 2024 (7th NPreUS 2024)

PENAUNG : YBhg. Dato' Prof. Dr. Mohd Farid Ravi bin Abdullah
PENASIHAT I : En. Nor Effendy bin Ahmad Sokri
PENASIHAT II : Pn. Nujaidah binti Nuwairi

PENGARAH : Pn. Nurul Nadirah binti Zakaria
TIMBALAN PENGARAH : Pn. Nur Fadhlina binti Mohamad Zabidey
SETIAUSAHA : Pn. Nur Hashima binti Mohamed
BENDAHARI : Pn. Nik Zuraihan binti Nik Mat Kamil

BIRO PROGRAM DAN PROTOKOL
Pn. Nurmaizatul Hazirah binti Mustaffa
Pn. Nur 'Atiqah Jamilah binti Abdullah
En. Hakimi bin Abd Halim

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Saudara Muhamad Adnan Fazilah (FA03)

BIRO TEKNIKAL
En. Muhammad Fansuri bin Mohd Zahari
Pn. Saidatul Khatijah binti Ismail
Saudara Mohamad Amanshah Jaafar (FA03)

BIRO TEKNIKAL (HIBRID)
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En. Mohammad Radzi Zamin bin Musa (BTM)
En. Abdul Hadi bin Abdul Rahim (Wakil UIAM Gambang)
Pn. Irma Malini Binti Ishak (BPPF)

BIRO MAKANAN & LOGISTIK
Cik Siti Noraisah binti Abd Razak

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En. Muhammad Sirajuddin bin Nik Ab Hadi
En. Mohammad Zariff Afiq Zuriman

BIRO PROSIDING
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Pn. Nurul Ashikin binti Abdul Razak
En. Shakir Zufairi Zamri

BIRO CENDERAHATI
Pn. Zulifah Rini binti Mohd Zulkifli
Pn. Noor Hazleena binti Mohd Nor Hazlee
Cik Hazirah binti Zainol Azam

Kertas Kerja Penuh

ANALYSIS AND DETERMINATION OF FACTORS ASSOCIATED WITH STUDENT PERFORMANCE BASED ON COMPOSITE ASSESSMENT SCORES

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Abstract: Examining final scores among pre-university engineering students is crucial for understanding their academic performance and identifying factors contributing to success or challenge in their educational journey. These scores are pivotal indicators of students' grasp of fundamental engineering principles and readiness for higher education. This study examines the correlation between different course assessments and final exam scores in a Mathematics course for pre-university engineering students. A dataset comprising assessments such as quizzes, open-book tests, and tutorials was collected from 552 pre-university engineering students at the Centre for Foundation Studies, International Islamic University Malaysia, for the 2023/2024 cohort. Regression analysis was employed to identify the significance course assessments, which were carried out using Python. The study revealed that all the quizzes, including open book test 2 and open book test 3, are significantly correlated with final examination scores with an adjusted R-squared of 0.467. This value indicates that 46.7% of the variation in final examination scores can be predicted by combining all quizzes and two open-book tests. This study examines the effectiveness of course assessments in predicting the final examination performance of students in pre-university engineering programs. Furthermore, it presents valuable recommendations for enhancing assessment strategies to support and foster student achievement more effectively.

Keywords: Regression analysis; Pre-University; Python; Mathematics

1. INTRODUCTION
1.1 Background

Course assessment is crucial to measure students' understanding of the course material. Formative assessment monitors students' learning progress during a program. Its objective is to provide continuous feedback to students and instructors to identify strengths, weaknesses, and areas for improvement (Lee et al., 2020). Examples of formative assessments are quizzes, tests, take-home

exercises, group projects, and case studies (Granberg et al., 2021). Different course has different methods to assess the students depending on the course learning outcome. The Assessment for Learning model emphasizes that assessments should be used to enhance learning and provide feedback that supports student development (Black & Wiliam, 1998). Educators should implement suitable assessments to ensure students understand the course content (Weldmeskel & Michael, 2016). In addition, the Theory of Formative Assessment agrees with the idea that using different types of assessments throughout the learning process allows teachers to monitor how well students are learning (Wiliam, 2011). Based on this feedback, teachers can adjust their teaching methods to support student learning and improve educational outcomes.

1.2 Literature Review

This literature review explores studies that employ multiple linear regression (MLR) to predict final exam scores based on various assessment methods.

Tutorials
Tutorials (Tutor), often structured as supplementary exercises to reinforce classroom learning, have been studied extensively for their predictive value in academic outcomes. In this study context, usually, students will be given a set of 20 to 25 questions from each chapter. Research by Smith (2017) found that tutorial attendance and participation positively correlate with higher exam scores, highlighting the role of active learning strategies in enhancing student performance. Similarly, Lee and Jones (2019) demonstrated through MLR analysis that tutorial engagement significantly predicts final exam outcomes across multiple disciplines, underscoring the importance of personalized academic support.

Quizzes
Quizzes (Q) serve as formative assessments that measure students' understanding of course material. In this study, students need to take 3 quizzes in 1 semester. The structured questions involve 3 levels: easy, moderate, and difficult. Studies by Brown et al. (2022) have shown that quiz performance when integrated into predictive models using MLR, provides early indicators of exam success.

Open Book Tests
Open book tests (OBT) represent a formative assessment, where students can refer to their notes and books to answer a set of questions. In this study context, students need to take 3 open-book tests per semester. Research by Garcia and Smith (2018) explored how open book test scores, incorporated into MLR models, contribute to predicting final exam performance. Their findings suggest that students who excel in open book tests often demonstrate higher-order

cognitive skills that translate into improved exam results, highlighting the pedagogical benefits of this assessment format.

1.3 Research Questions

In this research paper, there are 2 research questions:
1. Is there any correlation between different course assessments and final exam scores in Mathematics course?
2. What are the significance assessments in the Mathematics course?

1.4 Objectives

In this research paper, there are 2 objectives:
1. To examine the correlation between different course assessments and final exam scores in a Mathematics course for pre-university engineering students.
2. To identify the significance assessments in the Mathematics course.

1.5 Significance of the study

This study's significance was to determine the potential approach to transform assessment practices at the Centre for Foundation Studies, IIUM, by providing a comprehensive analysis of how different types of assessments, such as tutorials, quizzes, and open-book tests, affect student performance on the final exam scores. This study provides valuable insights for educators to enhance assessment methods, curriculum design, and student performance.

2. METHODOLOGY
2.1 Data collection

The data has been collected from the pre-university engineering students' results for Mathematics I in the Centre for Foundation Studies, IIUM, for cohort 2023/2024. There are 552 students from the foundation of engineering programs are included in this study.

2.2 Data Preprocessing

Data preprocessing is a crucial step in data analysis. In this analysis, data preprocessing has been used to improve the data's quality and reliability by addressing missing values, outliers, and inconsistent formats. Figure 2 shows a heatmap of missing data for the dataset used in this study. The heatmap in Figure 1 shows a uniform colour, indicating that there is no missing data across all variables and samples in the dataset.
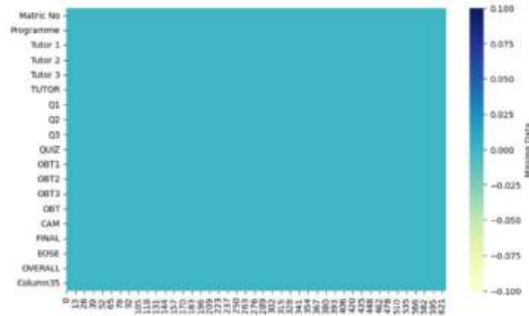
Fig. 1. Diagnostic Plots for Regression Model

3. RESULTS AND DISCUSSIONS
3.1 Data Descriptive

This analysis includes nine course assessments as independent variables: Tutor 1, Tutor 2, Tutor 3, Q1, Q2, Q3, OBT1, OBT2, and OBT3. The dependent variable is the final examination score. Figure 2 illustrates the summary of the results. The highest examination score is 67 out of 70, while the lowest is 0. The average score on the final exam was 40.3. The final exam score distribution is illustrated in Figure 3, showing a normal distribution.

|	Tutor 1	Tutor 2	Tutor 3	Q1	Q2	Q3	OBT1	OBT2	OBT3	FINAL
count	552.0000	552.0000	552.0000	552.0000	552.0000	552.0000	552.0000	552.0000	552.0000	552.0000
mean	4.9746	4.9493	4.9230	10.8859	14.4783	16.0054	7.2989	9.6214	9.7428	40.3043
std	0.2682	0.4110	0.5595	4.3578	3.9630	2.8178	3.1438	3.7373	3.0517	10.7650
min	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	0.0000
25%	5.0000	5.0000	5.0000	8.0000	12.0000	15.0000	5.0000	7.0000	8.0000	33.0000
50%	5.0000	5.0000	5.0000	11.0000	15.0000	16.0000	7.0000	10.0000	10.0000	41.0000
75%	5.0000	5.0000	5.0000	14.0000	17.0000	18.0000	10.0000	13.0000	12.0000	47.0000
max	5.0000	5.0000	5.0000	20.0000	20.0000	20.0000	15.0000	15.0000	15.0000	67.0000

Fig. 2. Descriptive Summary of Variables
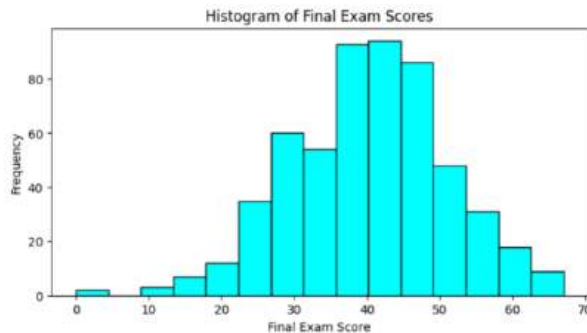
Fig. 3. Distribution of Final Exam Scores

3.2 Multiple Linear Regression Analysis

The study aimed to identify the significant formative assessments that can be used to predict students' final exam scores through linearity tests. Figure 4 illustrates the results of multiple linear regression analysis. The F-statistic is significant ($p < 0.001$), suggesting the model fits well. Among the predictors, Q1, Q2, Q3, OBT2, and OBT3 have statistically significant coefficients $(p-value < 0.001)$, indicating they are significant predictors of the dependent variable. In contrast, the coefficients for Tutor 1, Tutor 2, Tutor 3, and OBT1 are not statistically significant, suggesting their impact on the final exam score is negligible within this model $(p-value > 0.05)$. Therefore, the next step, which is model selection, is important to ensure that only significant predictors are considered in the final model. The hypothesis for the linear relationship test is as follows:

$H_0:$ Neither of the independent variables is related to the independent variables.

$H_0:$ At least one of the independent variables is related to the dependent variables.

```
                        OLS Regression Results
===============================================================================
Dep. Variable:                 FINAL   R-squared:                       0.474
Model:                           OLS   Adj. R-squared:                  0.466
Method:                Least Squares   F-statistic:                     54.37
Date:               Tue, 16 Jul 2024   Prob (F-statistic):           4.11e-70
Time:                       06:46:33   Log-Likelihood:                -1916.9
No. Observations:                552   AIC:                             3854.
Df Residuals:                    542   BIC:                             3897.
Df Model:                          9
Covariance Type:           nonrobust
===============================================================================
                 coef    std err          t      P>|t|      [0.025      0.975]
-------------------------------------------------------------------------------
const         -3.9130      6.491     -0.603      0.547     -16.664       8.839
Tutor 1        1.0956      1.437      0.762      0.446      -1.728       3.919
Tutor 2        0.6277      1.011      0.621      0.535      -1.358       2.614
Tutor 3        0.1932      0.740      0.261      0.794      -1.260       1.647
Q1             0.2804      0.090      3.100      0.002       0.103       0.458
Q2             0.7277      0.103      7.091      0.000       0.526       0.929
Q3             0.4184      0.139      3.013      0.003       0.146       0.691
OBT1           0.0336      0.126      0.267      0.790      -0.213       0.280
OBT2           0.5654      0.105      5.365      0.000       0.358       0.772
OBT3           0.8970      0.129      6.977      0.000       0.644       1.150
===============================================================================
Omnibus:                       1.567   Durbin-Watson:                   1.841
Prob(Omnibus):                 0.457   Jarque-Bera (JB):                1.368
Skew:                         -0.094   Prob(JB):                        0.505
Kurtosis:                      3.155   Cond. No.                         600.
===============================================================================
```

Fig. 4. Results of OLS Regression Analysis

3.3 Residuals Analysis

Residual analysis is a method used in regression analysis to assess a model's goodness of fit and verify the underlying assumptions. It involves checking for linearity, homoscedasticity, normality, and independence (Martin et al., 2017). Figure 5 depicts the diagnostic plots for the regression model. Figure 5(a) shows that the residuals appear randomly scattered around the horizontal axis, suggesting that the model's assumptions of linearity and homoscedasticity are reasonably met. The Normal Q-Q Plot in Figure 5(b) shows the points close to the diagonal line, indicating that the residuals are approximately normally distributed. These plots suggest that the regression model is well-fitted and its assumptions are valid. The residuals' distribution can be clearly observed in Figure 6, illustrating their normal distribution.
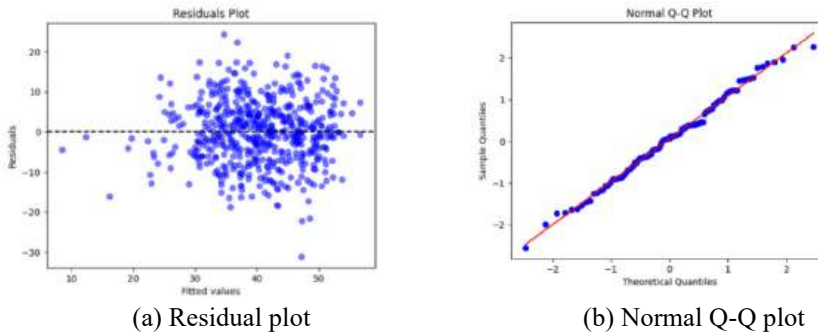

(a) Residual plot   (b) Normal Q-Q plot

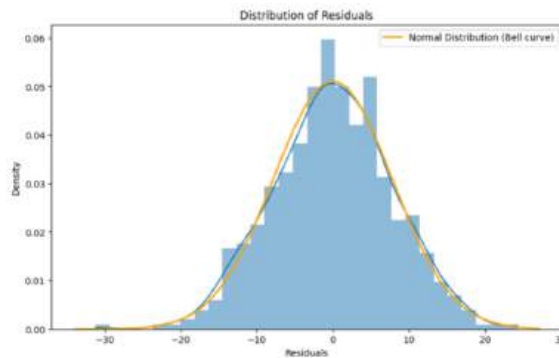**Fig. 5.** Diagnostic Plots for Regression Model

Fig. 6. Distribution of Residuals

3.4 Multicollinearity

Multicollinearity is a statistical concept that occurs when two or more independent variables in a model are highly correlated (Kim, 2019). In a regression model, an independent variable can be predicted from another

independent variable. Figure 3 shows a correlation heatmap, visualizing the relationships between dependent and independent variables using colours representing strength and direction. Lighter colours indicate stronger positive correlations, and darker colours indicate stronger negative correlations (W. Ding et al., 2023). The correlation heatmap indicates that the independent variables generally have low correlation coefficients, with most values below 0.4. This suggests a low degree of linear association between the independent variables. There are no issues with multicollinearity in this dataset.

Fig. 7. Correlation heatmap

	Variable	VIF
0	const	375.711756
1	Tutor 1	1.322931
2	Tutor 2	1.536582
3	Tutor 3	1.525699
4	Q1	1.382894
5	Q2	1.472219
6	Q3	1.362545
7	OBT1	1.389073
8	OBT2	1.380563
9	OBT3	1.369864

Fig. 8. Variance Inflation Factor (VIF) Values

The VIF values for different variables in a regression model to assess multicollinearity are displayed in Figure 8. VIF is a measure used to determine the degree of multicollinearity between independent variables in a regression model (O'brien, 2007). A high VIF value indicates high multicollinearity with other variables. All predictors, have VIF values ranging from 1.322931 to 1.536582. These values are well below the common threshold of 10, indicating that multicollinearity is not a significant issue for these predictors in the model (Salmerón Gómez et al., 2020).

3.5 Model Selection

Model selection in regression analysis involves selecting the most significant subset of predictors contributing to the dependent variable (J. Ding et al., 2018). This process is essential to ensure the model is simple and easy to understand, avoiding overfitting and underfitting. The output of the selection model is depicted in Figure 9.

```
                        OLS Regression Results
========================================================================
Dep. Variable:                 FINAL   R-squared:                 0.472
Model:                           OLS   Adj. R-squared:            0.467
Method:                Least Squares   F-statistic:               97.68
Date:               Fri, 12 Jul 2024   Prob (F-statistic):     1.96e-73
Time:                       21:14:46   Log-Likelihood:          -1918.1
No. Observations:                552   AIC:                       3848.
Df Residuals:                    546   BIC:                       3874.
Df Model:                          5
Covariance Type:           nonrobust
========================================================================
                 coef    std err          t      P>|t|     [0.025    0.975]
------------------------------------------------------------------------
const          4.7937      2.036      2.354      0.019      0.794     8.794
Q1             0.2756      0.088      3.129      0.002      0.103     0.449
Q2             0.7541      0.099      7.612      0.000      0.559     0.949
Q3             0.4508      0.135      3.341      0.001      0.186     0.716
OBT2           0.5663      0.104      5.453      0.000      0.362     0.770
OBT3           0.9164      0.127      7.193      0.000      0.666     1.167
========================================================================
Omnibus:                       1.590   Durbin-Watson:             1.835
Prob(Omnibus):                 0.452   Jarque-Bera (JB):          1.390
Skew:                         -0.095   Prob(JB):                  0.499
Kurtosis:                      3.156   Cond. No.                   173.
========================================================================
```

Fig. 9. Results of Regression Analysis with Significant Predictors

Based on Figure 9, the OLS regression results for predicting the final exam score include the predictors Q1, Q2, Q3, OBT2, and OBT3. The R-squared adjusted is 0.467, indicating 46.7% variation in the final exam score can be explained by the predictors. The F-statistic of 97.68 is highly significant ($p < 0.0001$), indicating that the model fits well. All predictor variables have positive and significant coefficients, suggesting that increases in Q1, Q2, Q3, OBT2, and OBT3 are associated with increases in the final exam score. The predictive model for the final exam score can be written as Equation (1):

$$\hat{y}_{FINAL} = 4.7937 + 0.2756_{Q1} + 0.7541_{Q2} + 0.4508_{Q3} + 0.5663_{OBT2} + 0.9164_{OBT3} \qquad (1)$$

4. CONCLUSIONS

Based on the findings from the multiple linear regression (MLR) and the correlation analysis, several conclusions can be drawn regarding factors influencing student performance in Mathematics course based on composite assessment scores. The MLR analysis in this study concluded that some of the composite assessments, which are Q1, Q2, Q3, OBT2, and OBT3, can be used to predict the final exam scores where the p-value of these assessment methods has a statistically significant coefficient. This highlights the importance of these assessments in assessing and potentially improving students' performance. Whereas for Tutor 1, Tutor 2, Tutor 3, and OBT1, they are not statistically significant. This might be due to the questions from tutorials being discussed in class with the lecturers. Therefore, students have ample time to ask questions and make corrections. This is why a majority of students are able to secure perfect scores in Tutorials 1, 2, and 3. Hence, these dependent variables are not a good indicator for predicting final exam scores. Based on the correlation analysis, it gives additional insights to find the relationship between all the independent variables with the dependent variable, which is the final exam scores. The result shows a strong and positive correlation between final exam scores and Q2, OBT2, and OBT3. It suggested that these assessment methods are associated with students' overall performance. Conversely, weaker correlations were observed for other variables, such as Tutor 1, Tutor 2, Tutor 3, and OBT1, indicating their minimal influence on the final exam scores within the context of this study.

Overall, a model developed in this study effectively explains 46.7% of the variance in the final exam scores, indicating a moderate level of predictive accuracy. These findings emphasize the significance of specific formative assessments in predicting and potentially enhancing student outcomes in Mathematics course. Educators can modify instructional strategies and implementation aimed at improving students' academic excellence. By focusing on assessments that show stronger correlations with final scores, educational practices can be refined to support better student learning and achievement in mathematics and potentially other subjects.

5. ACKNOWLEDGEMENT

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