PREDICTIVE VALIDITY OF CONTINUOUS ASSESSMENT SCORE ON THE FINAL EXAMINATION SCORE AND ASSESSMENT OUTCOMES FOR PHARMACY STUDENTS EXAMINED BETWEEN 2013 AND 2017 AT THE UNIVERSITY OF ZAMBIA

By

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DEDICATION

I am dedicating this thesis to my wife, Angela for the love, support, endurance and encouragement. You have been such a pillar that without your support through this process, I would still be trailing. To my sons, Solomon, Michael, Nchimuya and Nelson, I thank you for understanding my not being there sometimes, it has finally paid off.

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DECLARATION

I, Michael Michelo Chigunta, do hereby declare that the thesis report titled "Predictive Validity of Continuous Assessment Score on the Final Examination Score and Assessment Outcomes for Pharmacy Students Examined between 2013 and 2017 at the University of Zambia**"** submitted to the University of Zambia is entirely original work done by myself under the guidance of my supervisors. I further declare that, to the best of my knowledge, the information given in the thesis is authentic, and that the work of others has been duly acknowledged and that this thesis has not been submitted for any other degree or professional qualification.

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APPROVAL

The thesis of Michael Michelo Chigunta has been approved as having fulfilled the requirements for the award of the Doctor of Philosophy degree in Health Professions Education by the University of Zambia.

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ABSTRACT

Background: The University of Zambia, School of Medicine/ Health Sciences has an examination policy that puts significant emphasis on the contribution of the learners' continuous assessment scores towards their final examination scores. While there is evidence of the predictive nature of continuous assessment on academic performance in some educational setups, there exists locally, insufficient evidence on the predictive validity of continuous assessment scores on the final examination scores and assessment outcomes of pass or fail and the grade point average in health professions education such as pharmacy. Realizing that the ultimate key determinants of course specific pass or fail and grade point average are the quality of the assessment practices and decisions, in the context of their validity, the current study proposes that the predictive validity of continuous assessment scores on the final examination scores and assessment outcomes of pass or fail and grade point average in promoting quality in health professions education be established. Therefore, this study set out to establish the predictive validity of the continuous assessment score on the final examination score and assessment outcomes of pass or fail and grade point average for pharmacy students examined between 2013 and 2017 while exploring the experiences and perceptions of examinees and examiners regarding the assessment policy and practice at the University of Zambia.

Methods: The current study utilised a mixed-method approach using the convergent parallel study design. The quantitative arm was a non-interventional cross-sectional study, while the qualitative arm was a case study design. The study was conducted at the University of Zambia, School of Medicine, Department of Medical Education Development and Evelyn Hone College of Health Sciences located within Lusaka District, Zambia. The study sample comprised of the fourth- and fifth-year pharmacy students' examination results at the University of Zambia and third-year pharmacy student's examination results at Evelyn Hone College examined between 2013 and 2017. A total of 855 examination results were retrieved and analysed in the quantitative arm. In the qualitative arm, three (3) focus group discussions were conducted comprising of the third-year pharmacy students from Evelyn Hone College and a combined fourth- and fifth-year pharmacy students from the University of Zambia. Another focus group discussion was conduct on the examiners from both institutions. Correlations of the continous assessment score on the final examination score and the grade point average were carried out. Chi-square was used to establish the relationship between the continous assessment score and the course-specific pass or fail. Furthermore, Multiple linear and logistic regressions were conducted to establish the predictive validity of the continous assessment score on the final examination score, pass or fail and the grade point average while adjusting for demographic characteristics.

In the focus group discussions, the data were transcribed and then compared and further regrouped and recoded to come up with broader themes based on the interview guide. The broader themes were then linked to the six core categories for the examinees focus group discussions while only three core categories were identified for the examiners focus group discussions.

Results: There was a statistically significant positive correlation between course-specific continous assessment scores and the final examination scores as well as the grade point average scores across all the courses examined. The surprising finding after further analysis was that the median grade point average scores observed in the study were below the University of Zambia School of Medicine acceptable grade point average score of 2.5. There was a statistically significant difference observed between the course-specific mean continous

assessment scores and the respective final examination scores. Multiple linear and logistic regression revealed that the continous assessment score had predictive validity on the final examination score, grade point average and pass or fail assessment outcomes. Additionally, examinees, whose continous assessment score was Less than 20 demonstrated capabilities of passing in all the courses examined, who in this context, would not have ordinarily been allowed to sit for the final examination .

The main themes identified in the focus group discussions include: Awareness of the policy; Strengths and weaknesses; Feedback mechanism on assessments; and Factors affecting academic performance. Among the highlighted factors affecting students' academic performance include: Poor communication among faculty; Inadequate time allocation for the study break; and High student to lecturer ratio resulting in poor individual student attention.

Conclusion: There is predictive validity of the continous assessment score on the final examination score and examination outcomes of course-specific pass or fail and grade point average. However, it was observed that the median grade point average score obtained was lower compared to the University of Zambia acceptable grade point average score of 2.5. This could be indicative of poor mastery of expected competencies based on the definition of grade point average. Additionally, examinees whose continous assessment score was less than 20 demonstrated capabilities of passing in all the courses examined. The results suggest that there may be no justification to deny a student to sit the final examination based on the failed continous assessment score realising that a course is graded on a performance continuum of scores ranging from 0 to 100%.

The current study has provided valuable frameworks and evidence for designing interventions to improve learning and performance in assessments leading to better pedagogical delivery of curriculum objectives and better decisions on the assessment of competencies. This will ultimately lead to better educational outcomes that will translate into competent health professionals to deliver quality health care services for the benefit of patients.

Key Words: Predictive Validity, Continous Assessment, Final Examination, Summative Assessment, Grade Point Average

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ACRONYMS AND ABBREVIATIONS

AHTIs	Affiliate Health Training Institutions
APA	American Psychological Association
BA	Bachelor of Arts
BSc	Bachelor of Science
CA	Continuous Assessment
CCTDI	California Critical Thinking Dispositions Inventory
CCTST	California Critical Thinking Skills Test
CDC	Centre for Disease Control
cGPA	Cumulative Grade Point Average
CK	Clinical Knowledge
CSO	Central Statistics Office
ECOHS	Examination Council of Health of Sciences
EHC	Evelyn Hone College
EOC	End of Course
EOG	End of Grade
FA	Formative Assessment
FE	Final Examination
FGD	Focus Group Discussion
GPA	Grade Point Average
GRZ	Government of the Republic of Zambia
HPE	Health Professions Education
HTI	Health Training Institution
IMG	International Medical Graduates
MOE	Ministry of Education

MS Master of Science

NABPLEX National Association of Boards of Pharmacy Licensure Examination

NCME National Council on Measurement and Education

NGP National Gender Policy

OECD Organisation for Economic Co-operation and Development

OSCE Objective Structured Clinical Examination

OSLER Objective Structured Long Examination Record

PCAT Pharmacy College Admission Test

SA Summative Assessment

TOSBA Team Objective Structured Bedside Assessment

TPA Teacher Performance Assessment

UKCAT United Kingdom Clinical Appraisal Test

UMAT Undergraduate Medicine and Health Sciences Admission Test

UNZA University of Zambia

UNZABREC University of Zambia Biomedical Research Ethics Committee

UNZADMED University of Zambia Department of Medical Education Development

UNZASOM/HS University of Zambia School of Medicine/ Health Sciences

ZDHS Zambia Demographic and Health Survey

DEFINITION OF TERMS

Attrition Rate (AR): Proportion of students not attaining the set pass standard

Continuous Assessment (CA): Refers to any on-going assessment activity which results in a mark or grade which is subsequently used as a judgement on students' academic performance (Taras, 2009; Taras, 2010; William, 2000).

Educational Objectives: The behavioural intents which a student who has completed a course or programme of study is expected to demonstrate and apply to their professional demands.

Formative Assessment (FA): Refers to any task or activity which creates feedback (or feedforward) for students about their learning. Formative assessment does not carry a grade which is subsequently used in a summative judgement (Black and William, 2006).

Grade Point Average (GPA): A numerical figure representing the average level of academic achievement based on numerical grade scores attributed to letter grades representing a level of achievement, e.g. Distinction = A = 4; Merit = B = 3; Clear Pass = C= 1; Fail = D = 0.

Pass Rate: Proportion of students attaining the set pass standard.

Predictive Validity (PV): Describes how well an assessment anticipates a student's performance in the future and is determined by calculating the correlation coefficient between the results

of the assessment and the subsequent targeted behaviour (APA, NCME, 2014).

Summative Assessment (SA): Refers to any assessment activity which results in a mark or grade which is subsequently used as a judgement on student performance. These judgements are used to determine the classification of the award at the end of a course or programme (Black and William, 1998; Sadler 1989; Scriven 1967).

CHAPTER 1: INTRODUCTION

1.1 Background

The most important outcome of Summative Assessment (SA) is to categorise examinees into ordered performance level categories with respect to stated objectives of a curriculum, that is, to classify them into those that demonstrate proficiency in having achieved the educational objectives (pass candidates) and those who have not (fail candidates) (Banda, 2016; Biggs, 1998; Biggs and Collins, 1982; Baume and Yorke, 2002: Bloom, Hastings and Madaus, 1971). At University of Zambia School of Medicine (UNZASOM) and its Affiliate Health Training Institutions (AHTIs) such as Evelyn Hone College (EHC), the categorisation is from a summation of marks obtained from various assessment procedures, for example, essays, multiple-choice questions, and clinical or practical examinations (UNZASOM, 2013). The total score represents an examinee's attainment on the performance continuum implied by the proficiency levels and superimposed on a percentage scale ranging from 0 to 100% which is further comprised of the Continuous Assessment (CA) score (40%) and Final Examination (FE) score (60%) (UNZASOM, 2013).

The training of pharmacist and pharmacy technologist is organised around two schools at the University of Zambia. The training of pharmacists is conducted by the Department of Pharmacy in the School of Health Sciences. This programme is offered over a period of five years whilst the three (3) year pharmacy technology training programme is offered by Health Training Institutions (HTIs) that are affiliated to the School of Health Sciences. However, examinations for pharmacy technology programmes are coordinated by the Department of Medical Education Development (DMED) which is under the UNZASOM.

In the conduct of the examinations at UNZASOM, School of Health Sciences (UNZASOM/HS) and HTIs, there exists an examination practice and policy with significant emphasis on the contribution of CA score towards the FE score of the learners. The policy demands and emphasises that the CA and FE scores contribution should be 40% and 60% respectively and further states that any student that fails the CA score i.e. less than half of the 40% allocation (<20%) is not eligible to sit for the FE. Furthermore, students that fail the initial examination with a grade D+ could re-sit the course via a supplementary examination without any CA score contribution towards the final grade or examination outcome. Effective implementation of this policy has been questioned. This has been attributed to various reasons including educators work overload and the high lecturer to student ratio resulting in the delayed onward submission of the CA scores to administrators for action. This scenario provides an opportunity to investigate the predictive validity of the CA score on the FE score and examination outcomes of pass or fail and Grade Point Average (GPA) while exploring the experiences and perceptions of the examinees and examiners regarding the current examination policy at UNZA.

Conceptually, the objective of the CA policy is twofold: firstly, to promote the use of Formative Assessment (FA) so as to improve the quality of learning and teaching and secondly, to establish a regular system of managing cumulative pupils'/ students' performance marks for purposes of using the scores in combination with FE scores for selection and certification (Kapambwe. 2010). Realising the critical objective of the CA policy, students' achievements in the CA reflective of the CA score should be used effectively and consistently in any academic scenario that seeks to know the overall performance of a student in any specific course he/she is studying. In this regard, the significant emphasis of the contribution of the CA score in the examination policy and practices at examining institutions such as UNZA and its

AHTIs demonstrates a conceptual mismatch or flaw as there is no consistency in the significance and utilisation of the CA scores given the two scenarios above.

Academic staff have additionally expressed concerns about how students extremely focus on passing both the CA and FE while demonstrating minimum retention of the curriculum content of the prerequisite course (Mumma, Karma and Remmika, 2015; Anziani, Durham and Moore, 2008). According to their 2015 article, Mumma, Karma and Rammika assert that learning in higher education is still grade-centred, which affects the student learning process as the focus for the students may be to passing rather than learning and attaining mastery of the expected course/professional competencies.

Furthermore, academic staff have expressed deep concern about the innumerable instances where students have high marks in written examinations, for example, but have demonstrated glaring lack of factual, conceptual, and procedural knowledge in face-to-face oral (viva voce), clinical examinations and during class discussion session (Banda, 2016). Realising this academic delinquency and the concerns raised about the validity and reliability of assessment policies and practices at examining institutions cannot, therefore, be ignored.

A preliminary survey conducted on some UNZA examination results of January, 2016 for one course, there was an indication that the students whose CA score was less than 20 out of the allocated 40% scored highly in the FE score comparable to and in some cases higher than the students whose CA score was more than 20 out of the allocated 40%. As shown in figure 1.1 below, there was no significant difference in the median FE score for the students whose CA score was less than 20% and those whose CA was between 20% to 29% with median FE scores of 32.5 (IQR = 30 to 35) and 30.5 (IQR = 28 to 33) respectively.

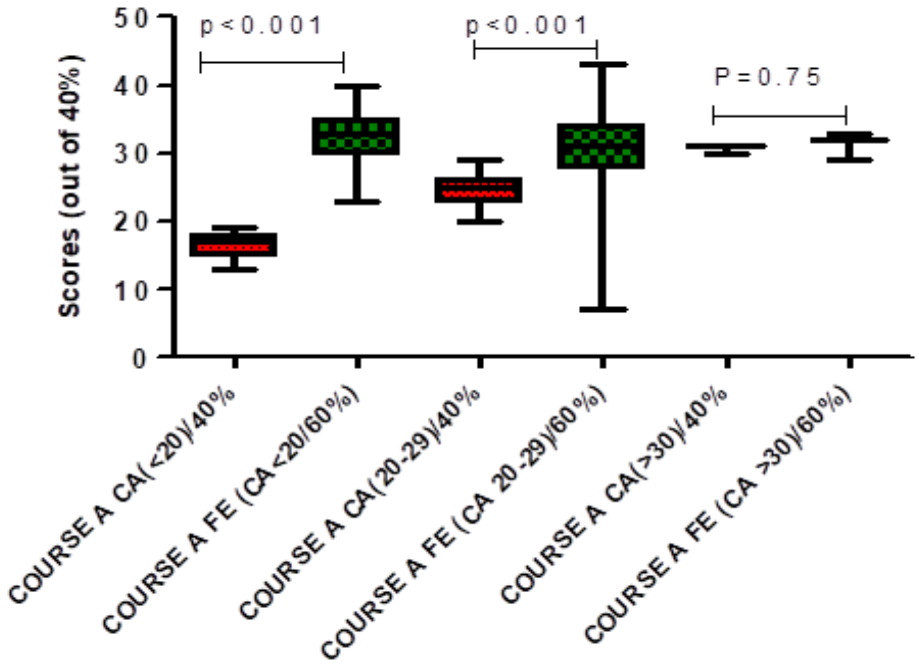

Figure 0.1: Comparison of Students' CA Score Against the FE Score in Course A

Another preliminary survey conducted based on some second-year and third-year UNZASOM (2015) supplementary examinations report demonstrated that over 75% of students that sat the supplementary examination in various courses ended up passing the respective courses without the contribution of the CA score as summarized in Table 1.1 below.

Table 0.1: Supplementary Results Summary for Selected UNZASOM Courses

Supplementary Examinations Results data (UNZA, 2015)					
Level	**Results characteristics**	**Course Title (Code)**			
Second-year		**A**	**B**	**C**	**D**
	Number of Students in the examination	12	1	6	2
	Number of students that Passed	9	1	6	0
	Number of students that failed	3	0	0	2
Third-year	Number of Students in the examination	8	10	7	1
	Number of students that Passed	6	10	7	1
	Number of students that failed	2	0	0	0

The two scenarios above demonstrate a conceptual mismatch and inconsistency in the application and use of the CA policy and practices at examining institutions such as UNZA. To a larger extent, this conveys an argument about the nature of the predictive validity of the CA score on the FE score and examination outcomes of pass or fail and GPA, as there is a demonstrable conceptual mismatch or flaw especially that there is no consistency in the contribution of the, CA scores given the two scenarios above and more so, on the emphasis to have a passed CA score i.e. >20%, yet those with a low CA score <20% are demonstrating abilities to pass the examination.

In order to ensure quality assurance to the stakeholders, examining institutions such as UNZA must embrace evidence-based, high fidelity and quality assessment practices and policies (Norcini *et al*., 2011; Banda, 2016; American Psychological Association, National Council on Measurement in Education (APA, NCME), 2014). To this effect, a research study about the predictive validity of the CA score on the FE score and examination outcomes of course-specific pass or fail, and GPA in Health Professions Education (HPE) has implications for so many students in high stakes proceedings and is significant. Therefore, the current study investigated the predictive validity of the CA scores on the FE scores and examination outcome of pass or fail and GPA while exploring the experiences and perception of pharmacy students examined between 2013 and 2017 at the UNZA and its AHTI.

1.2 Statement of the Problem

Conceptually, the objective of the CA policy is to improve the quality of learning and teaching as well as establish a regular system of managing cumulative students' performance marks for purposes of using them in combination with FE scores for selection and certification (Kapambwe. 2010). Realising the vital objective of the CA policy, students' achievements in the CA reflective of the CA score should be used effectively and consistently in any academic

scenario that seeks to recognise the overall performance of a student in any course-specific examination he/she is taking.

At UNZASOM and UNZASOM/HS and its AHTIs, there exists an examination practice and policy with significant emphasis on the contribution of CA scores towards the FE scores of the learners. The policy stipulates and emphasises that the CA and FE scores contribution should be 40% and 60% respectively and further states that any student that fails the CA i.e. <20% is not eligible to sit for the FE and that students that fail the initial exam with a grade D+ could re-sit the course as a supplementary exam without any CA contribution towards the final grade or exam outcome. This to some extent demonstrates a conceptual mismatch in the Examination policy and practice in that the contribution of the CA score towards the FE scores is considered in the initial aggregation of the final composite scores while not in the event that a student takes a supplementary examination.

The Assessment policy and practice at UNZA and the AHTIs has an implication on the academic performance of students. The predictive validity of CA scores on FE scores, the significant emphasis on passing the CA in order to qualify for the final summative exam, the influence of CA scores on the pass or fail and GPA are a source of concern and cannot be ignored as high achiever students in the CA are anticipated to do the same in the FE if continuous assessments are to be predictive of future performance or achievement (Perie, 2014; Gardner, 2006).

The conceptual flaw in the existing examinations policy does not demonstrate best practices for examining institutions such as UNZA and AHTIs since examining institutions are high-stakes vanguards of quality assurance, they must embrace evidence-based, high fidelity and quality assessment practices and policies (Norcini and Banda, 2011; Berry and Adamson,

2011). This can lead to more accurate, better decisions in examinations and ultimately to better health care service for the benefit of the patients (Banda, 2016).

Additionally, there exists locally insufficient evidence on the predictive validity of CA scores on the FE scores and course-specific pass or fail and the GPA, especially in HPE. The current body of evidence does highlight the predictive nature of CA scores on the final district or national exam scores in some low stakes educational setups such as primary and high school (Payne, 2013; Ababio and Dumba, 2013). However, a literature search conducted using Google Scholar, PubMed, Hinari and pub facts did not categorically demonstrate this linkage in higher education programmes and more especially, HPE such as pharmacy.

As can be seen from figure 1.2 below, factors affecting performance in assessments are generally categorized in three: Institutional related factors such as pedagogical effectiveness and skills of educators, Assessment-related factors such as Validity and reliability, and Student-related factors such as educational support (Diaz, 2003; Airasian and Russell, 2008; Bates et. al., 2013; Boud, 1995; Alexander and Hicks, 2016). Other vital considerations to make about performance in summative assessments are the educational infrastructure, the curriculum model, educational philosophy, student motivation assessment purpose among others (Azmi, Ali, Wong and Kumolosasi, 2014; Braxton, Hirshy and McClendon, 2004; Brown, Race and Smith, 1996). Realising the importance of institutional factors in the attainment of quality in HPE, the current study aimed at critiquing the current assessment policy and practices at UNZASOM/HS. The establishment of the predictive validity of the CA score on the FE score and examination outcomes of pass or fail and GPA while further exploring the experiences and perceptions of the examinees and examiners at UNZA and EHC as part of a contribution to academic quality assurance is inevitable.

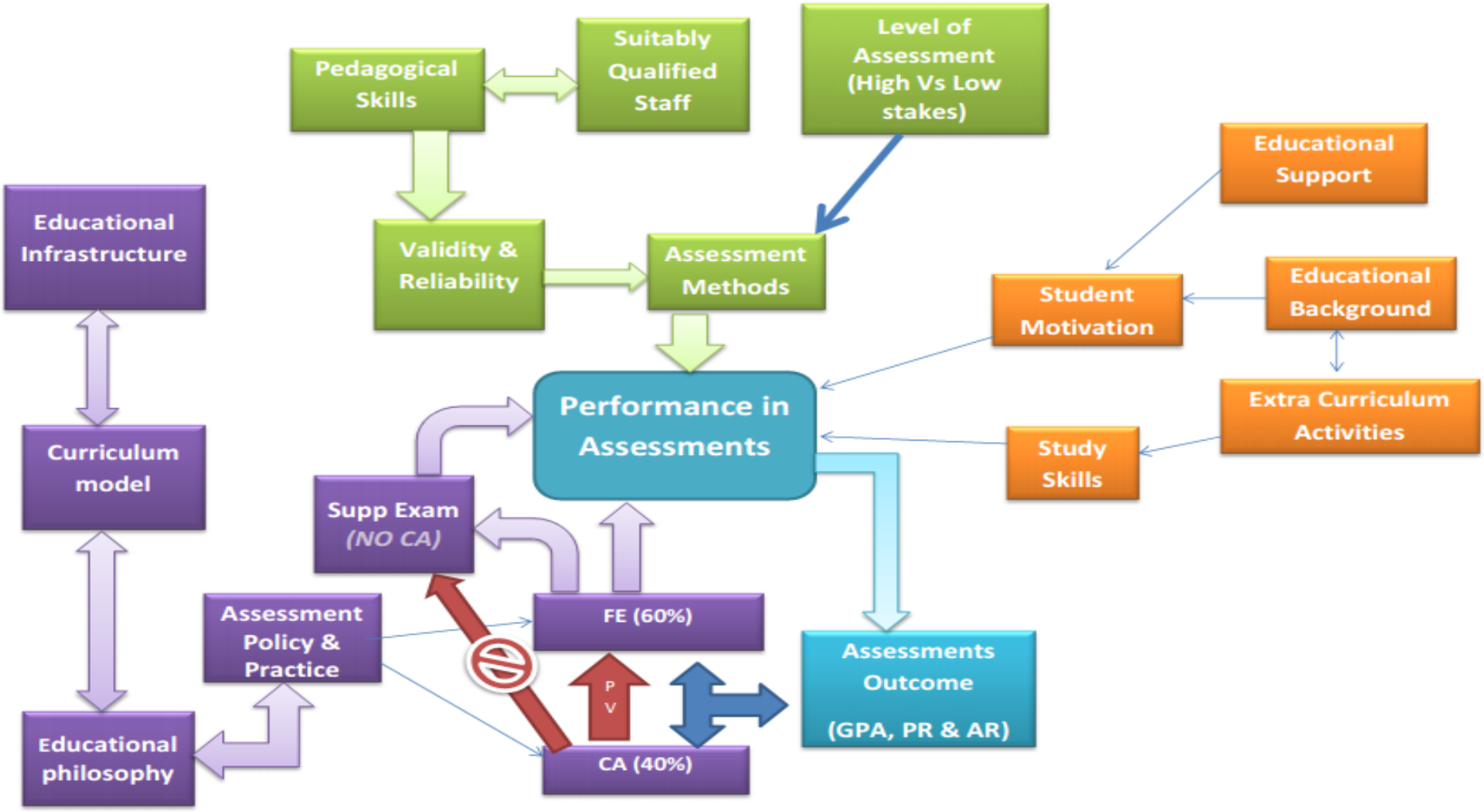

Figure 0.2: Problem Analysis Diagram

In a bid to ensure quality assurance to the various stakeholders, examining institutions such as UNZA must embrace evidence-based, high fidelity and quality assessment practices and policies. To this effect, a research study about the predictive validity of CA score on FE score and examination outcomes of pass or fail, and GPA has implications for so many students in high stakes proceedings and is significant. The question that arises from this argument, therefore is, "How does the CA score predict the FE score and to what extent do these scores influence the course-specific pass or fail and the GPA?

1.3 Research Question

1. How does the CA score predict the FE score and examination outcomes of pass or fail and GPA for Pharmacy students examined between 2013 and 2017 at UNZA?

1.3.1 Specific Questions

1. How does the CA score predict the FE score in pharmacy students examined between 2013 and 2017 at the UNZASOM/HS?
2. How does the CA score relate with the course-specific pass or fail and GPA for pharmacy students examined between 2013 and 2017 at UNZASOM/HS?
3. What are the experiences and perceptions of Pharmacy examiners and examinees at UNZASOM/HS and EHC regarding the current examination policy and practice?

1.5 Main Objectives

The main objective of the current study was to establish the predictive validity of CA score on the FE score and examination outcomes of pass or fail and GPA for pharmacy students examined between 2013 and 2017 while exploring the experiences and perceptions of pharmacy examinees and examiners at the UNZASOM/HS and EHC.

1.5.1 Specific Objectives

1. To describe the demographic characteristics of the examinees and compare the course-specific CA score and the FE score within and among courses (Pharmacology, Pharmaceutics, Pharmacy Practice, Medicinal/Pharmaceutical chemistry and clinical pharmacy) for pharmacy students examined between 2013 and 2017 at UNZASOM/HS and EHC.
2. To assess the predictive validity of CA score on the course-specific pass or fail and GPA in Pharmacology, Pharmaceutics, Pharmacy Practice, Medicinal/Pharmaceutical chemistry and clinical pharmacy for pharmacy students examined between 2013 and 2017 at UNZASOM/HS and EHC.
3. To determine the predictive validity of CA score on the course-specific FE score in Pharmacology, Pharmaceutics, Pharmacy Practice, Medicinal/Pharmaceutical chemistry and clinical pharmacy for pharmacy students examined between 2013 and 2017 at UNZASOM/HS and EHC.
4. To explore the perceptions and experiences of Pharmacy examiners and examinees regarding the current UNZASOM/HS and EHC examination policy and practices

1.6 Justification of the Study

In order to ensure quality assurance to the stakeholders, examining institutions such as UNZASOM and AHTIs must embrace evidence-based, high fidelity and quality assessment practices and policies (Zepke, Leach and Prebble, 2006; Banda, 2016; Norcini, Lipner and Grosso, 2013). This is in a bid to meet the public expectation of competent health practitioners, and more so, a general global discourse around accountability among professionals as well as Health Educators and this can be achieved by testing, measurement and recording using authentic methods (Lai, Sivalingam and Ramesh, 2007; Duvivier et al., 2011).

A study about the predictive validity of CA score on the FE score and the examination outcomes of a pass or fail and GPA has implications for so many students in high stakes proceedings and is ostensibly significant. The current study can provide valuable frameworks for designing interventions to improve learning and performance in assessments, lead to better pedagogical delivery of curriculum objectives and better decisions on the assessment of competencies and ultimately better educational outcomes that will translate into competent health professionals to deliver quality health care service for the benefit of patients. The study can equally help establish the strengths and weaknesses of the current examination policy to ensure quality and evidence based assessment policies.

1.7 Key Research Findings

In the current study, there was a statistically significant positive correlation between course specific CA score and the GPA score across the courses examined (Third-year courses, n=410, Pharmacology, $r = 0.636$, $p < 0.001$; Pharmaceutics, $r= 0.578$, $p<0.001$; Pharmaceutical Chemistry, $r = 0.634$, $p<0.001$ and; Pharmacy Practice, $r=0.602$, p-<0.001: Fourth-year courses, n=228, Medicinal chemistry, $r = 0.582$, $p<0.001$; Bio-Pharmacy, $r= 0.722$, $p<0.001$; Pharmaceutics, $r= 0.617$, $p<0.001$ and; Pharmacology, $r=0.621$, $p<0.001$ while the Fifth-year courses, n= 217, Clinical pharmacy, $r= 0.662$, $p<0.001$; Pharmacology, $r=0.634$, $p<0.001$ and; Pharmacy Practice, $r= 0.621$, $p<0.001$.

The surprising finding after further analysis was that the mean GPA score observed in the study was below the UNZASOM acceptable standard GPA score of 2.5 as categorized by the 2014 amended UNZA academic regulations (Third-year median GPA=2, IQR = 1.25 to 2.5; Fourth-year median GPA= 1.75, IQR = 0.75 to 2.25; Fifth-year median GPA= 1.67, IQR= 1.0 to 2.0).

Correlation of the course-specific CA score and the respective FE score demonstrated that there was a statistically significant positive correlation observed in all the courses examined (Third-

year courses, n=410: Pharmacology, r= 0.45, p<0.001; Pharmaceutics r=0.27, p<0.001; Pharmaceutical Chemistry, r=0.37, p<0.001; Pharmacy practice, r=0.44, p<0.001: Fourth-year courses, n= 228; Medicinal chemistry, r=0.402, p<0.001; Bio pharmacy, r=0.69, p<0.001; Pharmaceutics, r=0.29, p<0.001; Pharmacology, r=0.49, p<0.001: Fifth-year courses, n=217; Pharmacy practice, r= 0.43, p<0.001; Pharmacology, r=0.55, p<0.001; Clinical Pharmacy, r=0.41, p<0.001).

Further analysis using a paired ttest to test for the difference between the course-specific mean CA scores and the respective FE scores, there was a statistically significant difference observed (Third-year, n=410: Pharmacology, Pharmaceutics and Pharmacy practice, p<0.001 while Pharmaceutical chemistry, p<0.462: Fourth-year, n= 228; Medicinal chemistry and Pharmaceutics, p<0.001; Bio pharmacy, p=0.022; Pharmacology, p=0.013: Fifth-year, n= 217; Clinical Pharmacy, Clinical pharmacology and Pharmacy practice, p<0.001).

Analysis of Variance was used to compare the course-specific mean total scores among the courses and a statistically significant difference in the total mean scores were observed (Third-year courses, n= 410, p= 0.0012; Fourth-year courses, n= 228, p= 0.019 and; Fifth-year courses, n= 217, p<0.001).

On the experiences and perceptions of the pharmacy examinees and examiners regarding the examination policy, six thematic areas emerged from the FGDs that were conducted among them include: Awareness of the policy; Weaknesses and strengths of the policy; Feedback on assessments; Factors that may influence academic performance. Three FGDs were conducted: one with third-year pharmacy students at EHC; Another with UNZA pharmacy students; and the last with pharmacy examiners from both EHC and UNZA.

On the whole, both the examinees and examiners were aware of the existence and enforcement of the examination policy in the respective training institutions. The participants were all in

agreement regards existence of the policy and did indicate that they had to take several assessments types such as written tests, individual assignments and practical's as a way of contributing to the CA score which is calculated out of 40%.

Examination of the data concerning the strengths and weaknesses of the policy as perceived and experienced by the examinees and examiners, it was generally agreed that the policy was good and that it helps the student to prepare for the examination especially if they performed poorly during the academic year.

Regards feedback on assessment outcomes, it was generally agreed that there was poor feedback given in terms of the quality, timing after assessment and the nature of communication was poor. It was also found that Lecturers, in general, did not have a plan or did not share the assessment plan to the examinees in order for them to plan as such.

There are a variety of reasons that literature has demonstrated about factors affecting academic performance in higher training institutions. This inquiry was meant to highlight some of the experiences faced by the participants regarding factors that affected academic performance in assessments in general. The factors were abridged as follows, among others:

- High student to Lecturer ratio, which results in poor individual student attention.
- Financial support or sponsorship was also cited as a factor that may affect academic performance.
- Failure to communicate course outlines and content by the lecturers does affect preparation and performance by students.
- The high course load was also cited as one of the factors.
- Lecturer's poor teaching skills and attitudes.
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1.8 Significance and Implications to Policy and Practice

UNZASOM/HS oversees examinations of over 3,000 health professions in Zambia per year in over twenty UNZASOM affiliate colleges (ECOHS, 2016) while the University of Zambia has graduated over 600 pharmacy students. Therefore, because examining institutions are high-stakes vanguards of quality assurance they must embrace evidence-based, high fidelity and quality assessment practices and policies (Norcini and Banda, 2011; Peeters, 2013; William, 2009; Yorke, 2003). Assessment policies and decisions have serious implications for the students, for example, loss of sponsorship for continuation of studies, delays or exclusion from studies, rejection of application for licensure to practice a profession, and also substantial financial and opportunity costs to students, society and governments, and, as such, must be considered high stakes proceedings (Banda, 2016; Norcini et.al, 2011; APA, NCME, 2014).

Other, equally important considerations include the impact of poor quality practices on students, the examining institutions, and society; the accountability necessity of examining institutions to various stakeholders for the quality of assessment practices; and the duty to informed best practices (Downing and Yudkowsky, 2007; Banda, 2016; Knight, 2002; Miller, Imrie and Cox, 1998). Based on the results and realising the importance of this contemporary call to best practices, UNZA and its AHTIs are required and expected to demonstrate evidence-based policy guidelines. This can lead to more accurate, better decisions in examinations and ultimately to better health care service for the benefit of patients. The current study has established the predictive validity of the CA score on the FE score and course-specific pass or fail and GPA while exploring the experiences of the examinees and examiners in high stakes proceedings and the results are significant.

1.9 Thesis Structure

The thesis has been organised into Six (6) chapters with several sections and subsections as follows:

Chapter one contextualises the study and provides the information relating to the study, the introduction and background to the study. It further highlights and refines the current research problem, the questions that were asked, research objectives, justification of the study, a snapshot of the findings while highlighting some of the significant implications to policy and practice.

Chapter two interrogates and reviews a plethora of literature that contributed to the development and contextualisation of the research problem: General and current perspectives on assessments theory, concepts and principles. Literature relating to predictive validity in assessments is further reviewed and interrogated ending with a conceptual framework that puts into perspective the principles relating to assessments and demonstrating the gap identified and the contribution of the current study.

Chapter three presents the methodology that was used to gather the necessary data for the research problem. Firstly, the research paradigm for the current study is presented followed by the design, study site, target population, sample size and sampling technique, data collection and analysis method used. Furthermore, validity and reliability issues are presented, ending with ethical issues and considerations.

Chapter four presents the results of the data analysed and summarises the findings of the study in relation to the objectives of the study. It is divided into two phases the first, speaking to the quantitative methods and the second speaking to the qualitative methods and results. Several data presentation methods are used in relation to the variable as per the analysis method.

Chapter five presents the discussion of results about the literature that informed the study. Realising that the study design used was a mixed-method and convergent parallel, the discussion brings together the results, from both the quantitative and qualitative arms of the study and interrogates them in respect to the current trends and phenomenon regarding assessment policies and practices about predictive validity.

Chapter six presents the conclusion and recommendations of the study. Based on the findings and discussion, this chapter brings together, the summary of the emerging information and provides the contribution the current study has made to the body of knowledge while offering as well as suggesting some recommendation about the practice of assessments in higher training institutions.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

While there is evidence of the predictive nature of CA on academic performance in low stakes educational setups, there exists locally, insufficient evidence on the predictive validity of CA scores on the FE score and examination outcome of pass or fail and the GPA in HPE such as pharmacy. Realizing that the ultimate key determinants of pass rates and pass or fail decisions are the quality of the assessments practices and policies in the context of their validity, the current study proposes that the predictive validity of the CA scores on the FE scores in promoting quality in HPE be explored and established.

The main aim of the literature review was to develop a strong knowledge base of summative assessments and their predictive nature in higher education, more specifically health professions education based on scholarly literature. The review also aided the determination of appropriate research methodologies to help answer the research questions as well as determine the gaps, consistencies and inconsistencies about the assessment concepts in the literature. In this regard, Scholarly literature refers to published and unpublished data based on research reports, as well as conceptual or theoretical literature (Lobiondo-Wood and Haber, 2006). The literature cited in the current research is mainly from medical education journals, computer assessed doctoral theses, medical education books and many others accessed from internet search engines such as Google Scholar, PubMed, HINARI and Medical Journal online.

The literature review highlights the major concepts and principles that inform Assessments in general, purposes of assessments and how it has been implemented at UNZASOM/HS and AHTIs, validity and reliability issues, review of previous efforts, conceptual and theoretical framework.

2.2 Current Perspectives on Assessment Theory, Concepts and Principles in General

This section will discuss some critical assessment issues which have been identified while exploring and attempting to evaluate current discussions of terminologies of assessment in order to situate the relationships between concepts and thus the theories better. Definitions of formative and summative assessment are given while situating them within the wide understandings of roles and functions, and processes of assessment.

In recent years, assessment of student's achievement has been receiving the attention of teachers, parents and many other stakeholders. According to the Taras (2005; 2012), the theory of assessment has historically been less well developed than other forms of educational theory and that it is more commonplace to speak of assessment principles rather than theories. Brown *et al.* (1996) asserts that such principles have been developed out of actual practice, accumulated knowledge and experience of generations of teachers and lecturers.

2.2.1 Definition of Assessment and Underpinning Theories

Assessment has been defined as "Any systematic method of obtaining information from tests and other sources, used to draw inferences about characteristics of people, objects, or programs" (Downing and Yudkowlsky, 2009; APA and NCME, 2011). According to Hanna and Dettmer (2004), assessment is a process of determining whether predetermined educational objectives have been achieved and is, therefore, a measure of student learning. It is seen as a primary quality assurance mechanism by which health training institutions and professional licencing organisations can assure the public of acceptable levels of competence among their trainees and practitioner (Downing and Yudkowlsky, 2009; Nicol, 2007; Norcini, 2005).

McAlpine (2002) describes assessment as a form of communication, primarily between students and teachers but also to employers, curriculum designers and policymakers. Scriven (1967) describes the process of "assessment" as requiring the gathering of data, establishing

weightings, selecting goals and criteria in order to compare performances and justify each of these. It is not just an opinion which can be laden with our prejudices and feelings, but a process which at least attempts to provide accountability for the action and decision (Downing and Yudkowlsky, 2007: Taras, 2012; Norcini *et al.*, 2011; McAlpine, 2002; Miller, 2005; Ronald, 2007; Bennett, 2011).

Taras (2012) asserts that the results of an assessment and what we do with these are directly linked to the parameters which have been decided before the assessment took place. That is, the criteria have indicated what the important points of focus, the outcome signals the purpose or function of the assessment and the standards demonstrate and provide guidelines to the level required of the work and as such, any deviation or change in these aspects either during or after the assessment should be signalled, explained and justified: this is necessary in order to have an ethical, transparent assessment (Taras, 2012; Taras, 2007; Scriven, 1967).

The Classical Test Theory

Classical Test Theory (CTT) has been developed to quantify measurement error and to solve related problems such as correcting observed dependencies between variables (e.g., correlations) for the attenuation due to measurement errors. Basic concepts of CTT are true score and measurement error variables. These concepts are defined as specific conditional expectations and its residual, respectively. Models of CTT consist of assumptions about the true score and error variables allowing to identify the theoretical parameters from the variances and covariance's of the observable measurements. CTT has several weaknesses that have led to the development of other models for test scores, e.g. the concept of reliability is dependent on the group used to develop the test. If the group has a wide range of skill or abilities, then the reliability will be higher than if the group has a narrow range of skill or abilities. Thus reliability is not invariant with respect to the sample of test-takers, and is therefore not a characteristic of

the test itself; in addition, neither are the common measures of item or item difficulty (Tinto, 2005; Downing and Yudkowlsky, 2009)..

The Generalizability Theory

Generalizability theory (G theory) provides a framework for conceptualizing, investigating, and designing reliable observations. It was introduced originally by Cronbach and colleagues in response to limitations of the popular true-score-model of classical reliability theory. G theory reinterprets classical reliability theory as a theory regarding the adequacy with which one can generalize from a sample of observations to a universe of observations from which it was randomly sampled. Observations may conceivably be generalized to many different universes and may vary in how reliably they permit inferences about these universes and, therefore, be associated with different reliability coefficients (Downing and Yudkowlsky, 2009).

2.2.2 Summative Assessment

Summative Assessment (SA) is normally envisaged as a formal assessment with shared criteria, outcomes, standards and is a summation of a unit, course or programme of learning which is seen to take place towards the end and which is usually graded and part of an accredited unit. Issues of reliability and validity are linked to its formal nature (Black and William, 1998; Sadler, 1989; Scriven, 1967; Tara, 2012). It gives an overall picture of student performance and is a formal process that often leads to certification or pass/fail judgment or a grade A+, B, C or E (Banda, 2016). SA is for progression and external purposes, given at the end of a course and designed to judge the students' overall performance (McAlpine, 2002 Knight, 2002; Norcini, 2003). It is the most useful for those external to the educative process who wish to make decisions based on the information gathered e.g., employers, institutions offering further studies etc., and allows educators to determine whether predetermined educational objectives

have been achieved (Zubair and Khoo, 2007), thus, ‘a Measure of student learning’. SA is also thought to estimate the effectiveness of teaching and learning techniques of subject content, instructional media in meeting the goals of the course and is thus regarded as a medium to high stakes proceeding (Newble and Cannon, 2002; Norcini *et al*., 2011; Perrenoud, 1998; Ronald, 2007).

2.2.3 Formative Assessment

Formative Assessment (FA) is understood as assessment for feedback which provides support for learning and is linked to it being provided in good time for learners to adapt their thinking and work (Taras, 2012; Black and William, 1998). FA is believed to provide feedback which is separated from the emotional and sensorial aspects of a graded judgment. Increasingly, the understandings of FA are linked to informal drafts of work which are not linked to reliability and validity issues and proponents often contextualises it as an ad hoc part of the classroom process (Irons, 2008; Black and William, 1998; Black and William, 2006, Taras, 2012). According to Irons (2008), FA is intended to guide future learning, provide reassurance, and promote reflection and shape values. The primary purpose of formative testing is to provide useful feedback on student strengths and weaknesses concerning the learning objectives (Yorke, 2003; Irons, 2008; Taras, 2012; Tinto, 1993; Tinto, 2005; Downing and Yudkowlsky, 2009). Classic formative assessment takes place during the course of study, such that student learners have the opportunity to understand what content they have already mastered and what content needs more study or emphasis (Nicol, 2007; Black and William, 1998). Examples of formative assessments include weekly short quizzes during a microbiology course, shorter written tests given at frequent intervals during a two semester-long course in pharmacology, etc., (Downing and Yudkowlsky, 2009; William and black, 1996;). The distinction is that the feedback does not contribute to the overall grade at the end of the study unit (Bloom *et al.*,

1971). Effective formative assessment is typically low stakes, often informal and opportunistic, and is intended to stimulate learning (Norcini *et al.,* 2010, 2011).

2.2.4 Purposes and Roles of Assessment

Assessment is seen as a primary quality assurance mechanism by which health training institutions and professional licensing organisations can assure the public of acceptance levels of competence among their trainees and practitioners (Norcini, 2005; Norcini *et al.,* 2010, 2013). Many well-known adages emphasise the central role of assessment in the educational process such as ‘‘Assessment is the tail that wags the dog’’ or Miller’s (1990) assertion that ‘‘Assessment drives learning’’. These fundamental tenets are central to understanding the role of assessment and its application to teaching and learning (Taras, 2012; Norcini and Banda, 2011). It can be argued, therefore, that assessment is crucial to all education and all learning. Intrinsically it should be a neutral process which is ubiquitous and indispensable to every aspect of life from learning to walk to adapting to new circumstances (Harlen and Deakin, 2002; Taras, 2012). This means that to a great degree, if we wish to ensure that assessments are ethical, then they need to be contextualised and recorded.

The assessment itself is a neutral process which weighs the evidence in order to provide an estimated judgment of the work the learner has achieved or accomplished in a given time frame. Taras (2012) further asserts that if the assessment is not done, it is practically impossible to know or judge what is good, what is weak and importantly, how to improve the learning process. A wealth of literature has generally accepted as fact that the distinction between SA and FA is based on functions without really understanding the consequences of this belief. The functions of assessment are often considered to distinguish between summative and formative assessment (Berry and Adamson 2011; Black and William, 1998; Black and William, 2006; Gardner, 2006; Black and William, 2009).

Taras (2012) however suggests that in as much as the functions of SA and FA are essential, it is cardinal to equally understand how these results were obtained which mitigates against ensuring ethical and equitable practices. What appears in the literature within the dichotomy of SA and FA is the linkage of SA to formal exams or tests and FA to ad hoc classroom/work and feedback (Berry and Adamson, 2011; Black and Wiliam, 2006; Wiliam, 2009). Some authors further highlight that SA is as a result of much hard work and time, and importantly, psychometrics measures, i.e., validity and reliability are prominent (Taras, 2012; Black and William, 2006; Norcini *et al*., 2011) unlike in FA (Bennett, 2011; Campbell and Norton, 2007).

However, in the case of elementary and high school classroom assessments, which are produced and recorded by teachers as a regular indication of student progress, they can and often do find their way to generalizations of student progress and ability as has been demonstrated in other literature reviewed below regarding the predictive validity of specific benchmark assessments or test (Taras, 2012). These can take the form of reports which could be seen by parents, headteachers and future class teachers (MOE, 2007). The consequences of assessment have been extensively documented, and many are detrimental to individual self-esteem, perceptions of worth, prospects and careers (Berry and Adamson, 2011; Broadfoot, 2010; Stobart, 2008; Baranowski, 2006; Taras, 2012). These consequences are generally attributed to SA, that is, exams or tests that "count". It is arguable that all assessments count and that all have a personal impact on individuals, particularly informal, regular classroom assessment, whether recorded or not (Bennett 2011; Zubair and Khoo, 2007; Becker and Pomplun, 2006; Brady, 2005).

2.2.5 Continuous Assessments

This kind of assessment has been understood as an on-going, diagnostic, classroom-based process that uses a variety of assessment tools to measure learner performance (MoE, 2007; Kapambwe, 2007; Ecclestone, 2002; Gibbs and Simpson, 2004). It is an educational policy in

which students are examined continuously over most of the duration of their education, the results of which in some cases are taken into account in the SA (McAlpine, 2002; Gardner, 2006). According to McAlpine (2002), CA is thought to be a more modern form of modular assessment where judgements are made at the end of each field of study and are often proposed or used as an alternative to a single final examination system.

CA, sometimes called interim or benchmark assessments, occupy a somewhat gloomy place between formative and summative assessment (Ababio and Dumba, 2013; Payne, 2013; Perie, 2014; Harlen, 2006). The major diference between CA and FA is that, FA is directed at a diagnositic and feedback mechanism for learning where as CA in this context is utilised as a mechanism for measurement of learning and progression decisions (Downing, Tekian and Yudkowsky, 2006). CAs typically occur two or three times or as prescribed in the curriculum during a course or school year, and the data are used to measure a student's progress toward mastery of the expected competency (Payne, 2013; Perie, 2014). This characterisation seems to put CAs squarely in the summative camp. However, while the data are used for summative purposes, the literature suggests that most schools and educational institutions use the data to adjust instruction and provide interventions to students, a formative characteristic (Bates *et al*. 2013: Payne, 2013). Stiggins (2002) stated that the formative information from benchmark assessments could direct educators' improvement efforts. Some authors have argued that since CAs typically occur before the end of the semester or year, teachers still have time to adjust their practice, and students still have time to master the content before the high stakes FEs. Taras, (2012) and McAlpine, (2002) agreed that no definitive separation exists between the types of assessments, and interim assessments fall somewhere between formative and summative because they offer data for prediction, for program evaluation, and for identifying student learning needs.

In a study by Ababio and Dumba (2013), they indicated that benchmark assessments have many purposes, some of which include "instructional, evaluative, and predictive" which are used "to inform classroom instruction". Brown (2007) agreed that multiple reasons exist for schools to use benchmark or CA assessments including gauging student learning, providing actionable information for teachers, predicting high stakes scores, and pacing of the delivery of standards. According to Downing, Tekian and Yudkowsky (2006) and Ian and Robson (2007), FEs and the results arrive too late to influence instruction or increase student learning, and as such, schools need to know where students are performing at different points during the year while they can still adjust instruction. For this reason, many high performing schools utilise benchmark assessments (Olson, 2005). To mitigate the limitations of end of year summative assessment, states, districts, and schools including UNZASOM use CAs to test more often and use the CA data to adjust instruction, and most importantly, utilise multiple types of assessment in the classroom with student participation (Stiggins, 2005). To meet accountability goals, schools have to link everyday classroom practices with school-wide outcomes and develop data-driven practices (Kapambwe, 2010). Norcini et al. (2011) assert that effective summative assessment is typically medium or high stakes and is primarily intended to respond to the need for accountability.

2.2.6 Validity and Reliability Issues

Validity and reliability are paramount psychometric criteria, which to a great extent determine the credibility and overall quality in the scores and the underlying implications (Norcini, 2011; Axelson and Kreiter; 2009; Downing, 2004; Downing, 2003; Haladyna, 2004). A Valid assessment is one which measures that which it purports to measure while a reliable assessment highlights the extent to which the result is likely to be same if the same individuals were assessed by other people or the assessment was repeated at another time and typically hinges on Consistency (Axelson and Kreiter, 2009; McAlpine, 2002; Messick, 1996: Norcini, 2011).

2.2.6.1 Validity

Validity refers to the degree to which evidence and theory support the interpretation of test scores for proposed uses of tests is, therefore, the most fundamental consideration in developing and evaluating tests (American Psychological Association, 2014**)**. McAlpine (2002) and Messick (1996) categories the types of validity as follows;

Content Validity; where the entire content of the behaviour/construct/area is represented in the test or assessment to be undertaken by the student.

Face Validity; face validity refers to the degree to which a test appears to measure what it purports to measure.

Concurrent Validity: Concurrent validity is the degree to which the scores on a test are related to the scores on another, already established, a test administered at the same time, or to some other valid criterion available at the same time.

Construct Validity: Construct validity is the degree to which a test measures an intended hypothetical construct.

Predictive Validity: predictive validity describes how well an assessment predicts a student's performance in the future. The current study will focus on this kind of validity by determining the predictive validity of CA scores on the FE scores.

According to Messick (1996) and McAlpine (2002), predictive validity is determined by calculating the correlation coefficient between the results of the assessment and the subsequent targeted behaviour. The stronger the correlation between the assessment data and the target behaviour, the higher the degree of predictive validity the assessment possesses (ibid). In this study, the correlations between the CA scores and the FE scores will provide evidence of the predictive validity. Predictive correlations can range from 0 to +/-1 and the higher the correlation coefficient, the more the two tests measure the same construct, increasing the chance of accurately predicting one from the other (Messick, 1996: McAlpine, 2002: Brualdi,

1999: Downing and Haladyna, 2009; Peeters, 2013). In general, tests score, such as CAs at UNZASOM/HS could be said to have predictive validity if they demonstrate their effectiveness in predicting the criterion or, in this case, in predicting the end-of-academic year FE assessment scores.

2.3 Predictive Validity of Assessments

A review of the literature shows few published accounts of similar investigations that have been conducted before. There seems to be flimsy evidence of a mixed-method high stakes review of the predictive validity of CA scores on the FE scores and the examination outcome of pass or fail and GPA in health professions education. Many previous studies were narrowly focussed both in the assessment area and the age of the students. This is to say that most reviews focused on low stakes assessments such as early elementary school students and some high schools while a handful did focus on high stakes assessments.

In a study conducted by Brown and Coughlin (2007) to investigate the predictive validity of benchmark assessments in the Mid-Atlantic Region on state assessments to investigate the predictive validity of benchmark assessments on later state tests, they found that benchmark assessment did not predict performance on later state tests, although the benchmarks assessments were psychometrically well-constructed. Their findings did indicate that the TerraNova benchmark did provide appropriate predictive information in one state for some grade levels. Brown and Coughlin believed that benchmark assessments created by districts typically are not validated for their intended purposes, but products from vendors should be validated for their stated purposes. Many districts and schools have developed benchmark assessment systems with the prediction of student performance on subsequent high stakes tests, as stated if the secondary purpose of the benchmark assessment system. Brown and Coughlin cautioned that “the predictive ability of an assessment is not use but rather a quality of the

assessment". While they suggested that further research is needed on the predictive validity of benchmark assessments, the researchers recognised that only bigger school systems have the personnel available to conduct predictive validity studies. The current study is cognizant of this fact and therefore would further aspire to establish the predictive validity of CA score on FE scores as earlier highlighted.

Alexander and Hicks (2016) examined the relationship between students' class attendance of scheduled class activities on academic performance. The investigators used secondary data from tutor held records on attendance and results for article review assignments and laboratory reports for a total of 383 students who completed introductory psychology courses in 14 separate classes held over a three-year period (2012-2015) at a University in South-Eastern Queensland, Australia. They found that students' attendance of scheduled class activities had a positive impact on learning and academic performance. In a related study by Allen (2016) which sought to determine if preadmission variables or combination of variables can predict on-time graduation in a doctor of pharmacy program using secondary data such as student transcripts and files. The findings concluded that having a prior degree, lack of unsatisfactory grades in non-science courses, and pre-pharmacy GPA were significant predictors of on-time graduation. These arguments are essential in that they provided valuable information regarding various factors related to student academic performance in assessments as well as predicting success in assessments.

In another study conducted by Asabe (2007), he investigated the effects of CA on academic achievements of NCE chemistry students in Kaduna state using an experimental study design. He found that CA had significant effects on academic performance and that there was no significant correlation between CA scores and Final examination scores, among other findings of NCE chemistry students. These results are of keen interest as they demonstrate different

views from the other findings above. This also shows how inconsistent the predictive validity of CA scores is on the FE scores which the current researcher believes could be due to the context of how the CA scores are utilised depending on the educational institutions' assessment policies therein.

A study investigated by Azmi, Ali, Wong and Kumolosasi (2014) evaluated internal factors that affected pharmacy students' academic performance and determined whether these factors had a significant effect on student's Cumulative GPA and year of study. The authors used a cross-sectional survey approach (questionnaire-based) to collect data from 1,018 pharmacy students drawn from 5 Malaysian public institutions of higher learning. Their findings showed that students' academic performance, as measured by cGPA was associated with academic competency, test competency, time management skills, and test anxiety. These findings are important considerations to make in the current study as academic performance could be affected by internal factors as suggested by the authors.

Payne (2013) used a mixed-method approach/ design to explore the nature of a benchmark assessment program and how well the benchmark assessments predicted End-of-Grade (EOG) and End-of-Course (EOC) test scores in an American Indian school district. She identified five major themes and used them to develop Dimensions of Benchmark Assessment Program Effectiveness model: Professional Development, Assessment Literacy, Data Literacy, Instructional Practice, and Program Effectiveness. Among other findings, the study found that Benchmark assessment scores correlated strongly with the EOG and EOC scores except in two areas. Benchmark assessment scores predicted EOG and EOC scores well. These findings are in agreement with other scholars cited above providing diverse views on the predictive nature of benchmark/ CA scores to FE examination scores depending on the level, i.e., low or high stakes. This can be compared with the findings of Brown (2007) who investigated the predictive validity of selected benchmark assessments used in the Mid-Atlantic region on state

assessment and found that the evidence of the predictive validity of benchmark assessments generally lacked concerning the state assessments tests.

Demaree, Vaugh and Tolley, (2014) also investigated the predictive validity of Teacher Performance Assessment (TPA) for Teaching Credential candidates. The authors examined the relationship between teaching credential candidates scores on the Performance Assessment for California Teachers and three other measures of candidate effectiveness, including GPA. They used Pearson's test of correlation and found that there was no predictive validity between individual student mean scores and the GPA. The authors further recommended that more work needed to be done to explore the predictive validity of TPAs and other forms of assessment scores and various other assessment score relationships. This recommendation provides some background literature in supporting the current study.

Kappe and Van der Flier (2012) investigated the combined predictive validity of intelligence and Personality factors on multiple measures of academic achievement. Students in a college of higher education completed a survey that measured intelligence, the Big Five personality traits, motivation, and four specific personality traits. Student performance was measured with GPA and time to graduation, as well as with five specific performance measures: regular exams, skills training, team projects, internships, and a written thesis. The findings also demonstrated inadequate evidence of the predictive nature of intelligence and personality on measures of academic achievement.

Norcini *et al*., (2014) also studied the relationship between scores on Step 2 Clinical Knowledge (CK) and patient outcomes for International Medical Graduates (IMGs). The findings of the study provide evidence for the validity of Step 2 CK scores. The results support the use of the examination as an effective screening strategy for licensure. The context of

predictive validity studies seems to provide varying findings making the current study worthwhile.

Tejada *et al.,* (2016) investigated the ability of University of Maryland Eastern Shore School of Pharmacy's admissions criteria to predict students' academic performance in a 3-year pharmacy program and to analyse transferability to African-American students. They found that Pharmacy College Admission Test (PCAT), GPA, interview, and observational scores combined with previous pharmacy experience and biochemistry coursework predicted the students' academic performance except for second-year (P2) experiential performance. They concluded that both PCAT and GPA were predictors of didactic performance, especially in non-African Americans. Pharmacy experience and observational scores were predictors of experiential performance, especially in African-Americans.

Tektaş *et al.,* (2013) evaluated the association between high school leaving exam grade and achieved grades in the first medical state exam among medicine students in a major southern German medical school. They used an anonymous questionnaire using a cross sectional design among all medicine students of the 3rd to 5th year in a major medical school in the German federal state of Bavaria. The associations between grades of the high school leaving exam and grades achieved in both written and oral parts of the first medical exam were analysed using Spearman's rank correlation coefficients for the 432 students that answered the questionnaire. The study found that there was a weak correlation between high school leaving exam and medical state exam grades which support the trend seen in the past years in Germany that more and more medicine study places are distributed also considering other factors than high school leaving exam degrees. According to the findings, it is indicative that high school exam grades are a poor predictor of success in medical school exam grades.

Yates and James (2010) investigated the value of the United Kingdom Clinical Aptitude Test (UKCAT) in predicting pre-clinical performance to determine whether UKCAT scores predict performance during the first two years of the 5-year undergraduate medical course at Nottingham. They used a single cohort of students, who entered Nottingham Medical School in October 2007 and had taken the UKCAT and further used linear regression analysis to identify independent predictors of marks for different parts of the 2-year preclinical course. They found that the UKCAT total score had little predictive value and thus concluded that the limited study from a single entry cohort at one medical school suggests that the predictive value of the UKCAT, particularly the total score, is low and recommended that further research from medical schools with different types of curriculum and assessment is needed, with longitudinal studies throughout the course. This to a larger extent does indicate that the predictive nature of assessments in different settings need to be established and therefore, the current study aimed at establishing the predictive validity of the Continuous Assessment score on the final examination score and other examination outcomes of pass or fail and the GPA.

In another study conducted Husbands *et al*. (2014) were they investigated the Predictive validity of the UKCAT in the final years of medical school aimed to examine the predictive validity of the UKCAT and compare this to traditional selection methods in the senior years of medical school. The study was a follow-up study of two cohorts of students from two medical schools who had previously taken part in a study examining the predictive validity of the UKCAT in first year. The sample consisted of 4th and 5th Year students who commenced their studies at the University of Aberdeen or University of Dundee medical schools in 2007. The Pearson's correlations were used to examine the relationships between admissions variables, examination scores, gender and age group, and to select variables for multiple linear regression analysis to predict examination scores. They found that neither UCAS form nor interview scores were statistically significant predictors of examination performance. Conversely, the

UKCAT yielded statistically significant validity coefficients between 0.24 and 0.36 in four of five assessments investigated. Multiple regression analysis showed the UKCAT made a statistically significant unique contribution to variance in examination performance in the senior years. They concluded that the UKCAT appears to predict performance better in the later years of medical school compared to earlier years and provides modest supportive evidence for the UKCAT's role in student selection within these institutions. The methods used in this study are similar to those used in the current as correlation coefficients do indicate the relationship between two continuous variables while multiple regressions are effective at indicating the predictive strength of the variables.

Sartania *et al*., (2014) also conducted a study to establish the predictive power of UKCAT and other pre-admission measures for performance in a medical school in Glasgow using a retrospective longitudinal observational study of one cohort of students, admitted to Glasgow Medical School in 2007. They examined the associations which UKCAT scores, school science grades and pre-admissions interview scores had with performance indicators, particularly final composite scores that determine students' postgraduate training opportunities and overall ranking, and Honours and Commendation. Statistical analyses were conducted both with and without adjustment for potential socio-demographic confounders such as gender, age, ethnicity and area deprivation. They found that despite its predictive value declining as students' progress through the course, UKCAT was associated with the final composite scores and concluded that UKCAT has a modest predictive power for overall course performance at the University of Glasgow Medical School over and above that of school science achievements or pre-admission interview score and that UKCAT is the most useful predictor of final ranking. The study used correlation coefficients and regression analysis to identify predictors for success which is similar to what the current study used.

In a related study conducted by McManus *et al*., (2013) dabbed UKCAT-12 study were they investigated educational attainment, aptitude test performance, demographic and socioeconomic contextual factors as predictors of first year outcome in a cross-sectional collaborative study of 12 UK medical schools. They used a prospective study of 4,811 students taking the UKCAT from 2006 to 2008 as a part of the medical school application, for whom first year medical school examination results were available in 2008 to 2010. They found that UKCAT scores and educational attainment measures were significant predictors of outcome. UKCAT predicted outcome better in female students than male students, and better in mature than non-mature students. Incremental validity of UKCAT taking educational attainment into account was significant, but small. Medical school performance was also affected by sex and ethnicity. Multilevel modelling showed no differences between medical schools in predictive ability of the various measures. The study concluded that UKCAT has predictive validity as a predictor of medical school outcome, particularly in mature applicants to medical school but offers small but significant incremental validity which is operationally valuable where medical schools are making selection decisions based on incomplete measures of educational attainment. The current study did consider demographic characteristics of the participants in establishing the predictive validity of the CA score on FE score and examination outcomes of pass or fail and the GPA. This study was informative regards the some of the factors affecting academic performance in higher education. Similarly, multivariate analysis was conducted in the current study while establishing the strength of the relationship using both the Pearson's and spearman's correlations.

Meagher, Lin and Stellato (2006) conducted a study whose objective was to examine the validity of Pharmacy College Admission Test (PCAT) scores for predicting Grade Point Averages (GPAs) of students in years 1-4 of pharmacy programs. They collected data from 11 colleges and schools of pharmacy and further used correlation, regression, discriminant, and

diagnostic accuracy analysis to determine the validity of the PCAT for predicting subsequent GPAs. They found that PCAT scaled scores and entering GPAs were positively correlated with subsequent GPAs while the regression analyses also showed the predictive value of the PCAT scores, especially in combination with entering GPAs. Discriminant and diagnostic accuracy analyses supported these findings and provided practical suggestions regarding optimal PCAT scores for identifying students most likely to succeed in pharmacy school. They concluded that both PCAT scaled scores and entering cumulative GPAs showed moderate to strong predictive validity as indicators of candidates likely to succeed in pharmacy school. The methodology used in this study is similar to that used in the current study aside discriminant and diagnostic accuracy were not used.

McCall, Allen and Fike (2006) also conducted a related study were they investigated predictors of academic success in a Doctor of Pharmacy program at Texas Tech University. Their objective was to evaluate the correlation between specific pre-pharmacy college variables and academic success using undergraduate and pharmacy school transcripts for 424 students admitted to the Texas Tech doctor of pharmacy degree program between May 1996 and May 2001. The undergraduate college variables included pre-pharmacy GPA, organic chemistry school type (2- or 4-year institution), chemistry, biology, and math courses beyond required prerequisites, and attainment of a Bachelor of Science (BS), Bachelor of Arts (BA), or Master of Science (MS) degree. Measurements of academic success in pharmacy school included cumulative first-professional year (P1) GPA, cumulative GPA (grade point average of all coursework finished to date), and graduation without academic delay or suspension. They found that completing advanced biology courses and obtaining a BS degree prior to pharmacy school were each significantly correlated with a higher mean GPA while concluding that advanced biology coursework and a science baccalaureate degree were significantly associated with academic success in pharmacy school. On multivariate analysis, only advanced biology

coursework remained a significant predictor of success. Similarly, the study also demonstrates that the use of correlation and regression analyses is paramount in determining the predictive validity of one variable on the other.

McKenzie and Schweitzer (2010) investigated the factors predicting academic performance at an Australian University using a prospective study design. They included academic, psychosocial, cognitive, and demographic factors to establish the predictors of academic performance of first year Australian university students. The study was a questionnaire based administered to 197 first year students 4 to 8 weeks prior to the end of semester exams and overall grade point averages were collected at semester completion. Multivariate regression analysis was used and previous academic performance was identified as the most significant predictor of university performance. Identifying the factors that influence academic performance can improve the targeting of interventions and support services for students at risk of academic problems. The study is similar to McManus *et al*., (2013) who also indicated that academic performance can be affected by certain factors such as sex and age. The current study equally considered some of the demographic factors described in literature in order to establish whether they have a role to play in investigating the predictive validity of the CA score on the FE score and examination outcome of pass or fail and the GPA.

In a related study conducted by Poole, Shulruf, Rudland and Wilkinson (2012) were they compared the predictive validity of the Undergraduate Medicine and Health Sciences Admission Test (UMAT), the admission GPA, and a combination of both, on outcomes in all years of two medical programs. 1346 students were selected since 2003 using UMAT scores and attending either of New Zealand's two medical schools while regression models incorporated demographic data, UMAT scores, admission GPA and performance on routine assessments in the analysis. They found that the net predictive power of admission GPA was

highest for outcomes in Years 2 and 5 of the 6-year program, accounting for 17–35% of the variance; UMAT score accounted for < 10%. The highest predictive power of the UMAT score was 9.9% for a Year 5 written examination. Combining UMAT score with admission GPA improved predictive power slightly across all outcomes. Neither UMAT score nor admission GPA predicted outcomes in the final trainee intern year well, although grading bands for this year were broad and numbers smaller. They concluded that the ability of the general cognitive test UMAT to predict outcomes in major assessments within medical programs is relatively minor in comparison with that of the admission GPA, but the UMAT score adds a small amount of predictive power when it is used in combination with the GPA. These findings demonstrate that the predictive validity of one assessment on another may vary depending on the circumstances and variables being considered. Similarly, it is important to establish the predictive validity of the highly emphasized CA score on the FE score and examination outcomes of pass or fail and the GPA in the Zambian setting in a pharmacy school.

In a 2-year correlational study examining whether age, gender (demographic variables), and hardiness (cognitive/emotional variable) differentiate and predict university final degree GPA and final-year dissertation mark conducted by Sheard in 2009, he reported data collected from a total of 134 university undergraduate students. The participants provided baseline data in questionnaires administered during the first week of their second year of undergraduate study and gave consent for their academic progress to be tracked. Final degree GPA and dissertation mark were the academic performance criteria. They found that mature-age students, sex had an effect on academic performance while commitment was the most significant positive correlate of academic achievement. Final degree GPA and dissertation mark were significantly predicted by commitment, and commitment and gender, respectively. The study concluded that age, sex and harness commitment have implications for universities targeting academic support services to maximize student scholastic potential. This study is very informative to the current study as

well as the context is similar regards the use of other factors in predicting future performance in assessments and the analysis methodology is as well similar.

In the quest to establish whether an assessment can act as a guide to future teaching and learning, Martin and Jolly (2002) investigated the predictive validity and estimated cut score of an Objective Structured Clinical Examination (OSCE) on later performance in clinical examinations medical undergraduate students. Performance of two consecutive cohorts of year 3 medical undergraduates (n ¼ 138 and n ¼ 128) in a 23 station OSCE were compared with their performance in 5 subsequent clinical examinations in years 4 and 5 of the course. They found that there was Poor performance in the OSCE was strongly associated with later poor performance in other clinical examinations. Students in the lowest three deciles of OSCE performance were 6 times more likely to fail another clinical examination. The study concluded that performance in an OSCE taken early in the clinical course strongly predicts later clinical performance. The study is related is very informative to the current study as it demonstrates predictive validity of the one assessment tool to the future assessments.

Kidd and Latif (2003) conducted a study aimed at assessing the extent to which 7 traditional and novel predictors contribute to overall pharmacy GPA using a convenience sample and a blinded retrospective record review of the first 3 class years of Doctor of Pharmacy students at Shenandoah University's, School of Pharmacy (Classes of 2000, 2001, and 2002). They found that Pharmacy College Admissions Test (PCAT) score, essay score, California Critical Thinking Dispositions Inventory (CCTDI) and Skills Test (CCTST) were all significant predictors of pharmacy GPA. The study concluded that the study of predictors of pharmacy students' performance by examining the role of critical thinking in students' performance is crucial. It is cardinal therefore to consider a number of factors in studies seeking to establish the predictive validity of assessments on future assessments of which the current study has taken into consideration. Several factors

In a related study conducted by Houglum, Aparasu and Delfinis (2005), they sought to determine admissions criteria that are valuable in selecting pharmacy students by determining which criteria are significant predictors of success or failure using retrospective data of 309 students. Academic probation was used as an indication of academic failure while academic success was measured by first-professional year GPA in pharmacy courses. They found that predictors of failure included average grade in organic chemistry courses and gender while predictors of success included grades in math and science pre-pharmacy courses and prior attainment of a bachelor's degree. The study concluded that academic predictors of success and failure shared common variables, but there were predictors of success that were not predictors of failure. It may be useful for selection committees to consider both sets of predictors as part of the screening processes. The study findings point to the reflection that assessment outcomes in higher education could be affected by several factors all of which should be put into consideration when making high stakes decisions is informative to the current study.

Kuncel *et al.,* (2005) conducted a study aimed at comparing the validity of the Pharmacy College Admission Test (PCAT) and pre-pharmacy GPA in predicting performance in pharmacy school and professional licensing examinations using the Hunter and Schmidt psychometric meta-analytic method. After reviewing relevant research articles from multiple databases, correlations between the PCAT and GPAs or individual course grades were the most commonly presented data. The study found that the PCAT and pre-pharmacy GPA were positively correlated with first, second, and third year GPA and National Association of Boards of Pharmacy Licensure Examination (NABPLEX) scores, with validities ranging from 0.25 (N=244; k=3) to 0.51 (N=1,454, k=18) for first-year GPA. They concluded that both PCAT scores and pre-pharmacy GPA were moderate to strong predictors of grades earned in pharmacy programs and scores on licensing examinations. From this study, there is an

emphasis and that literature has reported mostly correlation and regression models in reporting predictive validity. This study informs the current research in the methodology and thus strengthens the methodological perspective.

In a related study conducted by Meagher *et al.,* (2009), they explored the utility of the Team Objective Structured Bedside Assessment (TOSBA), a novel ward-based formative assessment tool, in predicting student performance in the final clinical examination. They used a cohort of final year students (n¼191) in the TOSBA and was compared with their subsequent performance in the final examination. A comparison was also made between student performance in the existing formative assessment tool, the Objective Structured Long Examination Record (OSLER) and the final examination. They found that there was a clear relationship between student performance in the TOSBA and performance in the final examination (r2¼ 0.35) while student performance in the OSLER showed a poor relationship with performance in the final examination (r2¼ 0.15) compared with the TOSBA. They concluded that TOSBA performance is a strong predictor of subsequent performance in the final examination. Similarly, this study informs the current study regards the predictive nature of assessments in certain settings.

Good, Simmon and Kame'enui (2001) studied the validity of early literacy measures in predicting kindergarten through third grade scores on the Oregon state wide assessment. VanDerHeyden, Witt, Naquin and Noell (2001) also investigated the predictive validity of early readiness measures for predicting performance on the comprehensive Inventory of basic skills. Schilling, Carlisle, Scott and Zheng (2007) reviewed the predictive validity of the dynamic Indicators of Basic Early Literacy Skills for its relationship to the Iowa Test of Basic Skills of a group of students in Michigan. McGlinchey and Hixson (2004) studied the predictive validity of curriculum based measures for student reading performance on the Michigan Educational Assessment Program's fourth-grade reading assessment. Each of these studies

focussed on the predictive validity of a given benchmark for a given assessment, some of the assessments being state mandated tests. Most of these investigations focused on elementary grades and generally, these studies showed that various benchmark assessments could predict outcomes such as test scores and need for retention in grade but there was much variability in the magnitude of these relationships.

2.4 Conceptual Framework

The conceptual framework highlights some of the concepts and theories that informed the current study. Blooms taxonomy of educational objectives (Bloom *et al.,* 1956), George Millers pyramid which demonstrates the levels of competence acquisition in education (Miller, 1990; Krathwohl, 2002), Classical test theory and Generalisability theory over and above the decision theory which are cardinal psychometrics measures and the high stake decisions that are made with the assessment outcomes (Downing and Yudkowlsky, 2009; Brennan, 2001; Shavelson and Webb, 1991; Crocker and Algina, 2006; James, 2006). The logical conceptual relationships are demonstrated in a framework in figure 2.1 below followed by a narrative of the proposed conceptual and theoretical framework.

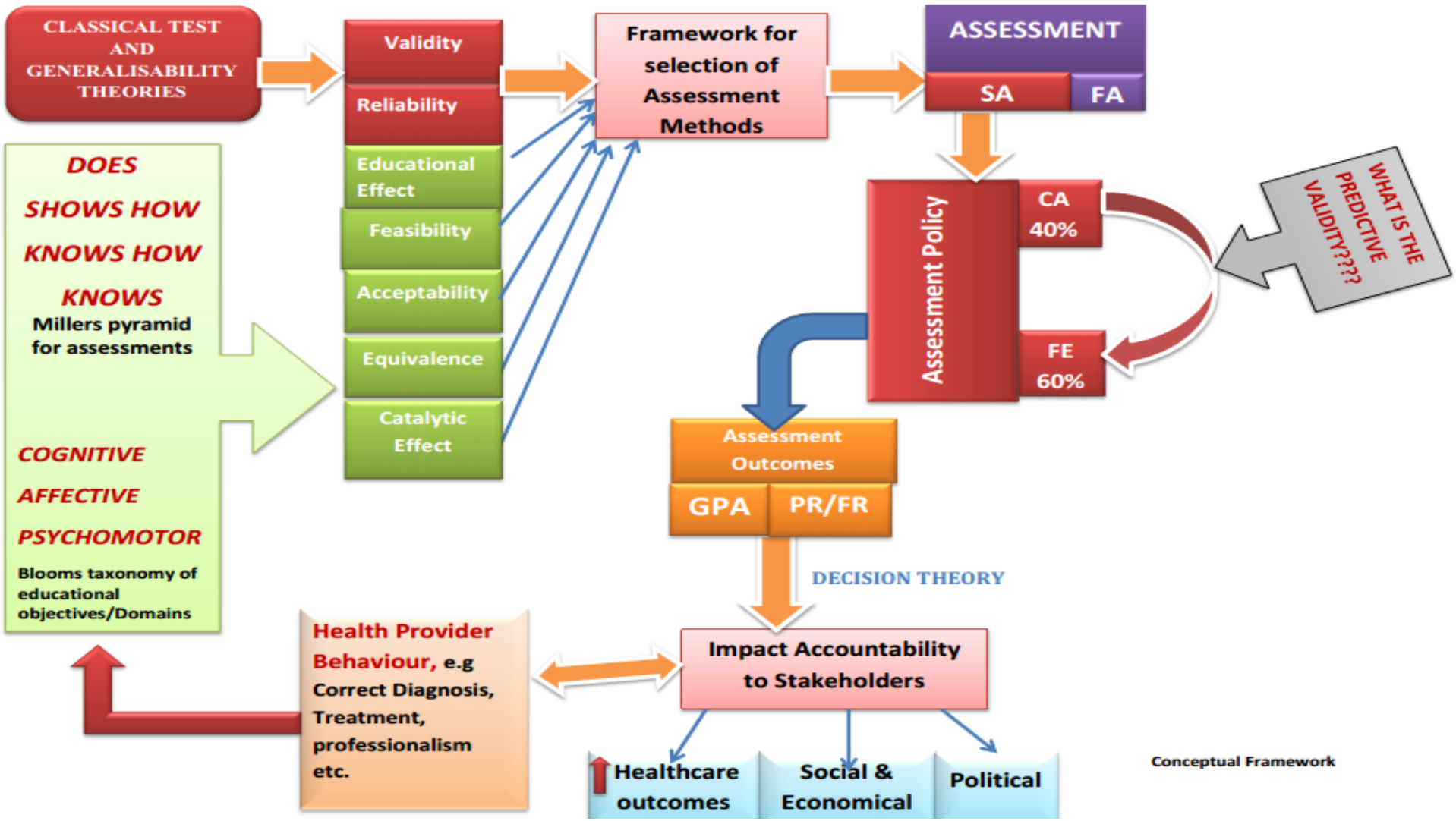


Figure 0.1: Conceptual Framework for assessment as a Quality Assurance Mechanism

2.4.1 Conceptual Framework Narrative

Anderson and Krathwhol (2001) assert that a quality assessment program should encompass the cognitive, psychomotor and affective domains. This is according to Benjamin Bloom (1956) whom at the time outlined a taxonomy of learning objectives that ensures that an educational system delivers knowledge, skills and attitudes that befits a profession of choice. Bloom et al. (1956) further indicates that in higher education, and most expressly HPE, the emphasis must be on the higher order educational objectives or requirements. Miller, (1990) also provides a framework for the assessment of competence and further suggests that it is in the 'DOES' level that a professional really performs (Krathwohl, 2002). This is an important consideration to make especially in assessments for Health professions such as pharmacists as mastery of the predetermined educational objectives demonstrates acquisition of competence to a larger extent.

According to Norcini *et al*., (2011) effective summative assessment is typically medium or high stakes and is primarily intended to respond to the need for accountability. It often requires coherent, high-quality test material, significant content expertise, a systematic standard-setting process, and secure administration. Consequently, assessment criteria such as validity and reliability are essential considerations to take. Validity is the degree to which the inferences made about medical competence based on assessment scores are correct (Messick, 1989) while reliability or generalizability is a measure of the relative magnitude of variability in scores due to error, with the aim of achieving a desired level of measurement precision (Perie, 2014). In addition to being critical, these two measures of performance have the advantage of being quantifiable. Other criteria for a good assessment in medical education in addition to validity and reliability include feasibility, acceptability, catalytic effect and educational effect (Norcini, 2005; Norcini *et al*., 2011; Van der Vleuten and Schuwirth, 2005).

According to Norcini *et al*. 2011, the educational effect of assessment capitalises on students' motivation to do well and directs their study efforts in support of the curriculum. For example, if the goal of a particular educational intervention is increased knowledge, then a written assessment will appropriately motivate students to study from books. Similarly, a goal of increased clinical skill is best supported by a clinical assessment that motivates students to interact with patients. Feasibility is the degree to which the assessment method selected is affordable and efficient for the testing purpose. Acceptability is the extent to which stakeholders in the process (e.g., medical students and faculty, practicing physicians, patients) endorse the measure and the associated interpretation of scores. A catalytic effect is desirable in providing useful feedback to support the learners in their continuing education (Norcini *et al*., 2011, 2013; Van der Vleuten and Schuwirth, 2005). It is critical to realize that the selection of an assessment device for a particular situation is a weighted combination of these factors which provide the framework for assessment criteria or methods (Banda, 2016).

As noted above, validity and reliability are essential elements of proper assessments criteria as they provide the psychometric rigour (Norcini *et al*., 2011; Van der Vleuten and Schuwirth, 2005; Banda, 2016; Brualdi, 1999). Critical considerations should also be made to theories that inform psychometrics such as Classical test theory, Generalizability theory and Decision theory in the planning, analyses and interpretation especially about reliability (Nering and Ostini, 2010; Kreiter, 2009; Banda, 2016).

HTIs such as the UNZASOM and AHTIs are required to define standards of quality assurance in the assessment of their trainees such that society can have confidence in the professional competence of the graduates once they are registered to practice. There are increasing demands for accountability through defensible, valid, reliable, and robust assessment policies and practices (Norcini *et al*., 2011, 2013). HPE institutions' policymakers and faculty must respond

accordingly to these contemporary expectations (ibid). According to McAlpine (2002), she agrees that when implemented well, CA is a powerful catalyst for quality improvements in education.

To this effect, CAs and SA, in general, have an ultimate dichotomy of outcomes, that is, pass or fail categorizations of examinees concerning knowledge, attitudes and skills. The final categorization results from the summation of marks obtained from several assessment methods such as essays, multiple-choice and practicum etc. The total mark represents an examinee's attainment on the performance continuum implied by the proficiency level, and it is represented on a test score range from 0 – 100% (UNZASOM, 2011). At UNZASOM/HS and AHTIs, the pass or fail criteria is arbitrary set at 50% score and thus, any score below the set standard demonstrates failure in the attainement of expected proficiency levels and a student will have failed the assessment in that particular course or subject. The total score is arrived at after the combination of both the CA (40%) and FE (60%) scores in a specific course or subject.

Norcini *et al*. (2011) assert that effective summative assessment is typically medium or high stakes and is primarily intended to respond to the need for accountability. As such, an essential result of summative assessments is the pass/failure rate, which directly or indirectly implicates the quality of instruction, instructors and also of the graduates (Ian and Robson, 2007). The impact of the assessment outcomes, i.e., Pass or fail rate and GPA creates educational tensions among major stakeholders such as the patients, students, parents, Governments etc., in the HPE (Ian and Robson, 2007). One reason for this could be that assessment remains the symbolic measure of confirming achievement of the prescribed performance standard, but it indicates the quality of the HPE as well (Norcini *et al*., 2013; Banda, 2016). However, the quality of SAs, including CA practices, and their impact on HPE accountabilities, remain neglected, poorly understood and underdeveloped at many HPE institutions (Norcini et al., 2011).

While there is evidence of the predictive nature of CAs on academic performance in some educational setups, there exists locally, insufficient evidence on the predictive validity of CA scores on the FE scores and pass or fail and GPA in HPE such as pharmacy. Realising that the ultimate key determinants of pass rates are the quality of the assessments practices and decisions in the context of their validity, the current study proposes that the predictive validity of CA scores on the FE scores in promoting quality in HPE be established.

CHAPTER 3: RESERCH METHODOLOGY

3.0 Introduction

This chapter presents the research method that was used to gather the necessary data for the research problem identified. Firstly, the research paradigm chosen for the study is presented followed by the design, study site, target population, sample size and sampling technique, data collection and analysis method used. Furthermore, validity and reliability issues are presented ending with ethical issues and considerations that were taken during the course of the study**.**

The main research questions of the study were 'How does the CA score predict FE score and examination outcomes of pass or fail and GPA of Pharmacy students examined between 2013 and 2017 at the UNZA and what are the experiences and perceptions of the pharmacy examinees and examiners in relation to the current examination policy? The main objective of the current study was to establish the predictive validity of CA score on the FE score and examination outcomes of pass or fail and GPA for pharmacy students examined between 2013 and 2017 while exploring the experiences and perceptions of pharmacy examinees and examiners at the UNZASOM/HS and EHC.

3.1 Research Paradigm

The current study undertook a mixed method approach that utilizes aspects of both the quantitative and qualitative research worldviews. This approach can also be viewed as an eclectic/ pluralistic or even as a critical realist method. The choice of the method over either the interpretivist or positivists approach was necessitated by the complexity of the research questions which sought to establish the predictive validity of CA score on the FE score and examination outcomes of pass or fail and GPA for pharmacy students examined between 2013 and 2017 while exploring the experiences and perceptions of pharmacy examinees and

examiners at the UNZASOM/HS and EHC as suggested by other authors (Krauss, 2005; Kothari, 2004; Lee. 2007).

The mixed method was chosen to help in comparing the consistency and uniformity of the data which increased the validity and credibility of the data and findings in general. It also provided an opportunity to answer the research questions using various methods and instruments as well as providing stronger evidence for the conclusion drawn through convergence and corroboration of the findings (Creswell, 2009; Maxwell, 2005; Dawkins and Bennet, 2013).

Mixed method research has however been associated with some challenges as asserted by Newman and Benz (1998) and Creswell (2007, 2009). They suggest that it may be difficult for a single researcher to carry out both qualitative and quantitative research especially if the two approaches are used concurrently as the case is currently. Despite the challenges, Creswell (2007, 2008 and 2009) asserts that the concurrent approach is preferred by many medical personnel because it is manageable to collect both qualitative and quantitative data at once to offset cost constraints and this is a truism for the current study.

3.2 Study Design

The study design used was a mixed method using the convergent parallel typology.

3.2.1 Quantitative Arm of the Study

The quantitative arm engaged a non-interventional cross-sectional study design in order to establish the predictive validity of the CA score on the FE score and examination outcomes of pass or fail and GPA. In this regard, examination results for pharmacy students examined between 2013 and 2017 at UNZA were used to answer the specific objectives 1, 2 and 3 of the current study and then the findings were interpreted side by side with the qualitative arm.

3.2.2 Qualitative Arm of the Study

The qualitative arm was a case study design where three (3) FGD were conducted to explore the perceptions and experiences of the examinees and examiners on the current assessment practices. A case study is a research method common in social science and is based on an in-depth investigation of a single individual, group, or event. Case studies may be descriptive or explanatory in nature. It is a research method that involves an up-close, in-depth and detailed investigation of a subject of study and its related contextual position and helps in bringing the understanding of a complex issue or object or in this case, experiences and perceptions on the examination policy and practices. One FGD was conducted with the third-year students, fourth- and fifth-year pharmacy students combined and with examiners from both institutions combined, i.e., EHC and UNZA. Through the use of a case study design, the emerging themes on the experiences and perceptions of the examination policy by the examinees and examiners were then documented and interpreted and converged with the quantitative results.

3.3 Study Site

Below is a description of the study sites that were used in the study.

3.3.1 Predictive Validity of CA Score on the FE score and Examination Outcomes of Course Specific Pass or Fail and GPA

This part of the study was conducted at the UNZASOM, Department of Medical Education Development and UNZASOHS. UNZASOM/HS oversees the examinations of AHTIs including EHC. As such, UNZA and EHC graduates over 50 pharmacists and 70 pharmacy technologists respectively, every year, using the UNZA approved academic regulations. As earlier alluded to, this study envisaged to establish the predictive validity of the CA scores on the FE scores and examination outcome of course specific pass or fail and GPA.

3.3.2 Experiences and Perceptions of Pharmacy Examinees and Examiners about the Examination policy

The EHC is an AHTIs to the UNZA and the diploma in pharmacy technology is among the programmes affiliated and all the academic processes including examinations are overseen by UNZASOM/HS. In view of the aforementioned, the study sought to explore the experiences and perceptions of the examinees and examiners at the two institutions since they are involved in the implementation of the assessment and examination policy. As such, a FGD was conducted with the hird year pharmacy students at EHC while another was conducted with fourth- and fifth-year pharmacy students at UNZA. One FGD was conducted with the examiners from both EHC and UNZASOHS.

3.4 Study Population

3.4.1 Predictive Validity of CA Score on the FE Score and Examination Outcomes of Pass or Fail and GPA

The study population comprised of the 3rd year EHC, 4th and 5th year examination results for pharmacy students' examined between 2013 and 2017 at UNZASOM/HS. The study population was purposively selected because the examination results in question are considered for the final classification or grading of the exit certificate (credit or merit). It is important to mention here that, in 2013, the UNZASOM revised the Pharmacy curriculum orienting it into a competence based whilst incorporating a credit point system. The period under review is therefore strategic for the current study.

3.4.2 Experiences and Perceptions of Pharmacy Examinees and Examiners about the Examination policy

The student that were currently enrolled for the pharmacy program at both EHC and UNZA for the 2017/2018 academic year were considered in the FGDs. For EHC, the final year diploma

in pharmacy technology students were interviewed while a FGDs was conducted for the combined fourth- and fifth-year pharmacy students enrolled at UNZA. Examiners from both EHC and UNZASOHS combined had a FGDs conducted in order to explore their experiences and perceptions towards the examination policy they were currently implementing.

3.5 Study Sample and Sampling

3.5.1 Quantitative Arm of the Study

Simple random sampling technique was used to select the examination results using the examinees' ID numbers at UNZASOM/SH. As such, ID numbers were then used to select the calculate sample size using an excel spread sheet. The RAND function in Microsoft excel was used to randomly select the sample size as calculated in the table 3.1 below. Using the Centre for Disease Control and Prevention EPI info Statistical calculator (CDC, 2012), the sample size for the study was calculated for each of the groups by year of study and totalled as demonstrated in Table 3.1 below.

Table 0.1: Summary of the Sampling Framework

Intake/ Year of study	**Fifth Year**		**Fourth Year**		**Third Year**		Sample size at 5% margin of error
	Class Size	**Sampled Students**	Class Size	**Sampled Students**	Class Size	**Sampled Students**	
2013	56	**43**	70	**53**	110	**79**	
2014	70	**53**	90	**63**	215	**120**	
2015	90	**64**	74	**58**	141	**93**	
2016	74	**57**	67	**54**	210	**118**	
Totals		**217**		**228**		**410**	**855** students examination results

3.5.2 Qualitative Arm of the Study

3.5.2.1 Examinees FGDs

Two FGDs were conducted in the current study with examinees, one with third-year pharmacy students at EHC and the other with a combined fourth- and fifth-year pharmacy students at UNZA. In order to ensure adequate population where to draw the sample from, each FGDs had a total of ten (10) participants which is a representative and recommended number of participants for a FGDs i.e., 8 to 12 (Creswell, 2009; Maxwell, 2005). The selection of the participants was done using a simple random technique with the help of the Heads of Pharmacy departments and class representatives at the two training institutions. Only those that were willing to participate voluntarily and consented went to participate in the FGDs.

3.5.2.2 Examiners FGD

One FGD was conducted with the examiners from both institutions in the UNZASOM board room. Twelve participants were selected using a simple random sampling technique with the help of the Heads of Departments at the two institutions implying that six participants were drawn from each institution. Further, only the participants that were willing to participate voluntarily and consented were allowed to join the FGDs.

3.6 Data Collection

This section summarizes the methodology that was used to collect data in the current study.

3.6.1 Quantitative Arm of the Study

The collection of the examination results was done through the heads of departments responsible for the implementation and conduct of the assessments at UNZASOHS for the fourth- and fifth-year examination results as well as the UNZASOM at DMED for the diploma in Pharmacy technology examination results. Using a designed structured data collection tool developed by the researcher and attached in Aappendix 1, the senate approved examination results for the academic years of 2013 through to 2017 were collected with the aid of the

student's ID numbers which were used to identify and match the students' examination results in the core courses per academic year of study; Pharmacology, Pharmaceutics, Pharmacy Practice, Medicinal/Pharmaceutical Chemistry, Bio-Pharmacy and Clinical Pharmacy. The students' IDs were further used to collect and match the demographic characteristics of the examinees which was done at departmental level. The complete data set was then entered in Microsoft excel spread sheet for security and ease of management.

3.6.2 Qualitative Arm of the Study

The researcher conducted three (3) FGDs were conducted with the students and examiners in the 2016/2017 academic year in order to get information regarding their experience and perceptions of the current assessment practices and policy. A standardised semi structured in interview guide was designed for the FGDs in order to explore their perceptions regarding the current examination policy and practices and both have been attached in the Appendix 2.

For the Examinees' FGD at EHC, the interview was conducted in a board room that was provided by the Head of Pharmacy department and an audio recorder was used to capture the discussion after seeking permission from the participants. At UNZA, the FGDs were conducted in the board room that was provided by the Head of department at UNZADMED. The interviews in both institutions were conducted over lunch hour and thus, the researcher provided snacks for the participants as the interviews took at least 30 to 40 minutes on average before completion. The environment was comfortable and conducive for the process as a verbal feedback was sought from the participants after the interviews.

For the examiners, the interview was conducted in the UNZASOM boardroom after seeking permission from the Dean of UNZASOM. As for the examinees, the examiners interview was conducted over lunch-hour in view of the busy schedules of the participants. Snacks were as well provided for the participants during the interview which took about 30 minutes before

completion. An audio recorder was used to capture the interview after seeking permission from the participants.

3.7 Data Analysis

The section presents a summary of how the data was analyzed in the current study.

3.7.1 Quantitative Arm

The data collected was managed in a password protected Microsoft excel spread sheet and was then imported into Stata version 13 and Graph pad prism 5 for ease of analysis.

3.7.1.1 Demographic Characteristics

The demographic characteristics of the examinees that were considered in the current study include age, sex, marital status, sponsorship and level of entry into university. These variables were considered in order to correlate and understand the relationship between them and the CA score, FE score and the GPA as suggested in some literature. In order to establish the relationship of the binary variables, tables, frequencies, percentages and proportions were used to present the results using Stata version 13 (Stata Corp, College Station, Texas, USA). For age, a continuous variable, the Shapiro-Wilk test for normality was used and the data set was then summarised using means and standard deviation for normally distributed data while the median and IQR was used for non-normally distributed data and tables were used to present the data.

3.7.1.2 Predictive Validity of the CA Score on Course Specific Pass or Fail and GPA

In order to establish the relationship between the CA score and the course specific pass or fail and the GPA, the Pearson's correlation coefficient was used for normally distributed data after confirming the distribution of the data using the Shapiro-Wilk test. For the non-normally distributed data, Spearman's rho correlation coefficient was used to establish the linear relationship between the course specific CA score and the GPA. To establish the relationship

between the CA score and the course specific pass or fail, both the Pearson's Chi square and Fisher's exact test were used for the analysis. Further analysis of the data using linear regression models was conducted to establish the relationship of the GPA and the CA score with the demographic characteristics as predictors. Logistic regression models were also constructed for the course specific pass or fail and the CA score with demographic characteristics as predictors and the results were presented and summarised in tables. Additionally, partial effects plots were constructed to show how the predictors relate with the outcome variable.

3.7.1.3 Predictive Validity of Course Specific CA Score on the FE Score

In order to establish the relationship between the course specific CA score and the FE score, the Pearson's and Spearman's correlation coefficient were used normally and non-distributed data, respectively. Scatter plots were then used to show the correlation of the CA score and FE score in the specific courses. Additionally, the linear regression models were generated in order to further understand the relationship between the FE score and CA score with demographic characteristics as predictors in the models. Tables were then used to summarise the results from the regression models.

3.7.1.4 Comparison of Overall Total Score and Course Specific CA score and FE score

In order to establish the relationship between course specific performance and overall performance in the core courses selected in the current study, the Kruskal-Wallis test was used for data sets that were non-parametric while the one-way Analysis of Variance was used for parametric data sets. Scatter plots were used to present the results.

Furthermore, to compare the overall performance in the mean CA scores and FE score, a paired t-test was used for the various courses under study. For this test, the CA scores were regarded

as the before scores while the FE scores were regarded as after in each course. It must be noted that for this test to be effectively meaningful, the CA scores were adjusted upwards to a fraction out of 60 which made it easier for comparability with the FE scores which are graded out of 60. Scatter plots were used to present the results as generated from Graph pad prism 5 (Graph Pad Software Inc., La Jolla, California, USA). For all the analysis done, a p-value of <0.05 was considered statistically significant.

3.7.2 Qualitative Arm of the Study

The case study design was used to get a feel of the participant's experiences and perceptions regarding the current examination policy at UNZA. The structured interview guide formed the basis of all the discussions and thus, the data was analysed by the researher in that manner. Based on the audio recordings that were done during the FGDs, the data was then transcribed and coded manually by the researcher. The emerging themes were then compared, revised and regrouped or coded into broader themes as is suggested by a plethora of literature (Schervish, 2015; Creswell, 2009; Creswell, Seagren and Henry, 1979; Hicks, 2004). The Audio recordings were then subjected to two independent expert transcribers so that their findings could be compared with the researcher's transcriptions. The three transcriptions were then compared, and further regrouping and recoding was done to come up with broader themes based on the interview guide. The broader themes were then presented and selected verbatim was also provided as evidence to the process.

The broader themes were then linked to the six core categories for the examinees FGDs while only three core categories were identified for the examiners FGDs. As is expected, a description of the core categories was then done after which two independent experts were given the results to verify. A consensus was then reached in which the descriptions were indicative of the coded data and as such, the results were presented in a descriptive and narrative form while attaching the verbatim as supporting evidence.

3.8 Threats to Validity and Reliability

3.8.1 Quantitative Arm of the Study

In order to enhance the reliability and validity of the study, the data collection tool was pretested using the UNZASOM Biomedical sciences examination results of 2013. In order to ensure internal consistency of the tool, the Cronbach's alpha reliability coefficient was calculated using Stata version 13 and found to be 0.79 indicating that the tool was reliable based on the recommended benchmark Cronbach alpha of 0.75. Additionally, the data analysis was conducted by the researcher in consultation with an expert Biostatisticians at the UNZASOM. Furthermore, the research assistants were also trained for three days on how to extract the CA scores to the corresponding FE scores and demographic characteristics of the study participants using the student's IDs in order to enhance the validity and reliability.

3.8.2 Qualitative Arm

Credibility and Transferability

Credibility refers to the extent to which a research account is believable and appropriate, with particular reference to the level of agreement between participants and the researcher. Transferability refers to the degree to which the results of qualitative research can be generalized or transferred to other contexts or settings. In order to adhere to the etiquettes of qualitative research, the researcher spent adequate time at the institution to familiarise with the research sites in order to overcome the effects of misinformation and understand the context. The use of a structured interview guide attached in the appendices also enhanced the credibility and transferability of the qualitative arm. The FGD guide also allowed for probing to further allow for more views on the matter of discussion. Audio recordings also ensured that the actual words from the participants were collected and allowed further interrogation by other

independent transcribers and experts in qualitative data as a way of triangulation. A further detailed description of the broader theme as well as quoting verbatim enriched the transferability.

Dependability and Confirmability

Dependability is important to trustworthiness because it establishes the research study's findings as consistent and repeatable. Researchers aim to verify that their findings are consistent with the raw data they collected. On the other hand, Confirmability refers to the degree to which the results could be confirmed or corroborated by others. A detailed and comprehensive documentation of the research process and methodological decisions was done while ensuring that the epistemological and ontological stance was clear throughout the research process. Triangulation of the data and results at both the coding and analysis stage enhanced the dependability.

3.9 Ethical Considerations

The study proposal was submitted to the UNZABREC of the School of Medicine for ethical clearance and approval was granted in 2017 with approval number: Ref. No. 011-06-17. In addition to the ethical approval, written permission was sought from the Deans-School of Medicine, School of Health Sciences and Students Affairs. Permission was also sought from the Head of Pharmacy department and the Principal of the EHC. The permission letter had a detailed explanation of the research purpose, procedures, possible risks or discomforts as well as benefits to the institutions and participants.

Participation in the FGDs was purely on voluntary basis and participants were informed that their acceptance to participate does not warrant them to answer or discuss everything but could withdraw or refrain from doing so at any time during the discussion.

Confidentiality was further ensured such that no names were picked but the IDs which were specifically and exclusively used for assessment scores extraction and matching purposes. As such, only the researcher and the assistants had access to the raw data. Assurance of anonymity with confidentiality was made at all levels of data collection, analysis and dissemination by eliminating the names and IDs (Computer numbers)

The investigator conducted FGDs on a one-to-one basis and the participants were further reassured that their participation in the study would not in any way affect their grades in subsequent examinations.

It was further emphasised that the study might not be of immediate benefit to the participants but that the potential benefits of the study are limited to pedagogical enhancements and improvement of assessment policies and practices for future students. Participants were encouraged to discuss openly and freely whilst understanding that they had the right to withdraw from the study at any time. Lastly, appointments for the discussions were made in such a manner that minimised the interference of the study to the normal duties of the participants.

CHAPTER 4: RESULTS

4.1 Introduction

This chapter presents the results of the data analysed and summarises the findings of the study in relation to the objectives of the study. The chapter is presented into two; quantitative results and qualitative results. Several data presentation methods are used in relation to the variables in response to the research question that was generated as indicated below.

4.1.1 Research Question

1. How does the CA score predict the FE score and examination outcomes of pass or fail and GPA of Pharmacy students examined between 2013 and 2017 and what are the experiences and perceptions of pharmacy examinees and examiners regarding the current examination policy at the UNZA?

4.1.2 Main Objectives

The main research objective was to establish the predictive validity of CA score on the FE score and examination outcomes of pass or fail and GPA for pharmacy students examined between 2013 and 2017 while exploring the experiences and perceptions of pharmacy examinees and examiners at the UNZASOM/HS and EHC.

As indicated above, the results are presented in two parts responding to the study design that was used. Thus, the quantitative results are presented first in response to specific objectives number one (1) to three (3) while the results relating to objective 4 are presented in the second part for qualitative results.

4.2.0 QUANTITATIVE RESULTS

4.2.1 Demographic Characteristics

The demographic characteristics that were considered in this study include; age, sex, marital status, sponsorship and level of entry into university. The data obtained is hereby presented by year of study as per study design beginning with the third-, fourth- and fifth-year pharmacy student. The data presented in this section is in response to objective number 1.

4.2.1.1 Demographic Characteristics of the Third-Year Participants

There was a total of 250 males (61%) compared to 160 females (39%) with a statistical difference in the sex distribution n =410, p<0.0001. There were more unmarried examinees represented by, n=366 (89%) than married participants represented by, n=44 (11%); p<0.0001. A total of 376 (92%) participants were non-sponsored while 34 (8%) were sponsored: p<0.0001. The median age of the participants was 24 years with an Inter Quartile Range (IQR) of 23 – 24. Table 4.1 below summarises the data.

Table 0.1: Demographic Characteristics of the Third-Year Participants

Variable	**Sex**	**Proportions**	***p-value***	**Totals**
Sex	Male	251 (61%)		410 (100%)
	Female	159 (39%)	<0.0001	
Marital status	Married	44 (11%)		410 (100%)
	Unmarried	366 (89%)	<0.0001	
Sponsorship	Self-sponsored	376 (92%)		410 (100%)
	Sponsored	34 (8%)	<0.0001	
Age median (IQR)		24 (23-24)		410 (100 %)

4.2.1.2 Demographic Characteristics of the Fourth-Year participants

There were more males 148 (65%) compared to females 80 (35%) with a significant difference in the proportions p<0.0001. There was a statistically significant difference in the proportions of the non-married 200 (88%) compared to the married 28 (12%); p<0.0001. With regards to sponsorship, about 163 (72%) of the participants were sponsored compared to 65 (28%) that

were not demonstrating a significant statistical difference in the proportions p<0.0001. There were more participants 183 (81%) that had enrolled into university at year one compared to 45 (19%) that entered into university in year three with a significant statistical difference p<0.0001. The median age for the participants was 24 years (IQR=23 to 25). Table 4.2 summarises the observations as shown below.

Table 0.2: Demographic Characteristics of the Fourth-Year Participants

Variable Name		**Proportions**	**p-value**	**Totals**
Sex	Male	148 (65%)		228 (100%)
	Female	80 (35%)	<0.0001	
Marital status	Married	28 (12%)		228 (100%)
	Unmarried	200 (88%)	<0.0001	
Sponsorship	Self-sponsored	65 (28%)		228 (100%)
	Sponsored	163 (72%)	<0.0001	
Level of Entry into University	Year One	183 (81%)		228 (100%)
	Year Three	45 (19%)	<0.0001	
Age median (IQR)		24 (23 – 25)		228 (100 %)

4.2.1.3 Demographic Characteristics of the Fifth-Year Participants

For the fifth-year participants, the proportion of males accounted for 133 (61%) while the females were 84 (39%). Further, 192 (88%) participants were not married while 25 (12%) were married presenting a significant statistical difference in the proportions by marital status P<0.0001. Regarding sponsorship, there were 151 (70%) participants sponsored compared to 66 (30%) that were not sponsored demonstrating a significant difference in the proportion by sponsorship p<0.0001. 170 (78%) of the participants had entered into university in year one while 47 (22%) did so in year three demonstrating a significant difference in the proportions; p<0.001. Table 4.3 below summarises the information.

Table 0.3: Demographic Characteristics of the Fifth-Year Participants

Variable Name		Proportions	p-value	Totals
Sex	Male	133 (61%)		217 (100%)
	Female	84 (39%)	0.0016	
Marital status	Married	25 (12%)		217 (100%)
	Unmarried	192 (88%)	<0.0001	
Sponsorship	Self-sponsored	66 (30%)		217 (100%)
	Sponsored	151 (70%)	<0.0001	
Level of Entry into University	Year One	170 (78%)	<0.0001	217 (100%)
	Year Three	47 (22%)		
Age median (IQR)		25 (24 – 27)		217 (100 %)

4.2.2 General Performance of the Participants in the CA, FE and Overall Examination Scores Against Examination Outcome of Pass or Fail

In order to describe the overall performance of the participants in the respective courses, it was necessary to have an observation of how the examination results were looking like. An overview of the general performance in the CA, FE and course specific pass or fail outcome is a preliminary response to objective two and is described and summarized below.

4.2.2.1: General Performance for the Third-Year Participants

A total of 393 (96%) participants passed the CA in pharmacology while 330 (80%) of the participants managed to pass the FE with 80 (20%) failing the pharmacology FE. On the whole, a total of 379 (92%) managing to pass the course while 31 (8%) failed Pharmacology. In Pharmaceutics, 406 (99%) of the participants managed to pass the CA while 4 (1%) failed the course CA. Further, 368 (90%) of the participants passed the FE while 42 (10%) failed, with a total 400 (97%) of the participants passing the course and 10 (3%) failing. In Pharmaceutical Chemistry, 336 (82%), 332 (81%) and 357 (87%) passed the CA, FE and the course respectively while 74 (18%), 78 (19%) and 53 (13%) failed the CA, FE and the course respectively. For Pharmacy Practice, the performance was such that 407 (99.3%), 363 (88.5%) and 405 (98.8%) passed the CA, FE and the course as a whole respectively while 3 (0.7%), 47

(11.5%) and 5 (1.7%) failed the CA, FE and the course as a whole respectively. Table 4.4 below shows the observations.

Table 0.4: Proportions of Participant's Performance in the CA, FE and Course Total Scores Against the Examination Outcome of Pass or Fail

Course	Exam-Outcome	CA Performance	FE Performance	Course Total Performance
Pharmacology	Pass	393 (96%)	330 (80%)	379 (92%)
	Fail	17 (4%)	80 (20%)	31 (8%)
Pharmaceutics	Pass	406 (99%)	368 (90%)	400 (97%)
	Fail	4 (1%)	42 (10%)	10 (3%)
Pharmaceutical Chemistry	Pass	336 (82%)	332 (81%)	357 (87%)
	Fail	74 (18%)	78 (19%)	53 (13%)
Pharmacy Practice	Pass	407 (99.3%)	363 (88.5%)	405 (98.8%)
	Fail	3 (0.7%)	47 (11.5%)	5 (1.2%)

CA= Continuous Assessment; FE=Final Examination

4.2.2.2: General Performance for the Fourth-Year Participants

There were more participants that passed the CA compared to those that passed the FE in Pharmacology, Pharmaceutics and Bio pharmacy while the opposite is true for Medicinal Chemistry were more participants passed the FE compared to those that passed the CA as demonstrated in Table 4.5 below.

Table 0.5: Proportions of the Participant's Performance in the CA, FE and Total Scores Against the Examination Outcome of Pass or Fail

Course	Exam-Outcome	CA Performance	FE Performance	Final Result Performance
Pharmacology	Pass	212 (93%)	201 (88.2%)	210 (92.1%)
	Fail	16 (7%)	27 (11.8%)	18 (7.9%)
Pharmaceutics	Pass	219 (96.0%)	198 (86.8%)	221 (96.9%)
	Fail	9 (4.0%)	30 (13.2%)	7 (3.1%)
Medicinal Chemistry	Pass	195 (85.5%)	197 (87.6%)	201 (88.2%)
	Fail	33 (14.5%)	28 (12.4%)	27 (11.8%)
Bio pharmacy	Pass	202 (88,6%)	193 (84.7%)	200 (87.7%)
	Fail	26 (11.4%)	35 (15.3%)	28 (12.3%)

CA= Continuous Assessment; FE=Final Examination

4.2.2.3: General Performance for the Fifth-Year Participants

There were ifth-year participants that passed the clinical pharmacy CA compared to those that passed the FE. For Clinical Pharmacology and Pharmacy Practice, there were more participants that had passed the FE compared to those that passed the CA results. Table 4.6 below summarises the information.

Table 0.6: Proportions of Fifth-Year Participants in the CA, FE and Total Scores by Course and Examination Outcome of Pass or Fail

Course	Exam-Outcome	CA Performance	FE Performance	Final Result Performance
Clinical Pharmacology	Pass	188 (87%)	203 (94%)	211 (97%)
	Fail	29 (13%)	14 (6%)	6 (3%)
Clinical Pharmacy	Pass	210 (92%)	199 (92%)	211 (97%)
	Fail	7 (3%)	18 (8%)	6 (3%)
Pharmacy Practice	Pass	197 (91%)	207 (95%)	206 (95%)
	Fail	20 (9%)	10 (5%)	11 (5%)

CA= Continuous Assessment; FE=Final Examination

4.2.3 Association of Demographic Characteristics and Examination Outcome of Pass or Fail

Based on the results of objective one and two, it was necessary to test for associations of the demographic characteristics and course-specific pass or fail. This was necessitated by the fact that literature has suggested and documented that academic performance could be affected by some factors such as the aforementioned (Kyoshaba, 2009).

4.2.3.1 Association of Sex and Examination Outcome Among Third-Year Courses

To establish the association of sex and pass or fail in the courses under study, the Chi-square and Fishers exact test were used. In Pharmacology, there was no association between the sex distribution and passing or failing the course; $X^2 = 3.7070$, $p = 0.054$. Furthermore, in Pharmaceutics and Pharmacy Practice there was no association between the two variables; $X^2 = 1.5228$, $p=0.185$ and $X^2 = 0.7520$, $p=0.357$ respectively. In pharmaceutical chemistry, there

was an association between sex distribution and passing or failing the course X^2=3.9202, p=0.048.

Table 0.7: Association of Sex and Course Specific Pass or Fail

Course	Examination Outcome	Male	Female	p-value
Pharmacology *	Pass	227 (90.4%)	152 (95.6%)	0.054
	Fail	24 (9.6%)	7 (4.4%)	
Pharmaceutics **	Pass	243 (96.8 %)	157 (95.6%)	0.185
	Fail	8 (3.2%)	2 (1.3%)	
Pharmaceutical Chemistry *	Pass	212 (84.5%)	145 (91.2%)	0.048
	Fail	39 (15.5%)	14 (8.8%)	
Pharmacy Practice **	Pass	247 (98.4%)	158 (99.4%)	0.357
	Fail	4 (1.6%)	1 (0.6%)	

*Chi-square test was used; ** Fishers exact test was used.

4.2.3.2 Association of Sex and Course-Specific Pass or Fail

Table 4.8 below shows the association of sex on the examination outcome of pass or fail for the Fourth year participants. There was no association of sex on passing or failing any of the courses under study.

Table 0-8: Association of Sex and Pass or Fail

Course	Variable Name	Pass	Failed	p-value
Pharmacology **	Male	135 (91.2%)	13 (8.8%)	
	Female	75 (93.7%)	5 (6.3%)	0.345
Pharmaceutics **	Male	142 (95.9%)	6 (4.1%)	
	Female	79 (98.8%)	1 (1.2%)	0.228
Medicinal Chemistry	Male	133 (89.8%)	15 (10.2%)	
	Female	68 (85.0%)	12 (15.0%)	0.191
Bio pharmacy	Male	129 (87.1%)	19 (12.9%)	
	Female	71 (88.7%)	9 (11.3%)	0.452

*Chi-square test was used; ** Fishers exact test was used.

4.2.3.3 Association of the Sex and Pass or Fail

In the Fifth year participants, there was no association observed between sex and the examination outcome of pass or fail in any of the courses as shown in table 4.9 below.

Table 0.9: Association of Sex and Course Specific Pass or Fail

Course	Variable Name	Pass	Failed	p-value
Clinical Pharmacology	Male	130 (97.7%)	3 (2.3%)	0.429
	Female	81 (96.4%)	3 (3.6%)	
Clinical Pharmacy	Male	131 (98.5%)	2 (1.5%)	0.159
	Female	80 (95.2%)	4 (4.8%)	
Pharmacy Practice	Male	128 (96.2%)	5 (3.8%)	0.213
	Female	78 (92.9%)	6 (7.1%)	

Fisher's exact test was used

4.2.3.4 Association of Marital Status and Course Specific Pass or Fail

In the current study, marriage was categorised into two, married and unmarried against passing or failing a course. To test for the association between the two variables, the Fishers exact test was used and the results show that there was no association of marital status and passing or failing any of the courses as can be seen the table 4.10 below.

Table 0-10: Association of Marital Status and Course Specific Pass or Fail

Course	Variable name	Pass	Failed	p-value
Pharmacology	Married	42 (95.5%)	2 (4.5)	0.329
	Not Married	337 (92.1%)	29 (7.9)	
Pharmaceutics	Married	44 (100%)	0 (0%)	0.317
	Not Married	356 (97.3%)	10 (2.7%)	
Pharmaceutical Chemistry	Married	41 (93.2%)	3 (6,8%)	0.147
	Not Married	316 (86.3%)	50 (13.7%)	
Pharmacy Practice	Married	44 (100%)	0 (0%)	0.565
	Not Married	361 (98.6%)	5 (1.4%)	

4.2.3.5 Association of Marital Status and Course Specific Pass or Fail

For the fourth-year participants, analysis of the data using Fisher's exact test showed that marital status had no association with passing or failing any of the courses. Table 4.11 below summarises the findings obtained.

Table 0.11: Association of Marital Status and Course Specific Pass or Fail

Course	Variable name	Pass	Failed	p-value
Pharmacology	Married	27 (96.4%)	1 (3.6%)	
	Not Married	183 (91.5%)	17 (8.5%)	0.321
Pharmaceutics	Married	28 (100.0%)	0	
	Not Married	193 (96.5%)	7 (3.5%)	0.394
Medicinal Chemistry	Married	26 (92.8%)	2 (7.2%)	
	Not Married	175 (87.5%)	25 (12.5%)	0.323
Bio Pharmacy	Married	23 (82.1%)	5 (17.9%)	
	Not Married	177 (88.5%)	23 (11.5%)	0.246

4.2.3.6 Association of Marital Status and Course Specific Pass or Fail

For the fifth-year participants, there was no association between marital status with the examination outcome of passing or failing a course as shown in Table 4.12 below.

Table 0-12: Association of Marital Status and Course Specific Pass or Fail

Course	Variable Name	Pass	Failed	p-value
Clinical Pharmacology	Married	24 (96.0%)	1 (4.0%)	
	Unmarried	197 (97.4%)	5 (2.6%)	0.525
Clinical Pharmacy	Married	25 (100%)	0 (0%)	
	Unmarried	186 (96.9%)	6 (3.1%)	0.475
Pharmacy Practice	Married	24 (96.0%)	1 (4.0%)	
	Unmarried	182 (94.8%)	10 (5.2%)	0.631

4.2.3.7 Association of Sponsorship and Examination Outcome of Pass or Fail

In the current study, academic sponsorship was categorised into two, sponsored and Not sponsored against passing or failing a course. The Fishers exact test was used to test for the association of the two variables. On the whole, there was no association of sponsorship status and passing or failing any of the courses as shown in the Tables 4.13, 4.14 and 4.15 below for the third-, fourth- and fifth-year participants respectively.

Table 0.13: Association of Sponsorship and Pass or Fail by course

Course	Variable name	Pass	Failed	p-value
Pharmacology	Not sponsored	347 (92.3%)	29 (7.7%)	0.514
	Sponsored	32 (94.1%)	2 (5.9%)	
Pharmaceutics	Not sponsored	367 (97.6%)	9 (2.4%)	0.583
	Sponsored	33 (97.1%)	1 (2.9%)	
Pharmaceutical Chemistry	Not sponsored	327 (87%)	49 (13%)	0.545
	Sponsored	30 (88.2%)	4 (11.8%)	
Pharmacy Practice	Not sponsored	372 (98.9%)	4 (1.1%)	0.353
	Sponsored	33 (97.1%)	1 (2.9%)	

Table 0-14: Association of Sponsorship and Pass or Fail by Course

Course	Variable name	Pass	Failed	p-value
Pharmacology	Not sponsored	61 (93.8%)	4 (6.2%)	
	Sponsored	149 (91.4%)	14 (8.6%)	0.378
Pharmaceutics	Not sponsored	64 (98.5%)	1 (1.5%)	
	Sponsored	157 (96.3%)	6 (3.7%)	0.358
Medicinal Chemistry	Not sponsored	56 (86.2%)	9 (13.8%)	
	Sponsored	145 (88.9%)	18 (11.1%)	0.350
Bio Pharmacy	Not sponsored	53 (81.5%)	12 (18.5%)	
	Sponsored	147 (90.2%)	16 (9.8%)	0.061

Table 0-15: Association of Sponsorship and Pass or Fail by course

Course	Variable Name	Pass	Failed	p-value
Clinical Pharmacology	Sponsored	145 (96.0%)	6(4.0%)	
	Self-sponsored	66 (100.0%)	0 (0.0%)	0.110
Clinical Pharmacy	Sponsored	146 (96.7%)	5 (3.3%)	
	Self-sponsored	65 (98.5%)	1 (1.5%)	0.409
Pharmacy Practice	Sponsored	144 (95.5%)	7 (4.5%)	
	Self-sponsored	62 (93.9%)	4 (6.1%)	0.443

4.2.3.8 Relationship of Age and Examination Outcome of Pass or Fail

The age of the participants in the third-, fourth- and fifth-year participants was not normally distributed based on the Shapiro-Wilk test for normality of data that was; $p<0.0001$. The Mann-Witney test was then used to test for the relationship between age and passing or failing a course. As is depicted in Table 4.16 for the third-year participants, Table 4.17 for the fourth-year participants and Table 4.18 for the fifth-year participants below, there was no significant

relationship between age and the ability for an individual to pass or fail in any of the courses under study.

Table 0.16: Relationship of Age and Pass or Fail

Course	Variable Name	Pass	Failed	p-value
Pharmacology	Age	24 (23 to 24)	24 (23 to 24)	0.632
Pharmaceutics	Age	24 (23 to 24)	23 (22 to 24)	0.302
Pharmaceutical Chemistry	Age	24 (23 to 24)	24 (23 to 24)	0.964
Pharmacy Practice	Age	24 (22 to 24)	24 (23 to 24)	0.574

Mann-Whitney test

Table 0.17: Relationship of Age and Pass or Fail

Course	Variable Name	Pass	Failed	p-value
Pharmacology	Age	24 (23 to 25)	24 (23 to 25)	0.829
Pharmaceutics	Age	24 (24 to 25)	24 (22 to 24)	0.331
Medicinal Chemistry	Age	24 (23 to 25)	24 (23 to 29)	0.797
Bio Pharmacy	Age	24 (23 to 25)	24 (23 to 29)	0.707

Mann-Whitney test

Table 0.18: Relationship of Age and Pass or Fail

Course	Variable Name	Pass	Failed	p-value
Clinical Pharmacology	Age	25 (24 to 27)	24.5 (23 to 25)	0.2948
Clinical Pharmacy	Age	25 (24 to 27)	24 (23 to 25)	0.8360
Pharmacy Practice	Age	25 (24 to 27)	24 (23 to 27)	0.3038

Mann-Whitney test

4.2.3.9 Association of Level of Entry into University and Examination Outcome of Course-Specific Pass or Fail

Level of entry was also considered as a variable for the fourth- and fifth-year participants in the current study. This was not applicable for the third-year participants. To establish the association of level of entry into university and pass or fail, both the Chi square and the Fishers exact test were used to test for the association between the two variables. As is summarised in Tables 4.19 and 4.20 below, the level of entry into university did not have any significant association with passing or failing any of the courses.

Table 0.19: Association of Level of Entry into University for the Fourth-Year Participants and Pass or Fail by Course

Course	Variable Name	Pass	Failed	p-value
Pharmacology **	Year 1	169 (92.3%)	14 (7.7%)	
	Year 3	41 (91.1%)	4 (8.9%)	0.492
Pharmaceutics**	Year 1	176 (96.2%)	7 (3.8%)	
	Year 3	45 (100%)	0	0.215
Medicinal Chemistry*	Year 1	163 (89.1%)	20 (10.9%)	
	Year 3	38 (84.4%)	7 (15.6%)	0.273
Bio Pharmacy *	Year 1	163 (89.1)	20 (10.9%)	
	Year 3	37 (82.2%)	8 (17.8%)	0.164

*chi-square test was used; ** Fishers exact test was used

Table 0-20: Association of Level of Entry into University for the Fifth-Year Participants and Pass or Fail by Course

Course	Variable Name	Pass	Failed	p-value
Clinical Pharmacology **	Year one	164 (96.5%)	6 (3.5%)	
	Year three	47 (100%)	0 (0%)	0.227
Clinical Pharmacy**	Year one	155 (91.2%)	15 (8.8%)	
	Year three	44 (93.6%)	3 (6.4%)	0.425
Pharmacy Practice**	Year one	161 (94.7%)	9 (5.3%)	
	Year three	45 (95.7%)	2 (4.3%)	0.561

** Fisher's exact test was used

4.2.3.10 Multiple Adjusted Logistic Models for CA Score as a Predictor of Course-Specific Pass or Fail

In order to obtain a detailed summary of the relationship between the course specific pass or fail examination outcome, demographic characteristics and the individual course CA scores, a multivariate multiple adjusted logistic regression models were designed. This was in response to objective two, which sought to establish the predictive validity of the course specific CA score on the examination outcome of pass or fail. In the fitted models, marital status, sex, age, sponsorship, level of entry, and course-specific CA scores as independent variables while course-specific pass or fail was considered as the outcome or dependent variable for the third-, fourth- and fifth-years. Based on the results of the obtained in the association of demographic characteristics and course-specific pass or fail above, univariate regression was not conducted

and thus, the adjusted multiple regression was done as shown in Tables 4.21, 4.22 and 4.23 below and the odds ratios for each of the predictors are as well summarised.

Table 0.21: Multiple Adjusted Logistic Regression Models for the Third-Year CA Score as a Predictor of Course-Specific Pass Outcome

	OR	**95% CI**	**P value**
Pass Pharmacology			
Married	1.50	0.16 to 13.77	0.722
Male	0.45	0.17 to 1.22	0.116
Age	1.01	0.68 to 1.51	0.948
Sponsored	2.80	0.41 to 19.22	0.297
Pass Pharmacology CA	55.40	16.02 to 91.36	0.000*
Pass Pharmaceutical Chemistry			
Married	4.28	0.78 to 23.38	0.093
Male	0.61	0.28 to 1.32	0.205
Age	0.86	0.63 to 1.19	0.366
Sponsored	1.50	0.40 to 5.55	0.547
Pass Pharmaceutical Chemistry CA	27.30	13.30 to 56.20	0.000*
Pass Pharmaceutics			
Married	1[a]		
Male	0.42	0.088 to 2.023	0.281
Age	1.28	0.689 to 2.362	0.439
Sponsored	1.09	0.125 to 9.445	0.940
Pass Pharmaceutics CA	1[b]	Empty[b]	
Pass Pharmacy Practice			
Married	1[a]		
Male	0.85	0,077 to 9,57	0.900
Age	1.20	0.450 to 3.20	0.714
Sponsored	0.90	0.048 to 17.07	0.946
Pass Pharmacy Practice CA	26.23	12.66 to 43.02	0.000*

OR is Odds Ratio; CA is Continuous Assessment.
**p<0.05 significant values different from reference category adjusted for explanatory variables marital status, sex, age and sponsorship.*
[a] Values omitted due to collinearity
[b] values empty due to perfect prediction (failed CA predicted well a pass in the course)

Table 0.22: Multiple Logistic Regression Models for the Fourth-Year CA Score as a Predictor of Course-Specific Pass or Fail Outcome

	OR	95% CI	P value
Pass Pharmacology			
Married	1.062	0.052 to 21.603	0.969
Male	0.543	0.126 to 2.350	0.414
Age	0.990	0.747 to 1.337	0.996
Sponsored	0.670	0.110 to 4.445	0.705
Third Year University entry	0.567	0.046 to 6.958	0.657
Pass Pharmacology CA	36.343	10.113 to 60.612	0.000*
Pass Bio Pharmacy			
Married	0.681	0.066 to 6.986	0.746
Male	0.348	0.099 to 1.214	0.098
Age	1.022	0.810 to 1.289	0.856
Sponsored	1.581	0.409 to 6.095	0.507
Third Year University entry	0.450	0.048 to 4.218	0.484
Pass Bio Pharmacy CA	38.01	12.714 to 65.658	0.000*
Pass Pharmaceutics			
Married	1[a]		
Male	0.41	0.039 to 4.228	0.452
Age	1.08	0.620 to 1.886	0.782
Sponsored	1.22	0.117 to 12.800	0.867
Third Year University entry	1[a]		
Pass Pharmaceutics CA	13.63	1.976 to 94.014	0.008
Pass Medicinal Chemistry			
Married	9.63	0.991 to 93.731	0.051
Male	1.23	0.429 to 3.524	0.699
Age	0.99	0.815 to 1.202	0.919
Sponsored	1.51	0.479 to 4.729	0.483
Third Year University entry	0.40	0.072 to 2.253	0.300
Pass Medicinal Chemistry CA	16.31	6.318 to 42.109	0.000

OR is Odds Ratio; CA is Continuous Assessment.
**p<0.05 significant values different from reference category adjusted for explanatory variables marital status, sex, age and sponsorship.*
[a] *Values omitted due to collinearity*
[b] *values empty due to perfect prediction (failed CA predicted well a pass in the course)*

Table 0.23: Multiple Adjusted Logistic Regression Models for the Fifth-Year CA Score as a Predictor of Course-Specific Pass or Fail Outcome

	OR	95% CI	P value
Pass Pharmacology			
Married	0.00	0.000 to 0.896	0.046
Male	2.21	0.265 to 18.307	0.464
Age	1.64	0.874 to 3.091	0.123
Sponsored	1[b]		
Third Year University entry	1[a]		
Pass Pharmacology CA	21.81	2.652 to 49.314	0.004*
Pass Pharmacy Practice			
Married	1.78	0.110 to 28.399	0.688
Male	2.94	0.591 to 14.621	0.188
Age	1.17	0.746 to 1.820	0.502
Sponsored	1.11	0.215 to 5.726	0.901
Third Year University entry	0.30	0.015 to 6.101	0.436
Pass Pharmacy practice CA	50.00	10.619 to 85. 473	0.000*
Pass Clinical Pharmacy			
Married	1[b]		
Male	3.91	0.633 to 24.165	0.142
Age	1.18	0.635 to 2.196	0.599
Sponsored	0.82	0.086 to 7.925	0.866
Third Year University entry	1[b]		
Pass Clinical Pharmacy CA	6.73	0.594 to 26.298	0.124

OR is Odds Ratio; CA is Continuous Assessment.
**p<0.05 significant values different from reference category adjusted for explanatory variables marital status, sex, age and sponsorship.*
[a] Values omitted due to collinearity
[b] values empty due to perfect prediction (failed CA predicted well a pass in the course)

4.2.3.11 Comparison of Course Specific Final Total Score for Examinees with Passed and Failed CA Scores

Based on specific objective number 2, it was necessary to compare the performance of the examinees whose CA was passed and failed respectively with the examination outcome of course-specific pass or fail. The examinees whose CA score was failed (<20) and passed (>20) were considered independently and the median course specific total score was used to make the comparison since the data set was not normally distributed. This was done in order to test how the examinees whose course-specific CA score is considered inadequate or failed fared in

reference to the examination outcome of pass or fail. The Mann Witney test was used to compare the median scores for the two groups i.e.; course specific CA score <20 and >20. As shown in Figures 4.1, 4.2 and 4.3, there was a significant statistical difference in the median total scores between the examinees whose CA score was >20 and <20 respectively in all the courses considered in the study. However, the examinees whose CA score was <20 demonstrated the capabilities to pass in almost all the courses considered in the study based on the median scores which were above the UNZASOM/HS arbitrary set criterion-referenced cut off score of 50. Figure 4.1 shows the third-year course-specific total scores compared to course specific pass or fail. In Pharmacology, the median score was 64 (IQR, 56-71) and 52 (37-54) for examinees whose CA score was >20 and <20 respectively; for Pharmaceutics, the median scores were 65 (IQR= 59-71) and 52 (IQR=51-54) respectively; Pharmaceutical chemistry median scores were 67 (IQR=59-73) and 45 (IQR=38-54) respectively; Pharmacy practice median scores were 65 (IQR=59-71) and 53 (IQR=48-55).

In the fourth-year course-specific total scores for the examinees that had the CA score >20 and those whose CA score was <20 compared to course specific pass or fail, it was observed that there was a statically significant difference between the course-specific median total scores in the two groups as shown in Figure 4.2 below. It was found that in Medicinal chemistry, the median total score was 62 (IQR=57-68) for the examinees whose CA score was >20 while 51 (IQR=45-54) was the median total score for the examinees whose CA score was <20. In Bio Pharmacy, the median total score was 65 (IQR=57-73) and 51 (IQR=45-52) for examinees with CA scores >20 and <20 respectively. In Pharmacology, the median total score was 61 (IQR=57-67) and 52 (IQR=44-53) for the examinees with CA scores >20 and <20 respectively while in Pharmaceutics, the median total score was 63 (IQR=57-68) and 52 (IQR=47=54) for the examinees with the CA score >20 and <20 respectively.

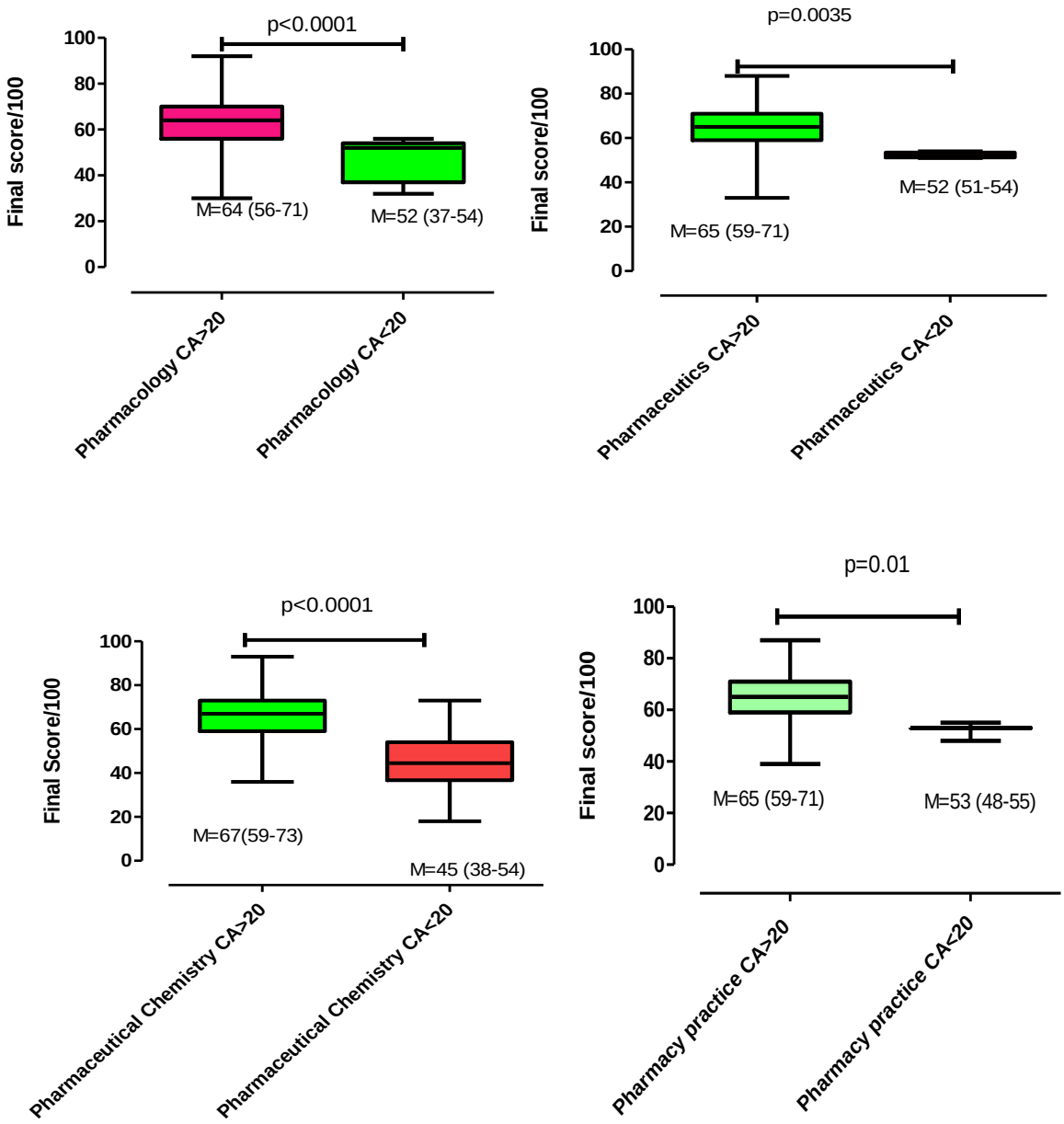


Figure 0.1: Comparison of the Median FE scores between Candidates whose CA score was Passed and Failed in Specifi Courses for the Pharmacology, Pharmaceutics, Pharmaceutical Chemistry and Pharmacy Practice in the Third-Year Examinees

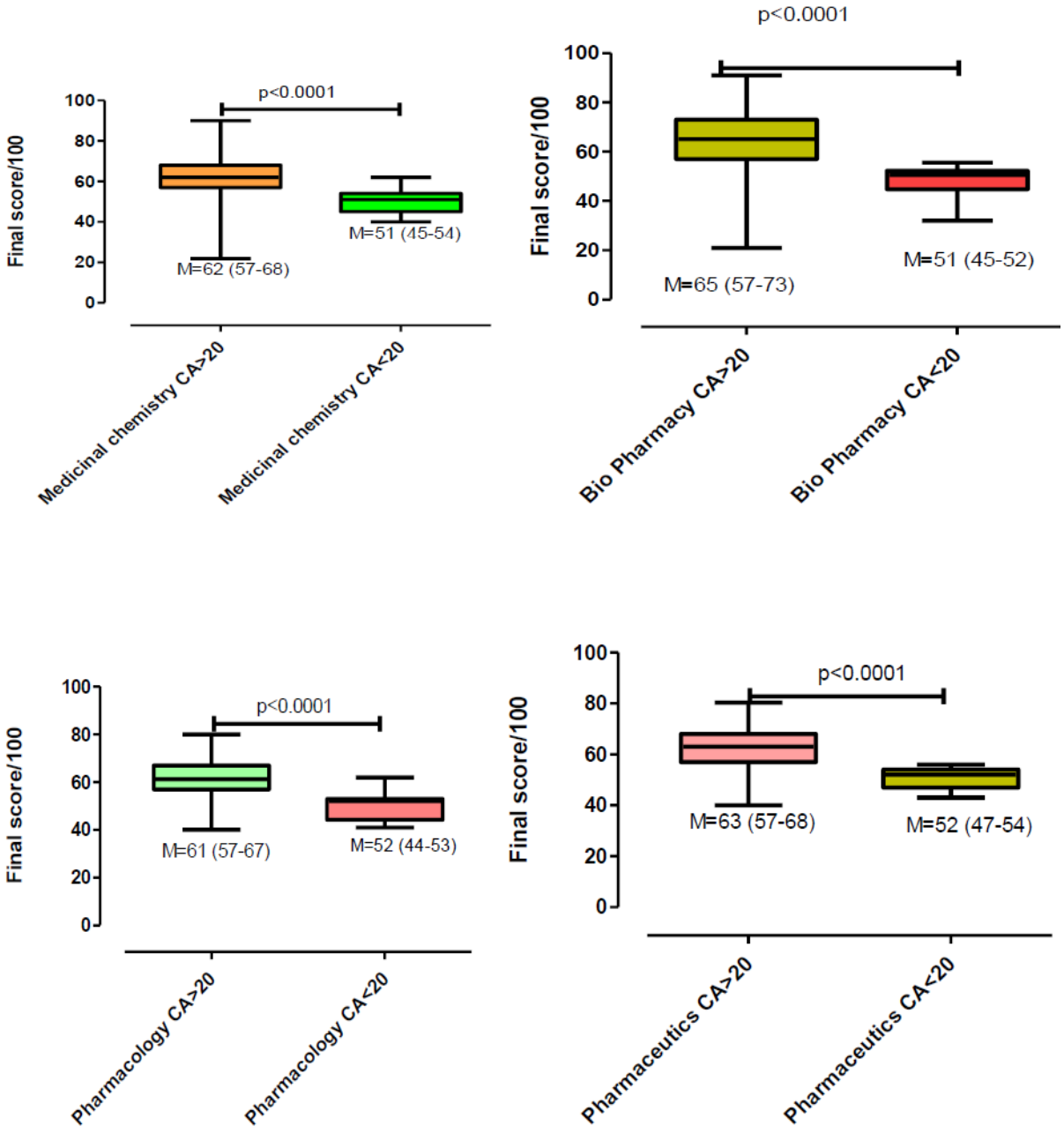


Figure 0.2: Comparison of the Median FE total scores between Candidates whose CA was Passed and Failed in Medicinal chemistry, Bio-Pharmacy, Pharmacology and Pharmaceutics in the Fourth-Year Examinees

For the fifth-year examinees, In Pharmacy Practice, the median total score was 64 (IQR=59-70) and 52 (IQR=50-55) for examinees with CA scores >20 and <20, respectively. In Pharmacology, the median total score was 62 (IQR=57-65) and 50 (IQR=50-54) for the examinees with CA scores >20 and <20 respectively while in Clinical Pharmacy, the median

total score was 60 (IQR=56-64) and 52 (IQR=50=54) for the examinees with the CA score >20 and <20 respectively.

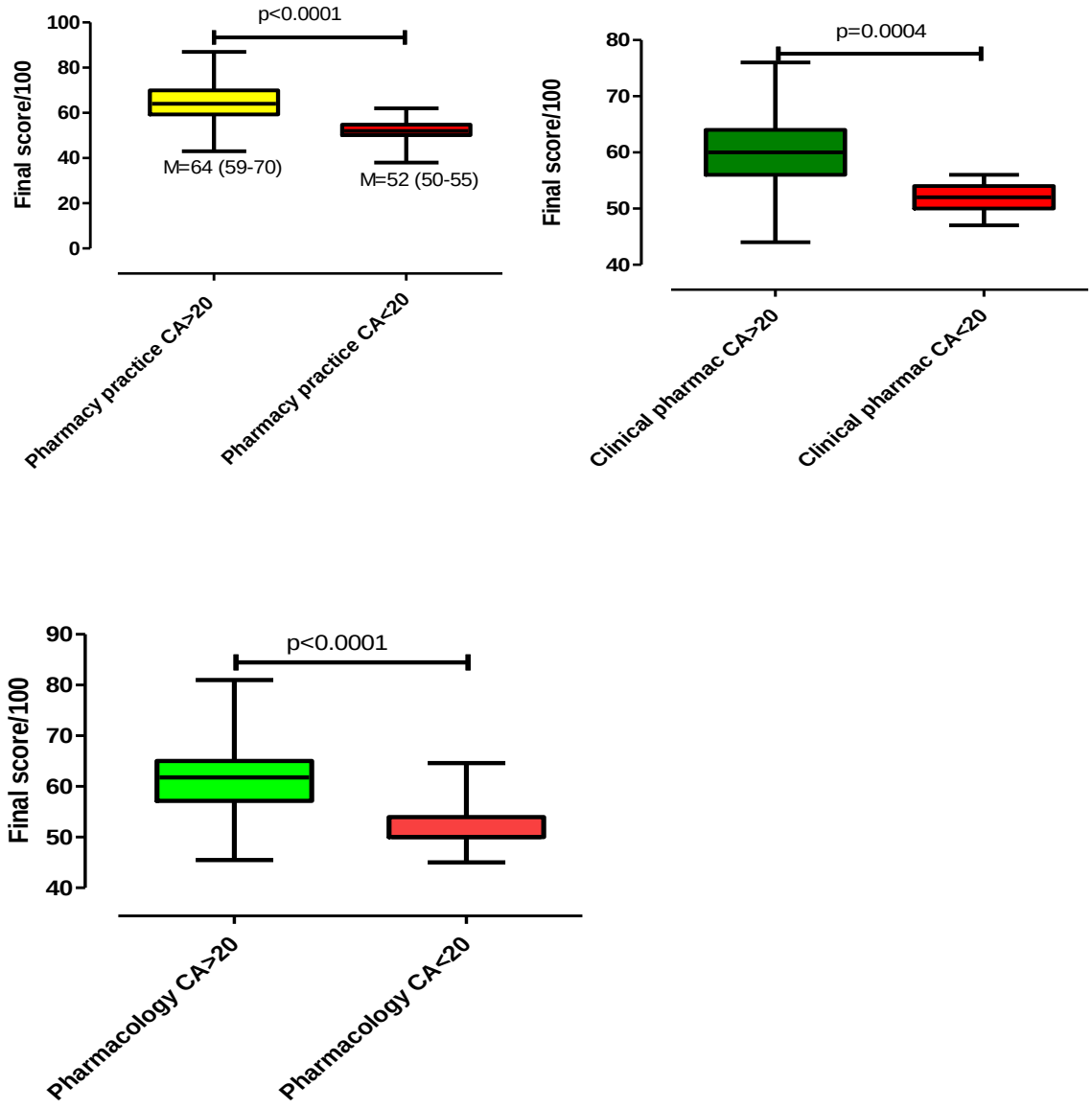


Figure 0.3: Comparison of the Median FE Total Scores between Candidates whose CA was Passed and Failed in Pharmacy Practice, Clinical Pharmacy and Pharmacology in the Fifth-Year Examinees

4.2.4 Correlation of Course Specific CA Scores and GPA Scores

In order to establish a preliminary relationship between the course specific CA score and the GPA, Spearman's correlation test was used as the data was not normally distributed. This was

done in response to part of objective 2 which sought to assess the predictive validity of CA score on the GPA and the results are presented below.

In the third-year participants, there was a statistically significant positive correlation of the CA scores and the GPA as shown for Pharmacology, Pharmaceutics, Pharmaceutical Chemistry and Pharmacy Practice respectively in figure 4.4 below.

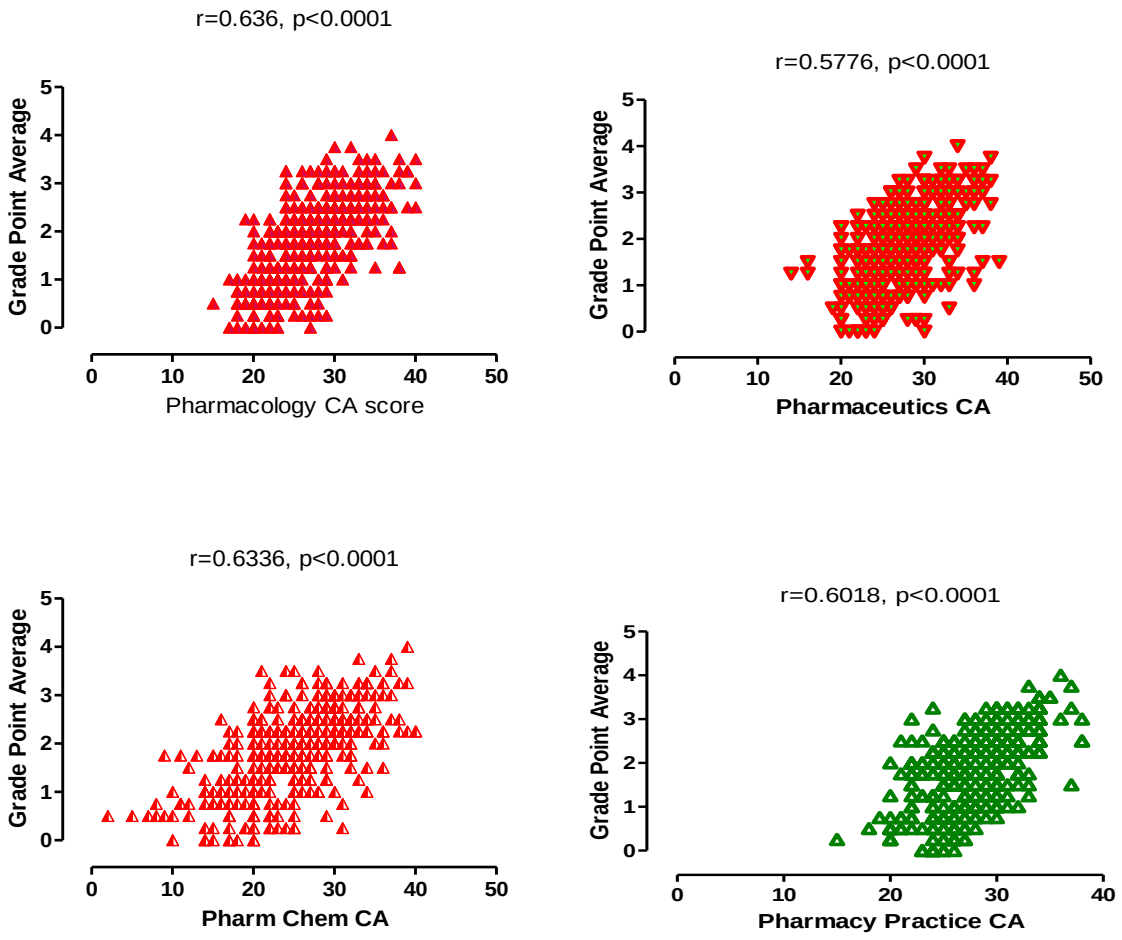


Figure 0.4: Correlation of CA Scores in Pharmacology, Pharmaceutics, Pharmaceutical Chemistry and Pharmacy Practice with the Third-Year GPA Score

A similar observation was made in the fourth-year participants were there was a significant positive correlation between the fourth-year GPA scores and the course specific CA scores under study as depicted in the Figure 4.5 below.

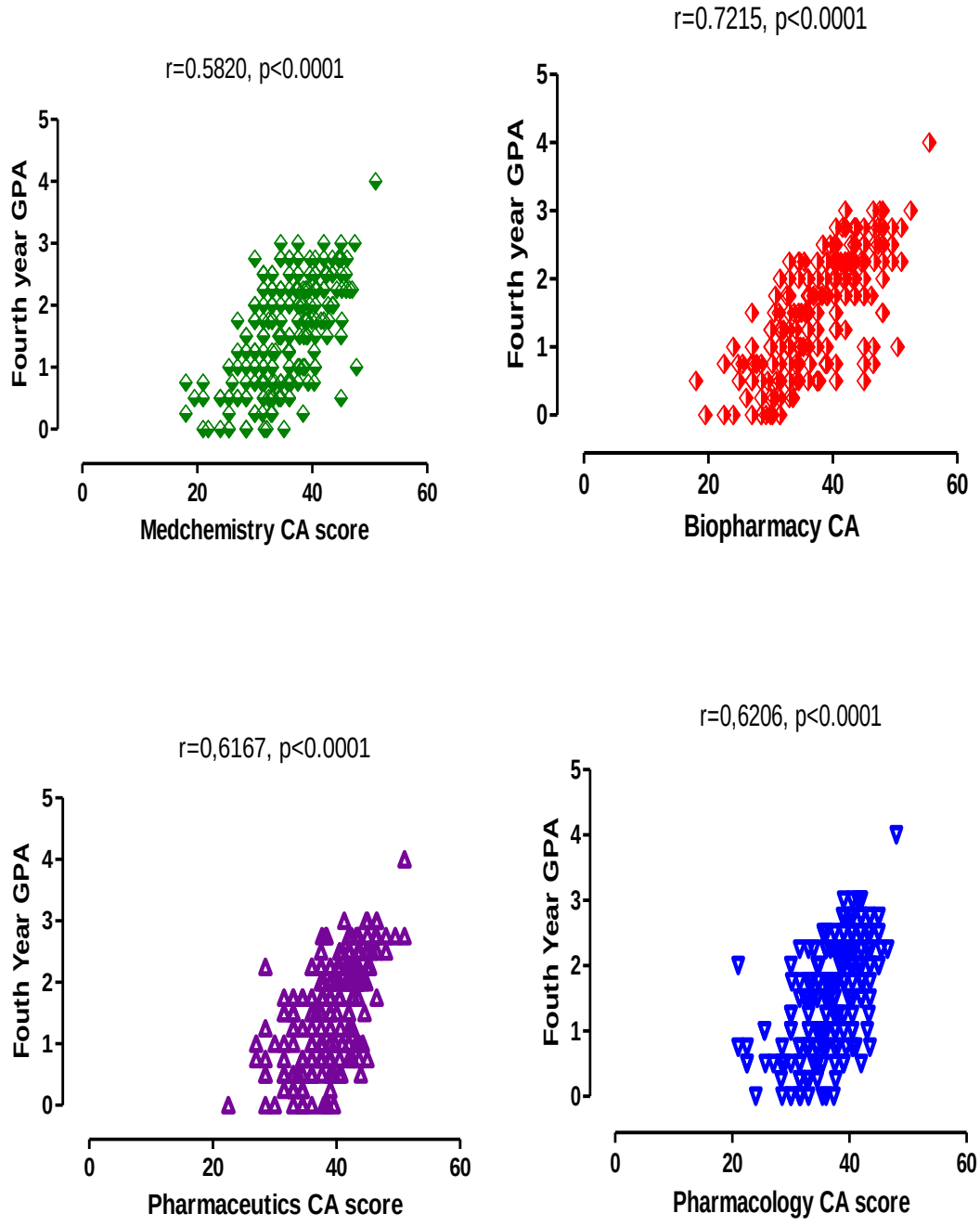


Figure 0.5: Correlation of CA Score in Pharmacology, Medicinal Chemistry, Pharmaceutics and Bio Pharmacy with the Fourth-Year GPA Score

For the correlation between the fifth-year course specific CA scores and GPA scores, there was a significant positive correlation between the Clinical Pharmacy, Clinical Pharmacology, Pharmacy Practice CA scores and the fifth-year GPA. The Figure 4.6 shows the findings.

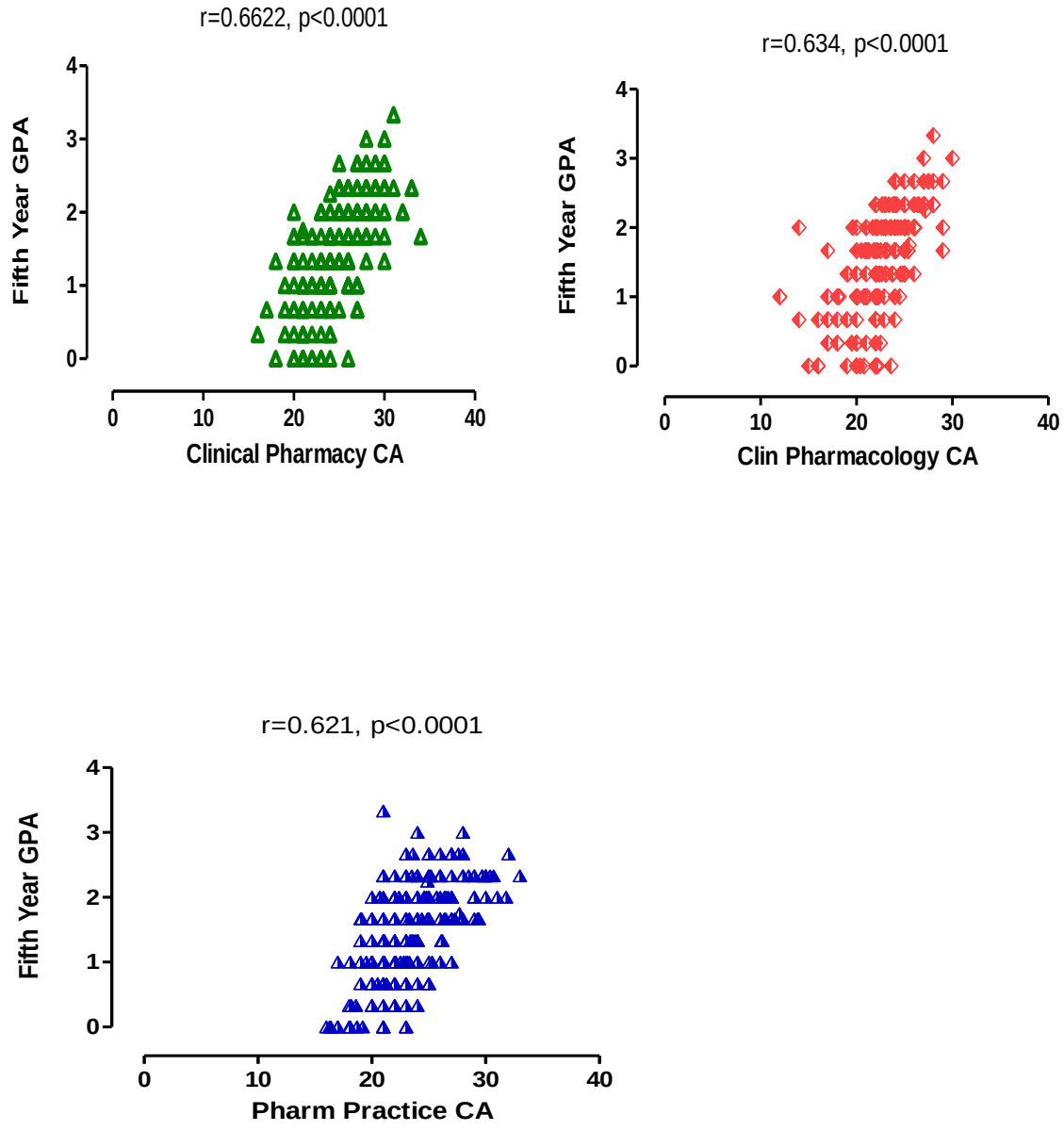


Figure 0.6: Correlation of the CA Scores in Pharmacology, Clinical Pharmacy and Pharmacy Practice with the Fifth-Year GPA Score

4.2.4.1 Median GPA Compared to the Acceptable GPA

In order to have an idea of the overall examinee's performance based on their GPA score attainment, a comparison of the participant's median GPA score with the minimum acceptable according to the revised UNZA academic regulations was done (UNZA, 2014). The median GPA score for the third-year participants was 2 (IQR = 1.25 to 2.50). A comparison of the demographic characteristics against the GPA was done in order to test whether there would be any statistical differences in the demographic categories. As shown in Figure 4.7 below, there was no statistical difference observed between the categories regarding their GPA but what is worth noting is that the median GPA score fell below the minimum acceptable standard of 2.5.

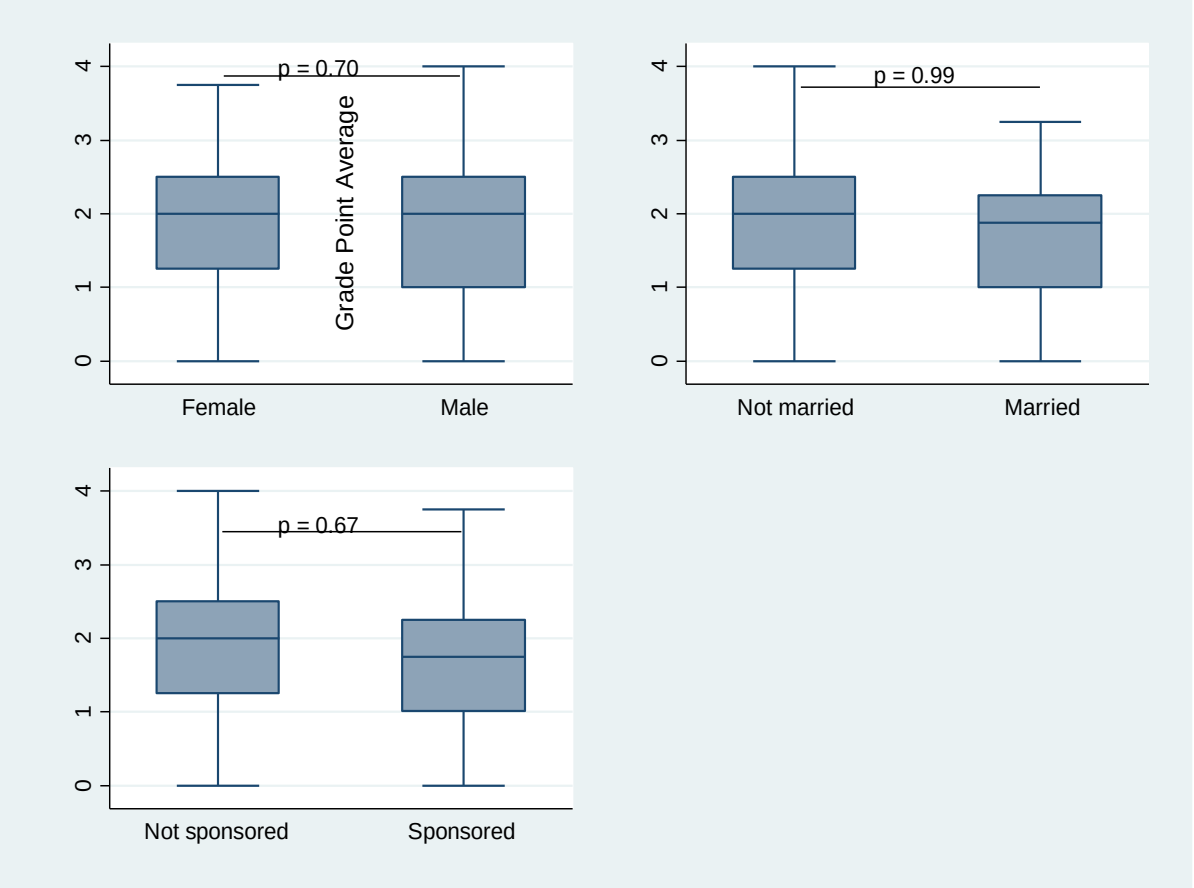


Figure 0.7: Median GPA Score for the Third-Year Examinees by Demographic Characteristics

In the fourth-year participants, the median GPA was found to be 1.75 (IQR = 0.75 to 2.25). A comparison of the demographic characteristics against the GPA was done in order to test whether there would be any statistical differences in the categories. As shown in Figure 4.8 below, there was no statistical difference observed between the categories regarding their GPA but what is worth noting is that the median GPA score fell below the minimum acceptable standard of 2.5 as well.

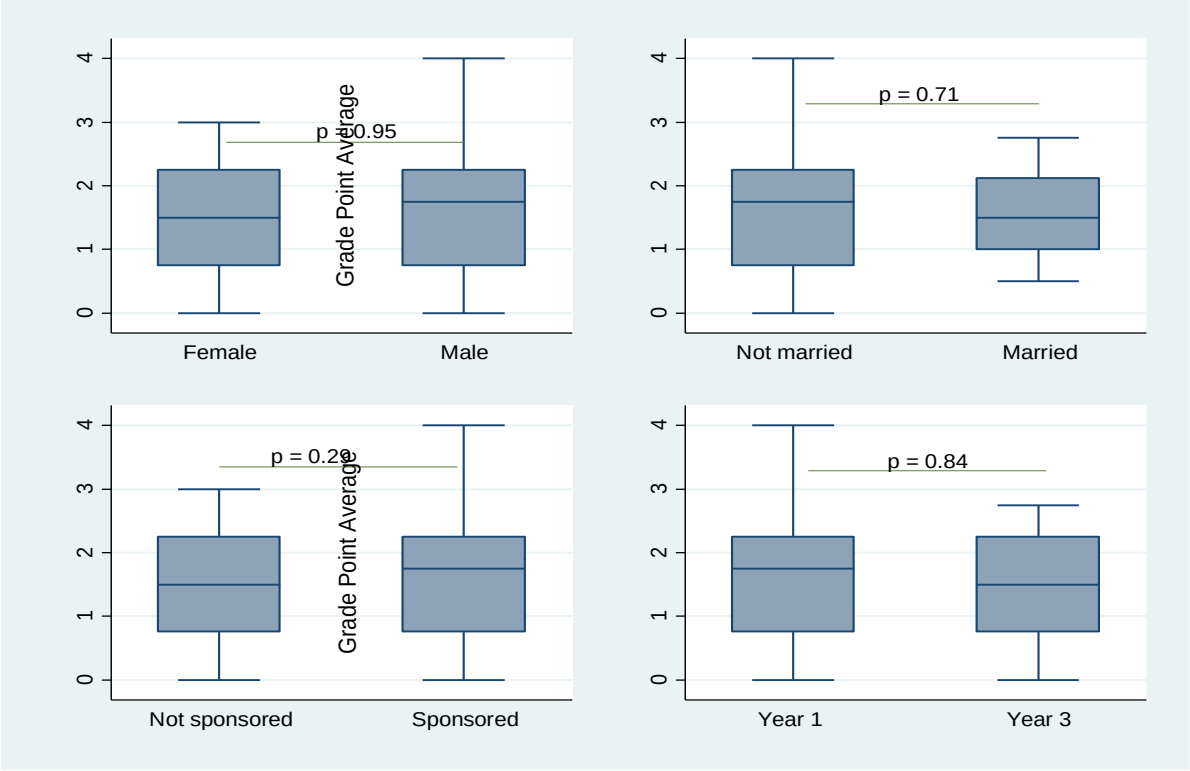


Figure 0.8: Median GPA Score for the Fourth-Year Participants by Demographic Characteristics

The median GPA score for the fifth-year participants was 1.67 (IQR, 1.00 to 2.00). A comparison of the demographic characteristics against the GPA was done in order to test whether there would be any statistical differences in the categories. As shown in Figure 4.9 below, there was no statistical difference observed between the categories regarding their GPA but what is worth noting is that the median GPA score fell below the minimum acceptable score of 2.5 as well.

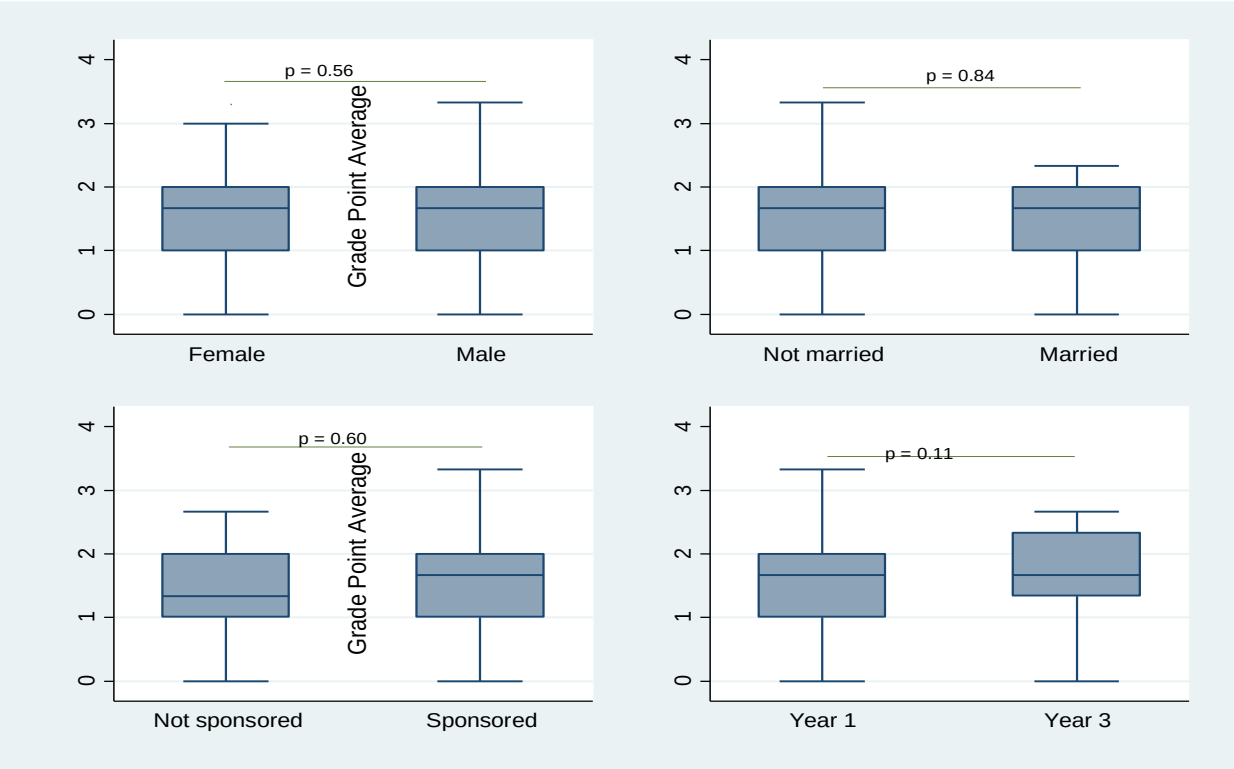


Figure 0.9: Median GPA Score for the Fifth-Year Participants by Demographic Characteristics

4.2.4.2 Multiple Regression Models

In order to obtain a summary of the detailed relationship between the GPA, demographic characteristics and the individual course CAs, multivariate multiple regression models were designed considering marital status, sex, age, sponsorship, level of entry, Pharmacology CA scores, Pharmaceutics CA scores, Pharmaceutical chemistry CA scores and Pharmacy practice CA scores as independent variables while GPA was considered as the outcome or dependent variable for the models. Based on the results of the obtained in the association of demographic characteristics and the GPA, univariate regression was not conducted and thus, the adjusted multiple regression was done as shown in Table 4.24 below.

Table 0.24: Multivariable Linear Regression Analysis of the Relationship between GPA, Demographic Characteristics and CA Scores in the Third-, Fourth- and Fifth-Year Participants

	Third-Year (n=410)		
GPA	**B**	**95% CI**	**p value**
Married	-0.21	-0.412 to -0.008	0.041*
Male	0.063	-0.038 to 0.163	0.221
Age	0.062	0.020 to 0.105	0.004*
Sponsorship	0.172	-0.008 to 0.350	0.061
Pharmacology CA	0.056	0.042 to 0.068	0.000*
Pharmaceutics CA	0.033	0.025 to 0.042	0.000*
Pharmaceutics Chemistry CA	0.053	0.039 to 0.068	0.000*
Pharmacy Practice CA	0.045	0.029 to 0.061	0.000*
Fourth-Year (n=228)			
Married	-0.243	-0.531 to 0.044	0.096
Male	-0.047	-0,134 to 0.124	0.942
Age	0.013	-0.012 to 0.038	0.298
Sponsored	-0.063	-0.226 to 0.100	0.448
Year 1 entry	0.131	-0.116 to 0.378	0.296
Pharmacology CA	0.059	0.040 to 0.078	0.000*
Pharmaceutics CA	0.075	0.056 to 0.095	0.000*
Bio pharmacy CA	0.077	0.062 to 0.091	0.000*
Medicinal Chemistry CA	0.045	0.029 to 0.061	0.000*
Fifth-Year (n=217)			
Married	0.105	-0.136 to 0.346	0.391
Male	-0.026	-0.140 to 0.088	0.658
Age	-0.011	-0.040 to 0.018	0.468
Sponsored	-0.037	-0.165 to 0.091	0.567
Year 1 entry	0.171	-0.045 to 0,388	0.120
Pharmacology	0.092	-0.077 to 0.117	0.000*
Clinical Pharmacy	0.083	0.064 to 0.102	0.000*
Pharmacy Practice	0.079	0.061 to 0.097	0.000*

Data are given as regression coefficient (B) and 95% confidence interval.
Adjusted R^2 is 0.69 for the third-year model, 0.76 for the fourth-year model and 0.72 for the fifth-year model.
*p<0.05 significant values different from reference categories adjusted for all the explanatory variables as shown above
GPA is Grade Point Average, CA is Continuous Assessment

The above general linear model demonstrates the regression of GPA against students' marital status, sex, age, sponsorship status and CA scores to determine which covariates predict variations in GPA. The Adjusted R^2 was 69.0% for the third-year participants shows that the fitted covariates explain approximately 69.0% of the variation in GPA. The model shows that every unit increase in age was associated with a mean of 0.06 (95% CI, 0.02 to 0.10) increase in GPA in the population. A unit increase in Pharmacology CA score was associated with a

mean of 0.064 (95% CI = 0.053-0.08) increase in GPA. A unit increase in Pharmaceutics CA score was associated with a mean of 0.06 (95% CI = 0.04%-0.07) increase in GPA. Every unit increase in Pharmaceutical Chemistry CA score was associated with a 0.03 (95% CI = 0.025-0.042) increase in GPA. A unit increase in Pharmacy Practice CA score was associated with a 0.06 (95% CI = 0.053-0.076) increase in GPA. Furthermore, being married was associated with a mean of -0.21 (95% CI = -0.41 to – 0.008) reduction in GPA compared to being unmarried. However, there was no statistically significant difference in GPA between males versus females and sponsored versus unsponsored P=0.22 and 0.06, respectively.

The Adjusted R^2 was 76.0% for the fourth-year participants showing that the fitted covariates explain approximately 76.0% of variation in GPA score (F= 75.4, p<0.001) while the fifth-year model fit obtained an adjusted R^2 of 72.0% indicating that the fitted covariates explain approximately 72.0% of the variations in the GPA score (F= 66.6, p<0.001) which significantly predicted the GPA.

Additionally, partial effects plots were designed using the course-specific CA score in order to show its predictive margins and respective confidence intervals on the likely GPA score given sex, marital status and sponsorship. This was done following the successful running of regression models above as shown in Table 4.24. Figures 4.10, 4.11, 4.12 and 4.13 show the predictive partial effect plots by course with the respective confidence intervals.

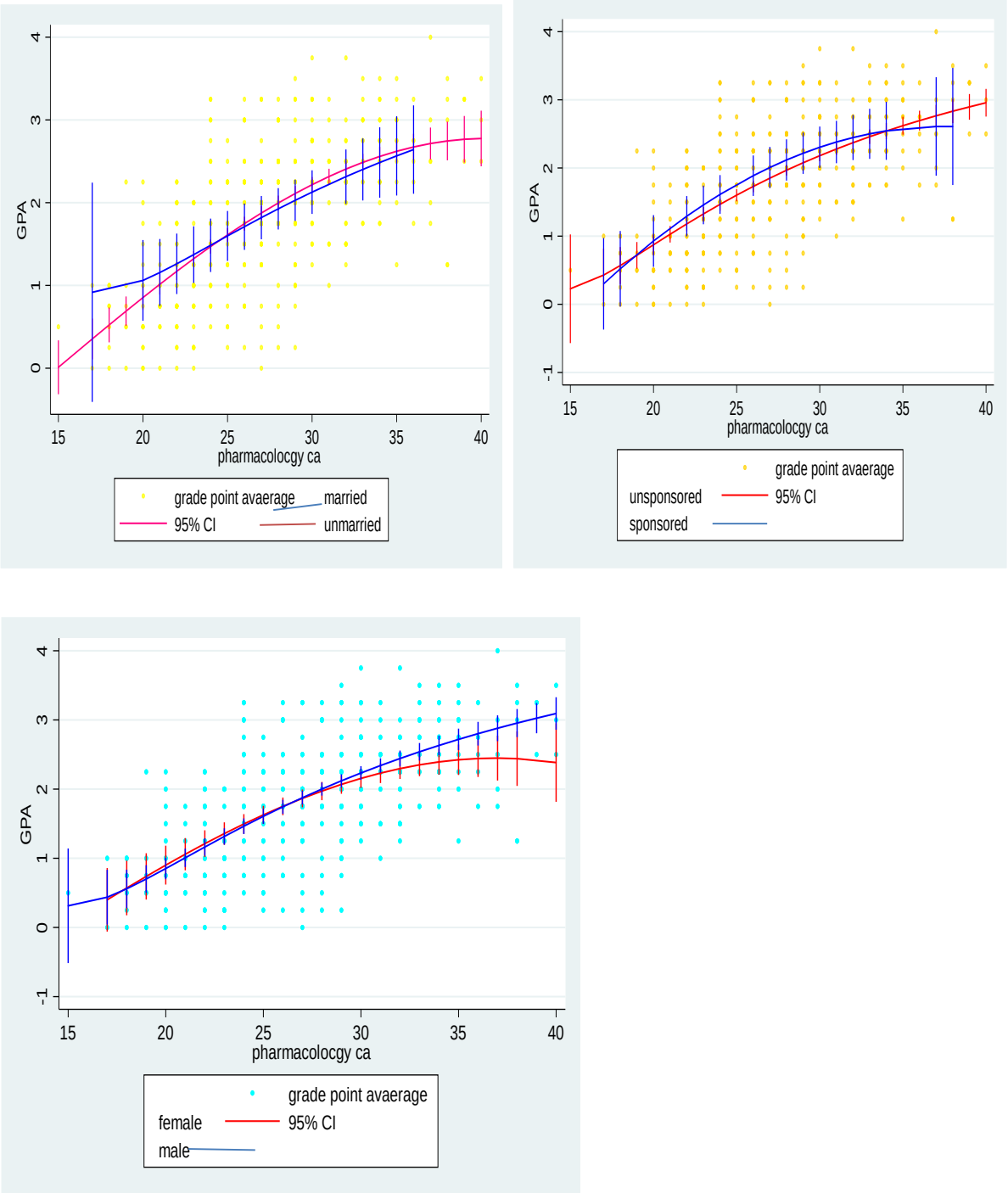


Figure 0.10: Predictive Model of Pharmacology CA Score on GPA given Marital Status, Sponsorship and Sex are Constant

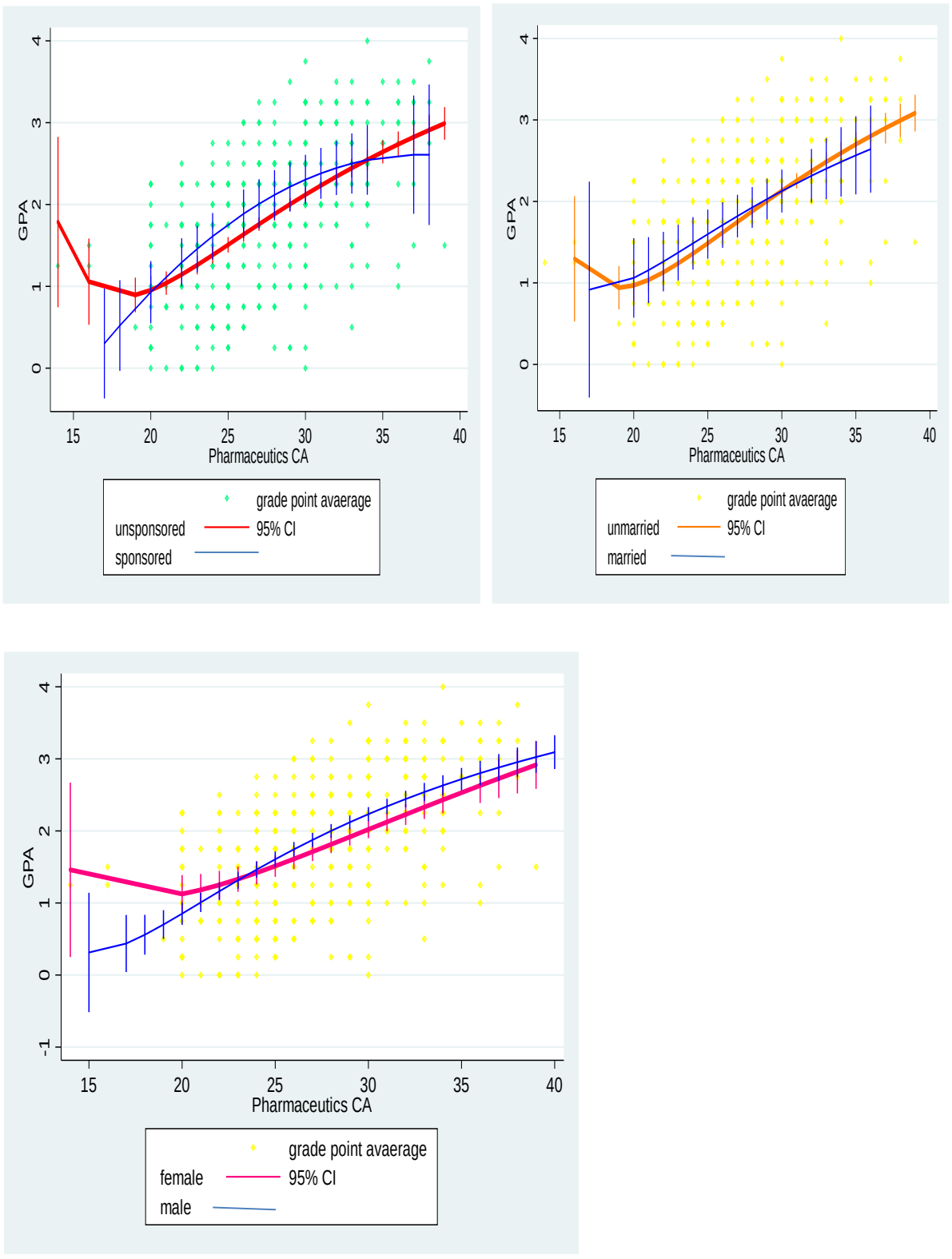


Figure 0.11: Predictive Model of Pharmaceutics CA Score on GPA given Sponsorship, Marital Status and Sex are Constant

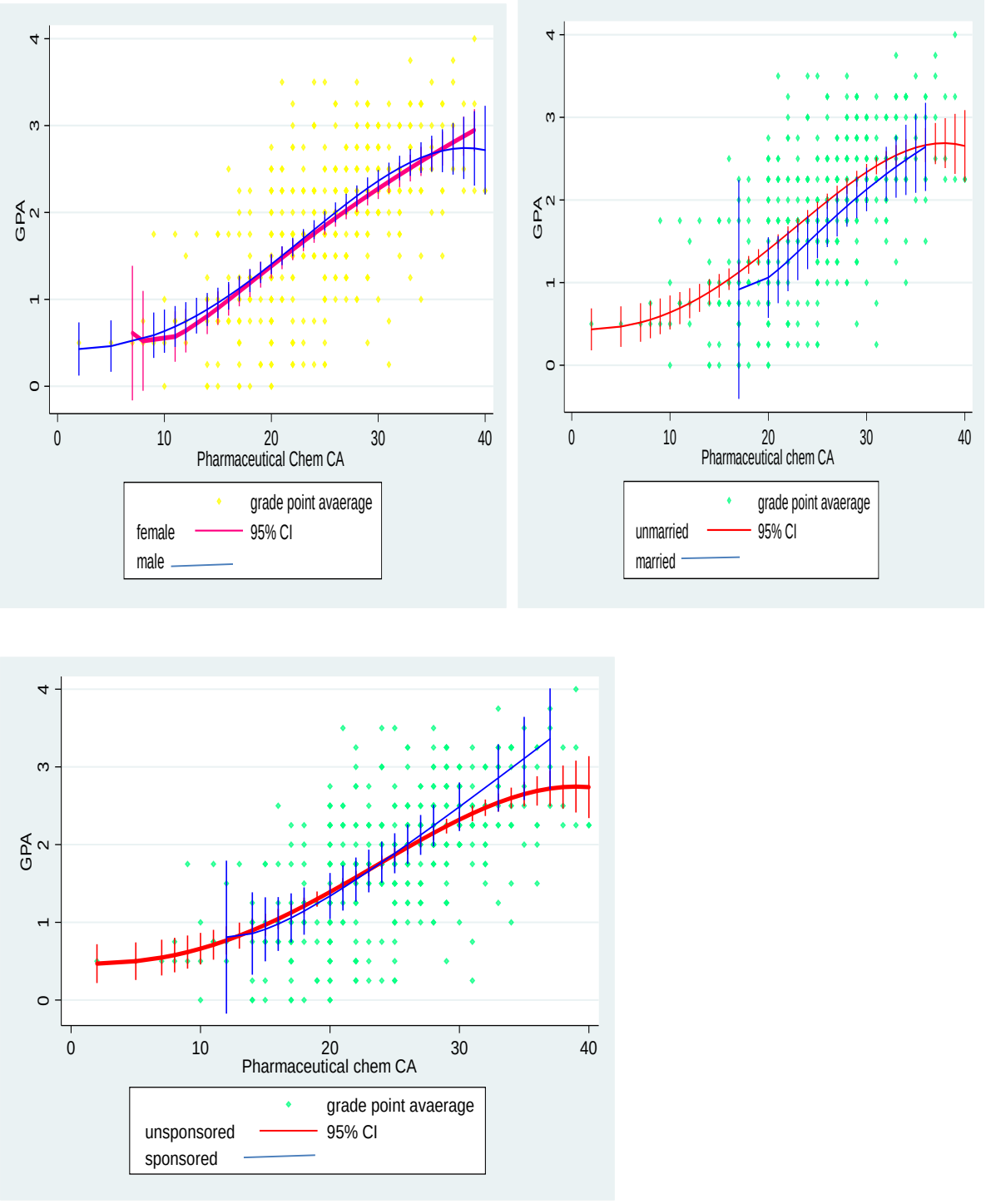


Figure 0.12: Predictive Model of Pharmaceutical Chemistry CA Score on GPA given Sex, Marital Status and Sponsorship are Constant

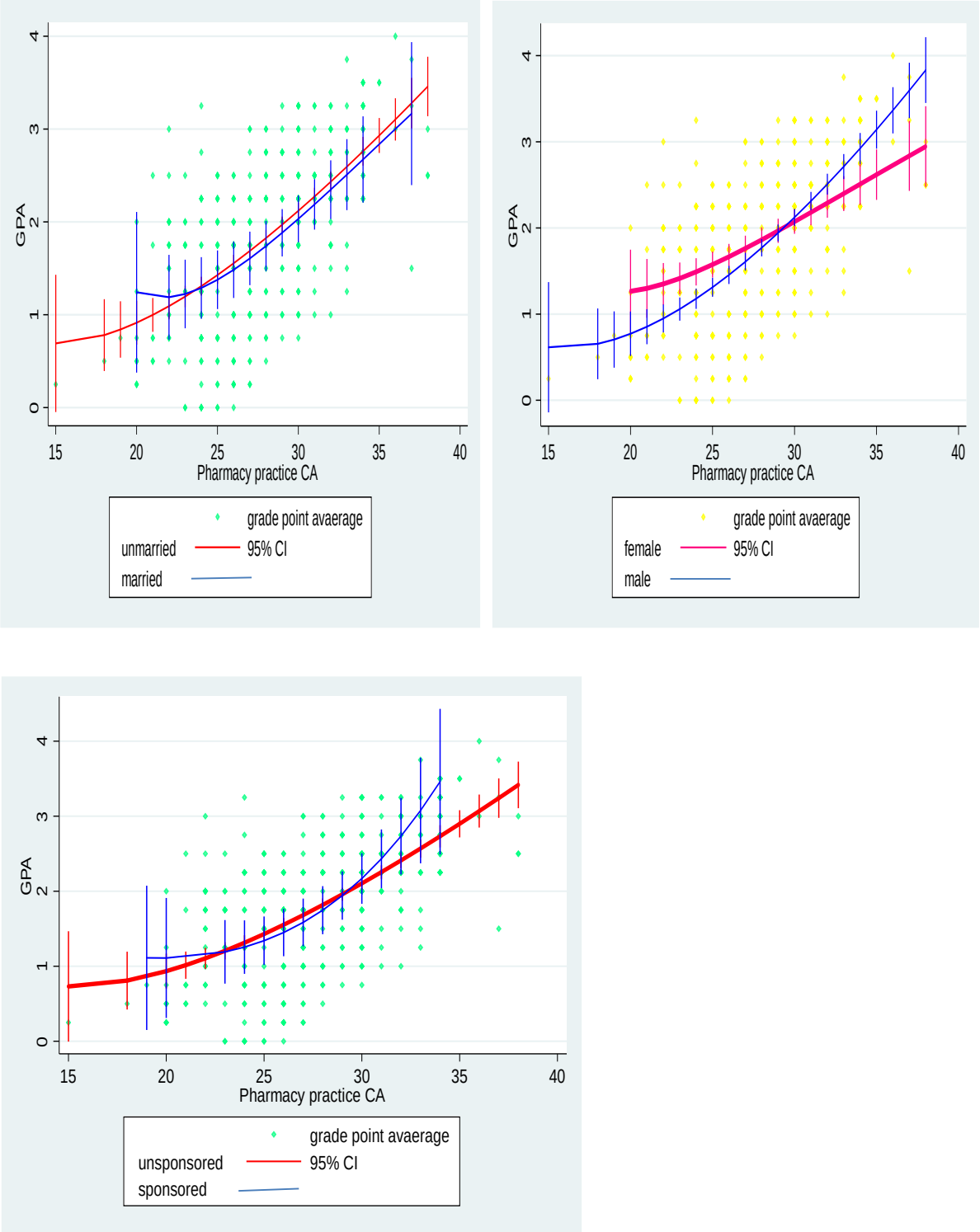


Figure 0.13: Predictive Model of Pharmacy Practice CA Score on GPA given Marital Status, Sex and Sponsorship are Constant

4.2.4.3 Comparison of CA and FE Scores within and Among Courses

Specific objective 1 further sought to compare the course specific CA score and FE score as well as the overall performance within and among courses under study. This was necessitated in order to establish whether the CA score would predict a similar FE score while also observing whether the consolidated CA and FE score would be the same among the courses. This was additionally necessitated in order to establish whether the performance of an examinee in one course would be the same in the other courses. In order to establish this observation, a paired t-test was used to compare within courses while the Analysis of Variance tests was used with the CA scores having being adjusted out of 60 against FE scores for the T-test. Normality of the data was done using the Shapiro-Wilk test and the data was parametric.

4.2.4.3.1 Comparison of the CA and FE scores within Courses

In the third-year courses, there was a statistically significant difference in the mean CA and FE scores in Pharmacology ($p<0.0001$), Pharmaceutics ($p<0.0001$) and Pharmacy Practice ($p<0.0001$) while not in Pharmaceutical Chemistry ($p=0.462$) as shown in Figure 4.14 below.

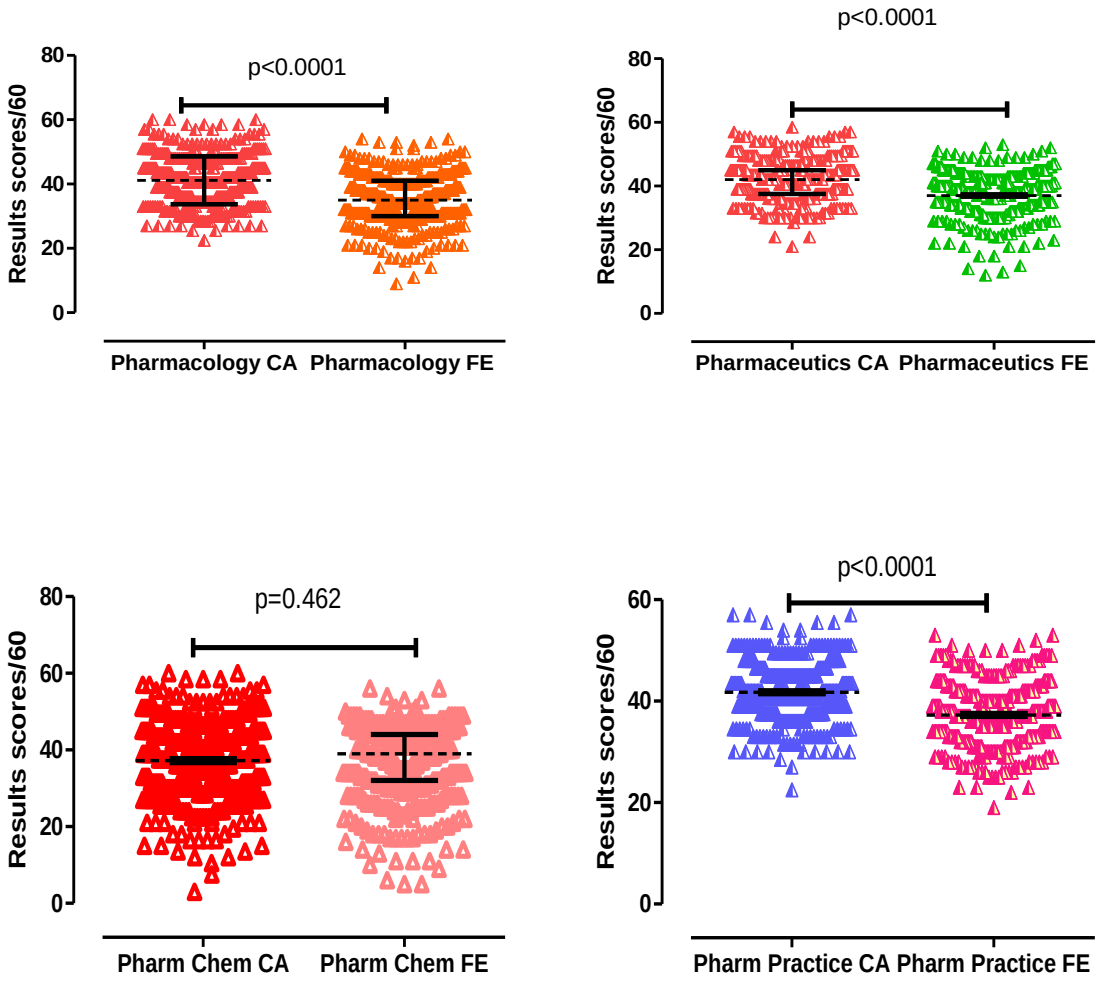


Figure 0.14: Comparison of Third-Year Mean CA and FE Scores in Pharmacology, Pharmaceutics, Pharmaceutical Chemistry and Pharmacy Practice

In the fourth-year courses, a statistically significant difference in the mean CA and FE scores across all the courses was observed as shown in the figures 4.15 below.

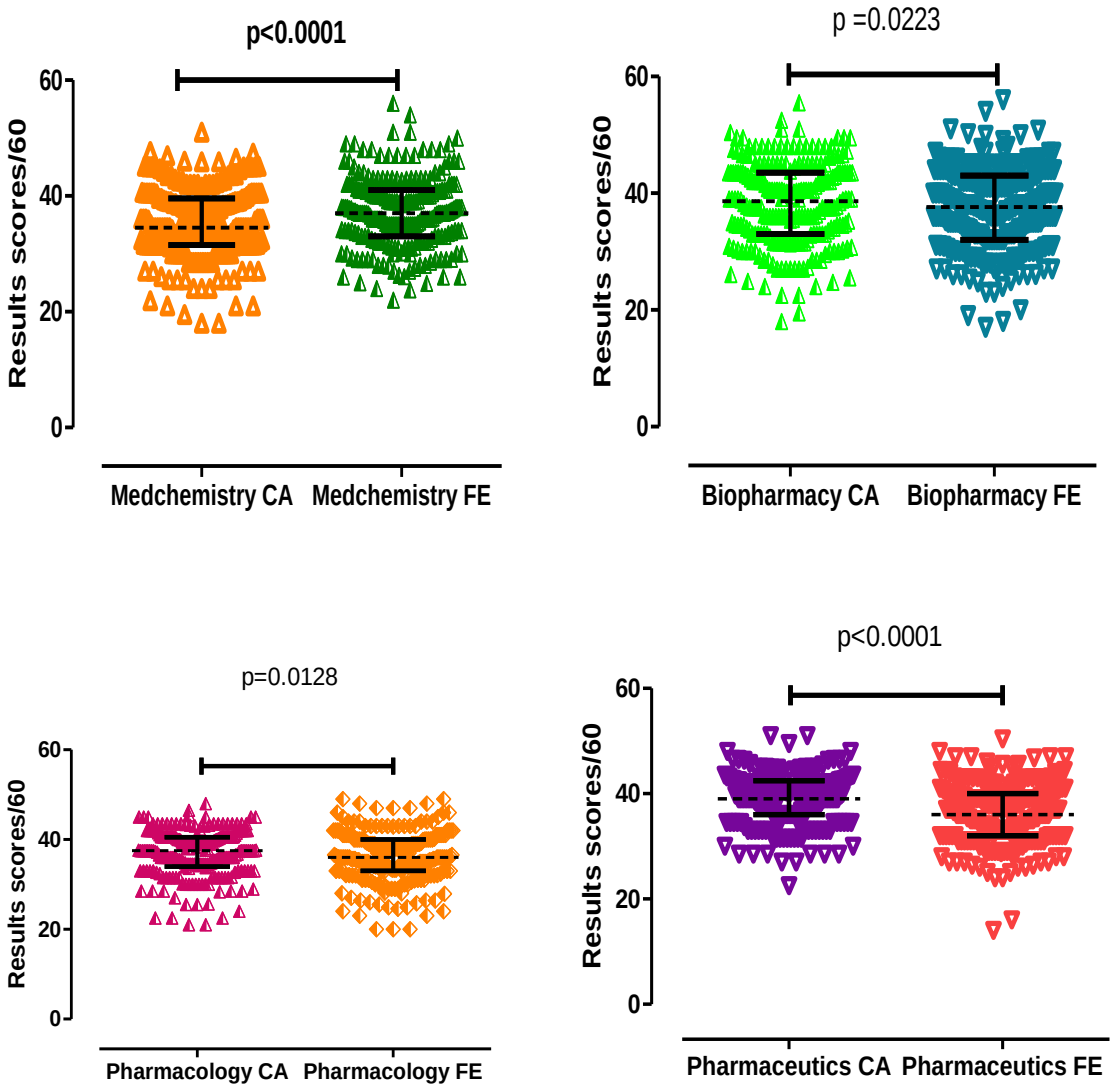


Figure 0.15: Comparison of Fourth-Year CA and FE Scores in Medicinal Chemistry, Bio Pharmacy, Pharmacology and Pharmaceutics

For the fifth-year courses, there was also a significant statistical difference in the mean CA and FE scores as shown in the Figures 4.16 below.

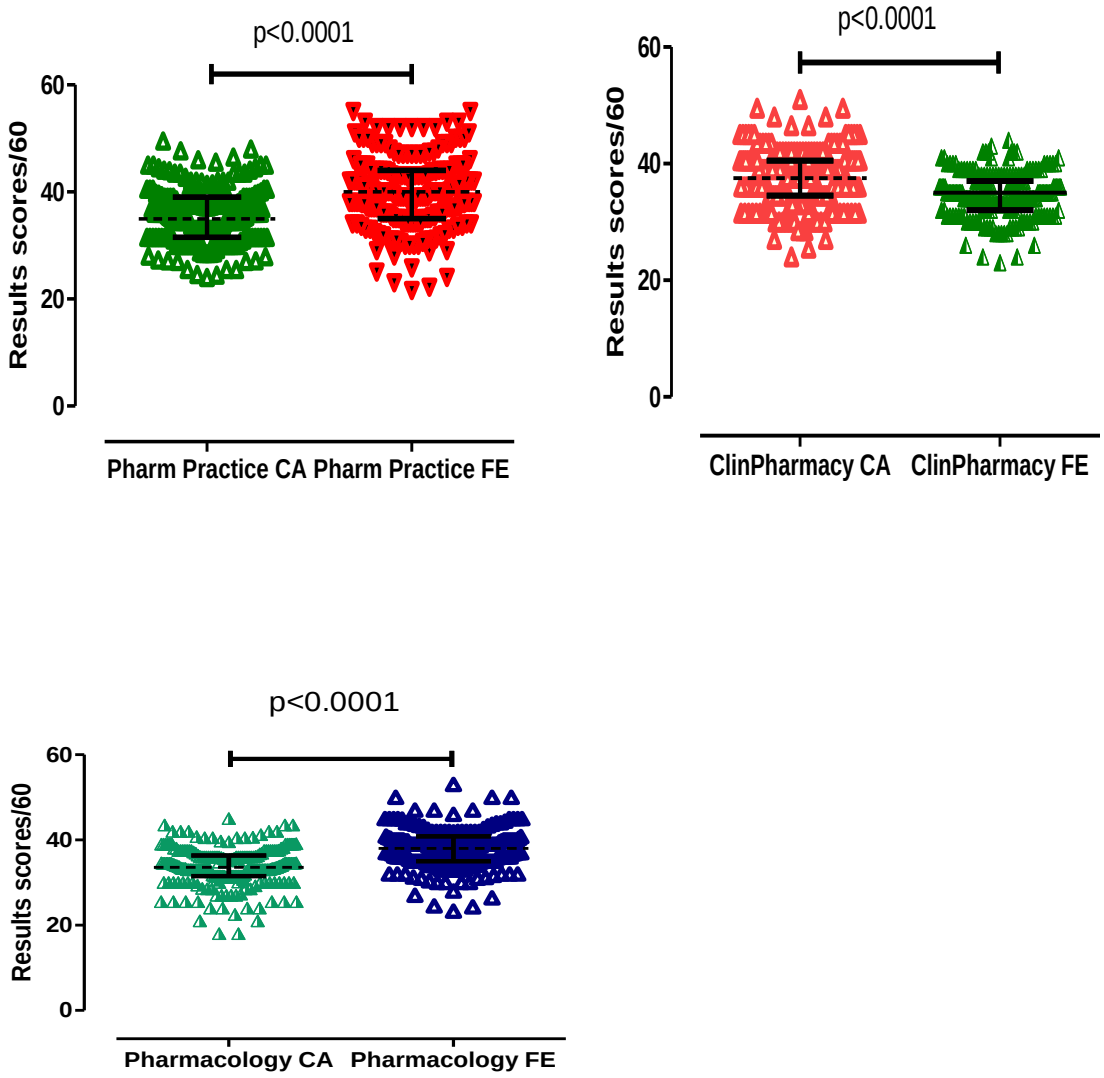


Figure 0.16: Comparison of the Fifth-Year CA and FE Scores in Pharmacy Practice, Clinical Pharmacy and Pharmacology

4.2.4.3.2 Comparison of Examination Total Scores Among Courses

Additionally, objective 1 sought to establish the relationship between a student's performances in one course against other courses, the One-way ANOVA test was used.

In the third-year courses, it was observed that there was a significant difference in the mean consolidated CA and FE scores (Examination total scores) among the courses, p=0.0012 as shown in Figure 4.17 below.

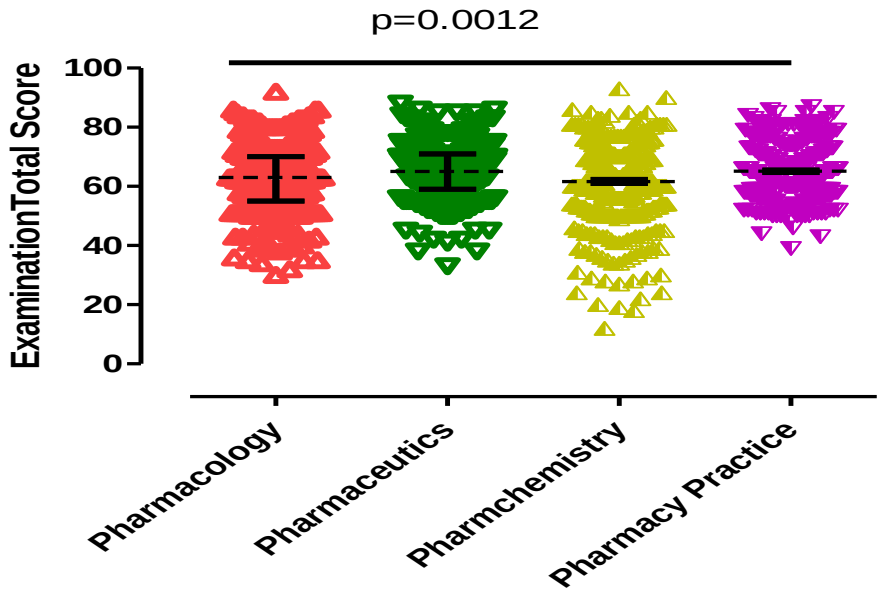


Figure 0.17: Mean Examination Total Scores Among Third-Year Courses

In the fourth-year courses, there was a statistically significant differences in the mean examination total scores obtained in the courses, p = 0.0186. Figure 4.18 shows the summaries of the findings.

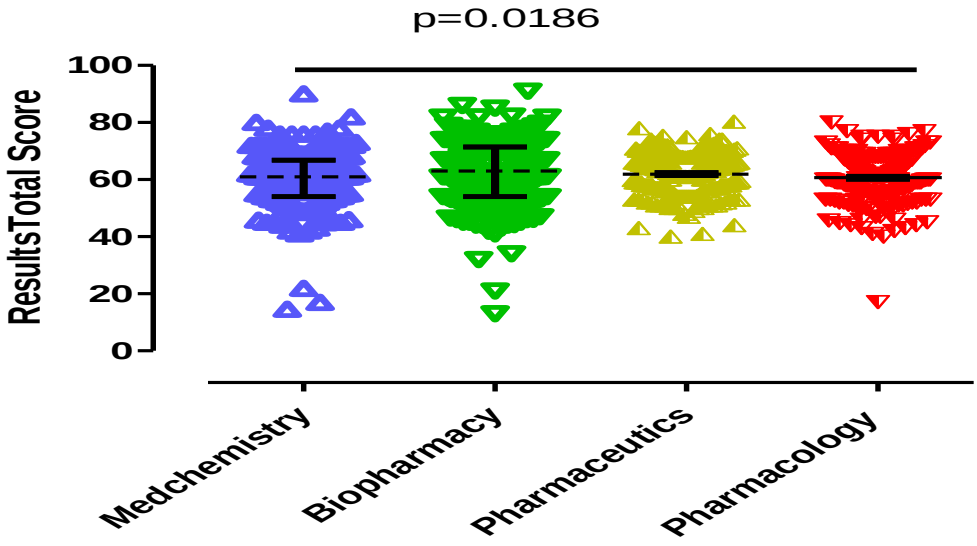


Figure 0.18: Mean Examination Total Scores Among Fourth-Year Courses

In the fifth-year courses, there was a statistically significant difference in the mean total examination scores among the courses, p<0.0001 as shown in Figure 4.19 below

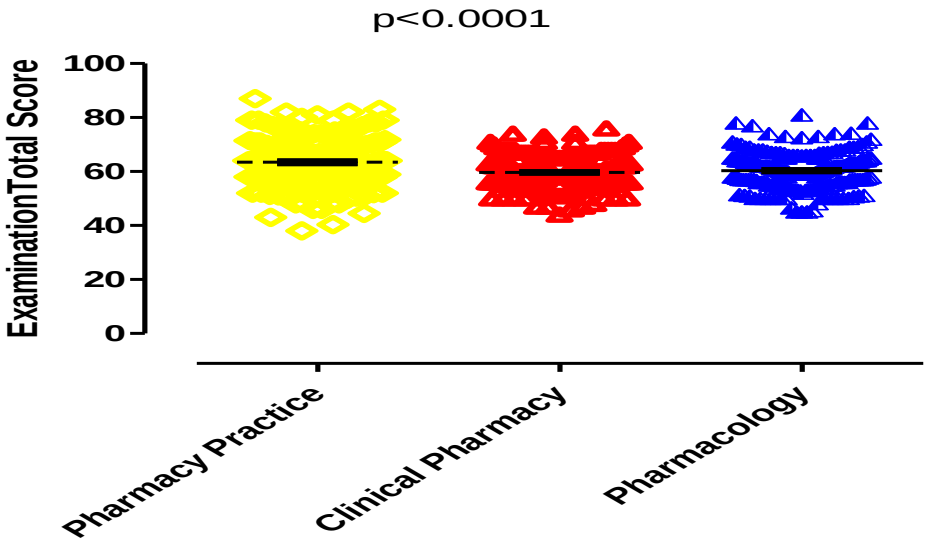


Figure 0.19: Mean Examination Total Scores Among Fifth-Year Courses

4.2.5 Correlation of Course Specific CA Scores and FE Scores

In order to determine the predictive validity of the CA score on the course specific FE score in Pharmacology, Pharmaceutics, Pharmacy Practice, Medicinal/Pharmaceutical Chemistry and clinical pharmacy, a preliminary description the relationship between the CA score and the FE score was done using the Pearson's correlation test was done and the results are demonstrated in the graphs below.

In the third-year courses, there was a positive and significant statistical correlation between the CA and FE scores in Pharmacology, Pharmaceutical Chemistry, Pharmacy Practice and Pharmaceutics. The results are summarised in the figure 4.20 below.

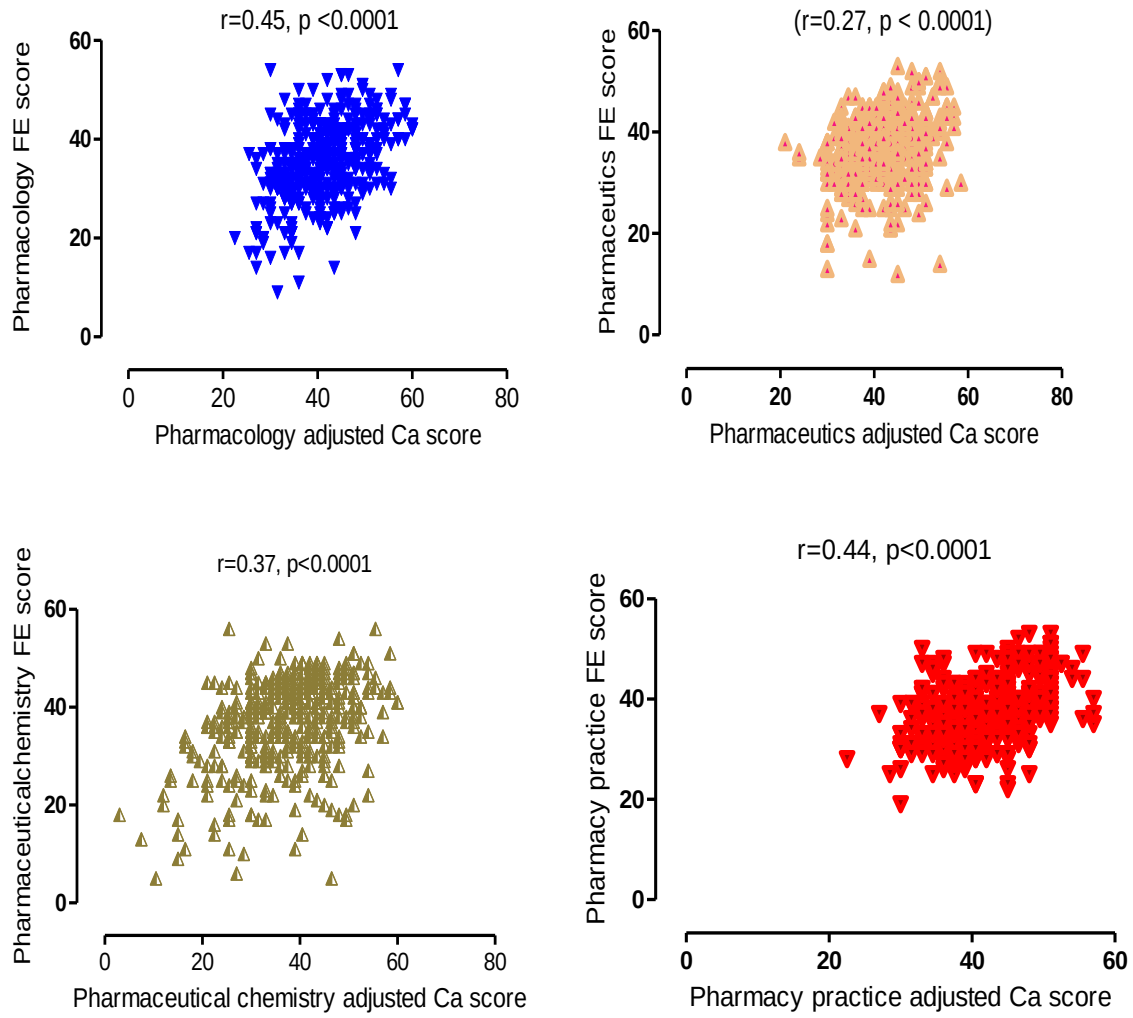


Figure 0.20: Correlation of Third-Year Course Specific CA Scores and FE Scores

For the fourth-year study course results, there was a positive and statistically significant correlation between the CA and FE scores in the courses under study. Figure 4.21 below summarise the findings.

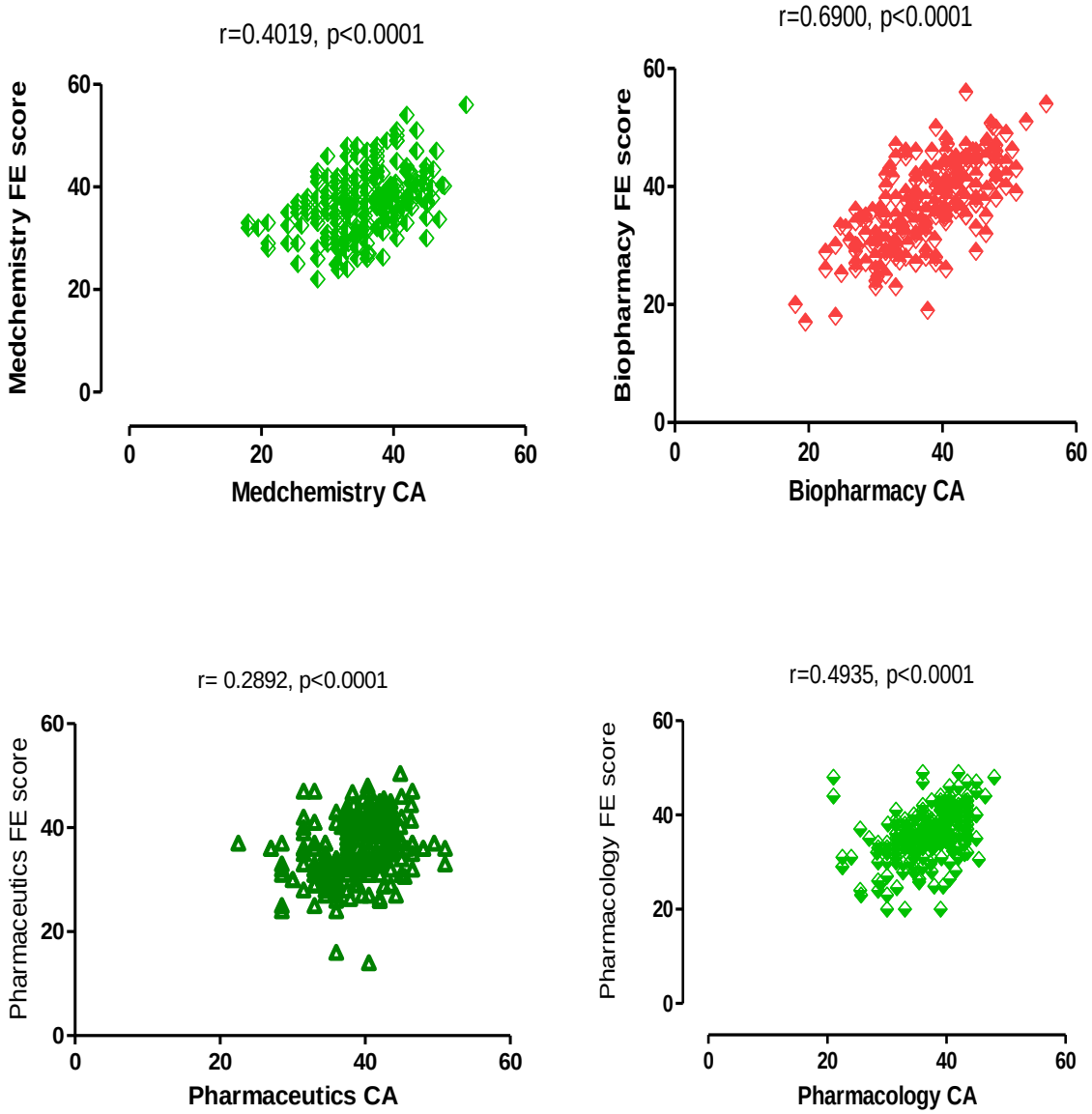


Figure 0.21: Correlation of Fourth-Year Course Specific CA Scores and FE Scores

Similarly, in the fifth-year courses, a positive and statistically significant correlation was observed in all the courses under study as depicted in the Figure 4.22 below.

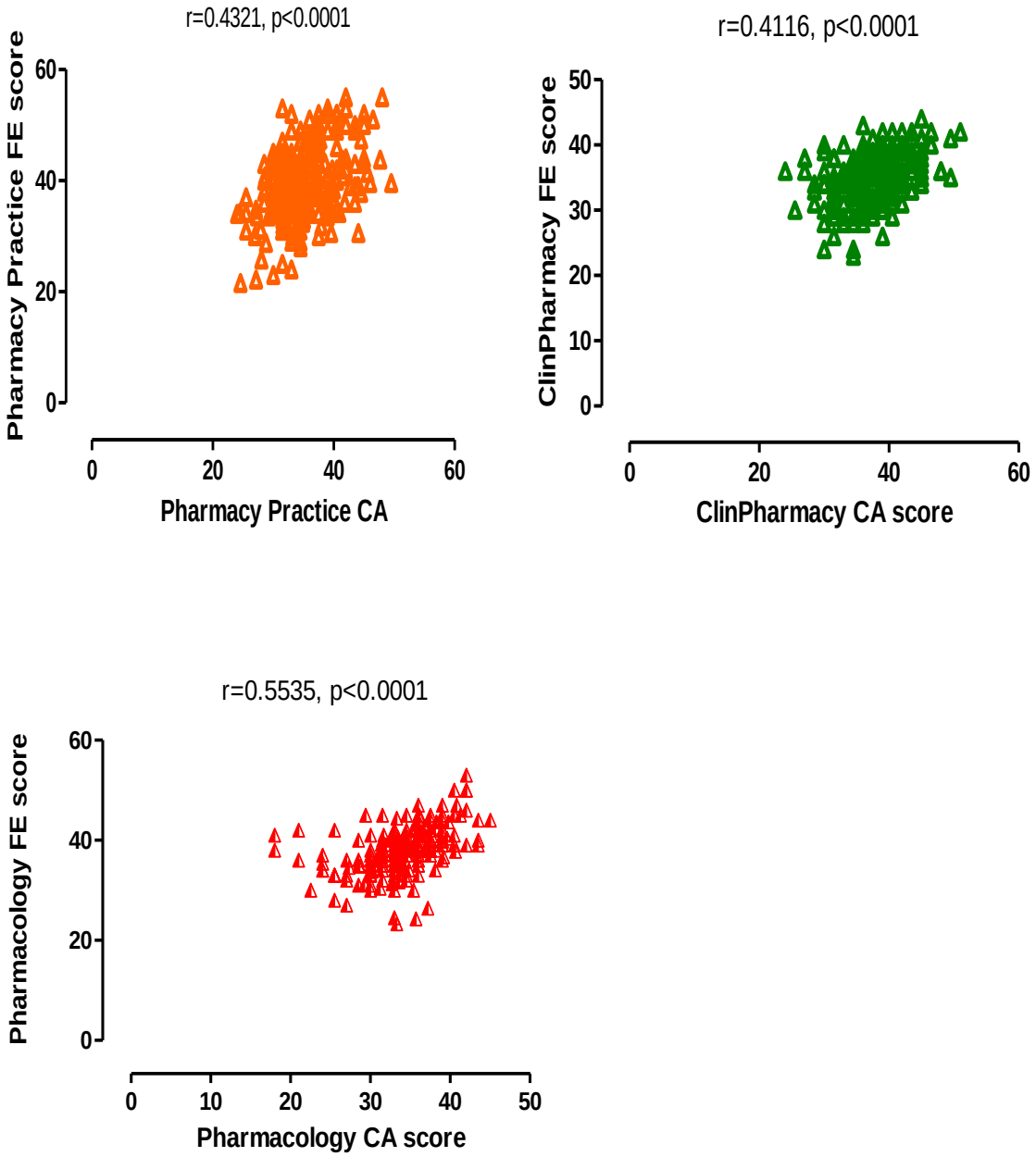


Figure 0.22: Correlation of Fifth-Year Course Specific CA Scores and FE Scores

4.2.5.1 Multiple Linear Regression Models for Prediction of CA score on the FE score

In order to obtain a detailed summary of the relationship between the FE scores, demographic characteristics and the course specific CA scores, multivariate multiple regression models were designed considering marital status, sex, age, sponsorship, level of entry, course specific Pharmacology CA scores, Pharmaceutics CA scores, Pharmaceutical Chemistry CA scores and Pharmacy Practice CA scores as independent variables while the course specific FE scores were considered as the outcome or dependent variable for the models. This was in response to objective 3 which sought to determine the predictive validity of the course specific CA score on the FE score. Based on the results obtained in the association of demographic characteristics and the FE scores, univariate regression were not conducted and thus, the adjusted multiple regression was done as shown in Tables 4.28, 4.29 and 4.30 below.

In the third-year regression models conducted, there were statistically significant model fits obtained with Pharmacology adjusted R^2 of 22.0% ($F=22.61$, $p <0.001$) and Pharmaceutical Chemistry adjusted $R^2$of 17.0% ($F = 15.94$, $p < 0.001$), Pharmaceutics adjusted $R^2$of 8.0% ($F=7.4$, $p<0.001$), Pharmacy Practice adjusted $R^2$of 20.0% ($F= 20.45$, $p <0.001$). The results are summarised in Table 4.28 below.

Table 0.25: Adjusted Multivariable Linear Regression Models for Third-Year Course-Specific CA Score as a Predictor of Course-Specific FE score

	B	95% CI	P value
Pharmacology FE score			
Married	-1.50	-4.33 to 1.33	0.298
Male	0.79	-0.61 to 2.19	0.269
Age	0.43	-0.16 to 1.02	0.156
Sponsored	2.37	-1.37 to 4.88	0.064
Pharmacology CA score	0.73	0.59 to 0.86	0.000*
Pharmaceutical Chemistry FE score			
Married	-0.87	-4.39 to 2.65	0.628
Male	-0.60	-2.34 to 1.14	0.497
Age	0.52	-0.21 to 1.27	0.160
Sponsored	1.07	-2.04 to 4.19	0.498
Pharmaceutical Chemistry CA score	0.56	0.43 to 0.69	0.000*
Pharmaceutics FE score			
Married	-1.24	-3.85 to 1.38	0.352
Male	0.14	-1.16 to 1.43	0.834
Age	0.51	-0.03 to 1.06	0.067
Sponsored	-0.49	-2.79 to 1.83	0.680
Pharmaceutics CA score	0.41	0.27 to 0.56	0.000*
Pharmacy Practice FE score			
Married	-0.36	-2.67 to 1.95	0.760
Male	0.97	-0.17 to 2.11	0.094
Age	0.29	-0.19 to 0.78	0.234
Sponsored	0.12	-1.92 to 2.17	0.906
Pharmacy Practice CA score	0.70	0.56 to 0.85	0.000*

Pharmacology adjusted R^2=0.22, F=22.61, p <0.001; Pharmaceutical Chemistry adjusted R^2=0.17, F = 15.94, p < 0.001; Pharmaceutics adjusted R^2=0.08, F=7.4, p<0.001; Pharmacy Practice adjusted R^2=0.20, F= 20.45, p <0.001.
CA is Continuous Assessment; FE is Final Examination.
**p<0.05 significant values different from reference category adjusted for explanatory variables marital status, sex, age and sponsorship*.

Additionally, partial effect plots were constructed in order to approximate the how much the course specific CA score would predict the respective FE score given sex, marital status, sponsorship are constant with confidence intervals showing. The partial effect and margins plots were produced to estimate the expected outcome variable based on the course specific CA score as a predictor upon successfully running of course specific third-year multiple

regressions above. Figures 4.23, 4.24, 4.25 and 4.26 shows the predictive relationships by course.

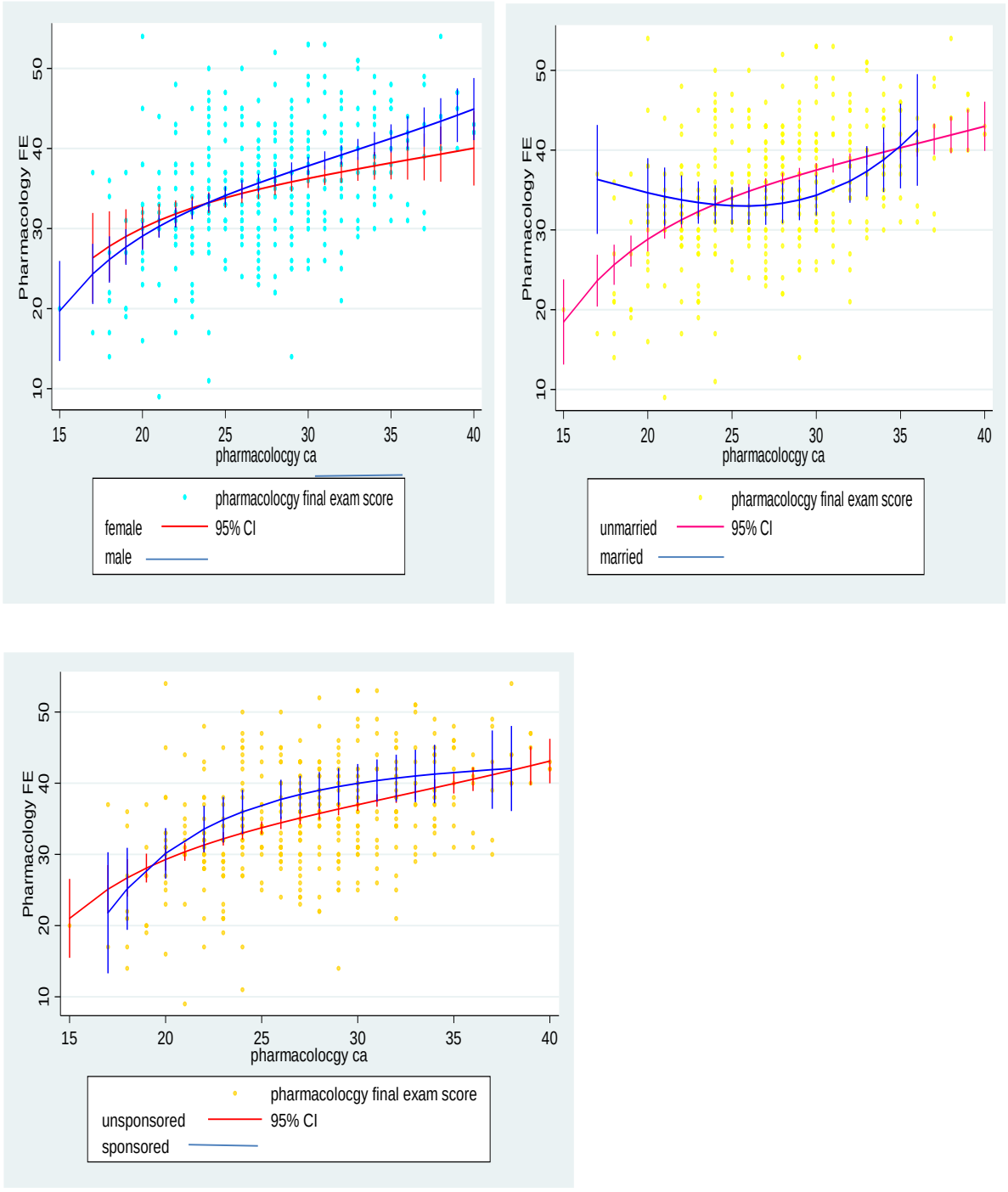


Figure 0.23: Predictive Model of Course Specific Third-Year Pharmacology CA score as a Predictor of Pharmacology FE score given Sex, Marital Status and Sponsorship are Constant

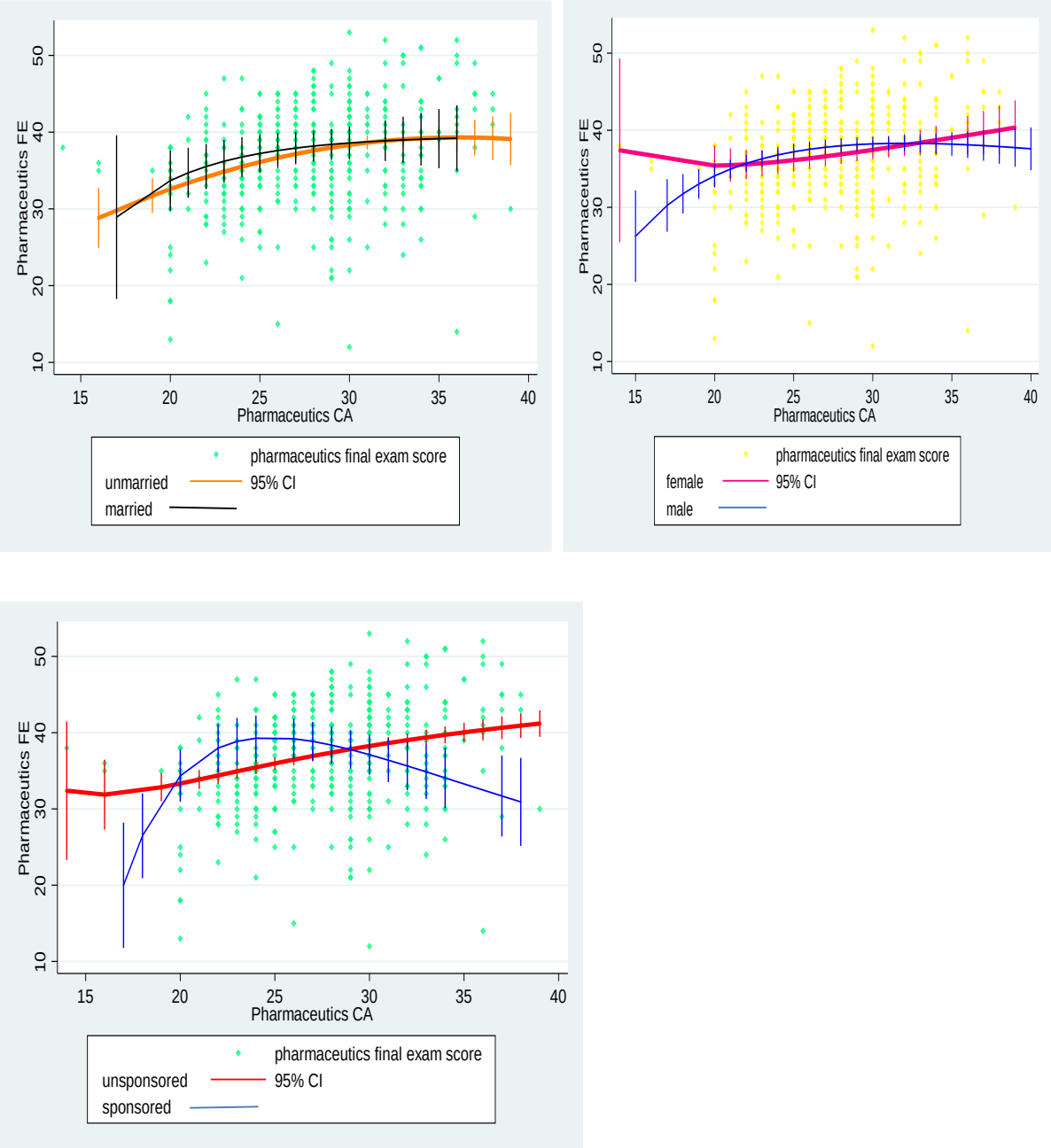


Figure 0.24: Predictive Model of Course Specific Third-Year Pharmaceutics CA Score as a Predictor of Pharmaceutics FE score given Sex, Marital Status and Sponsorship are Constant

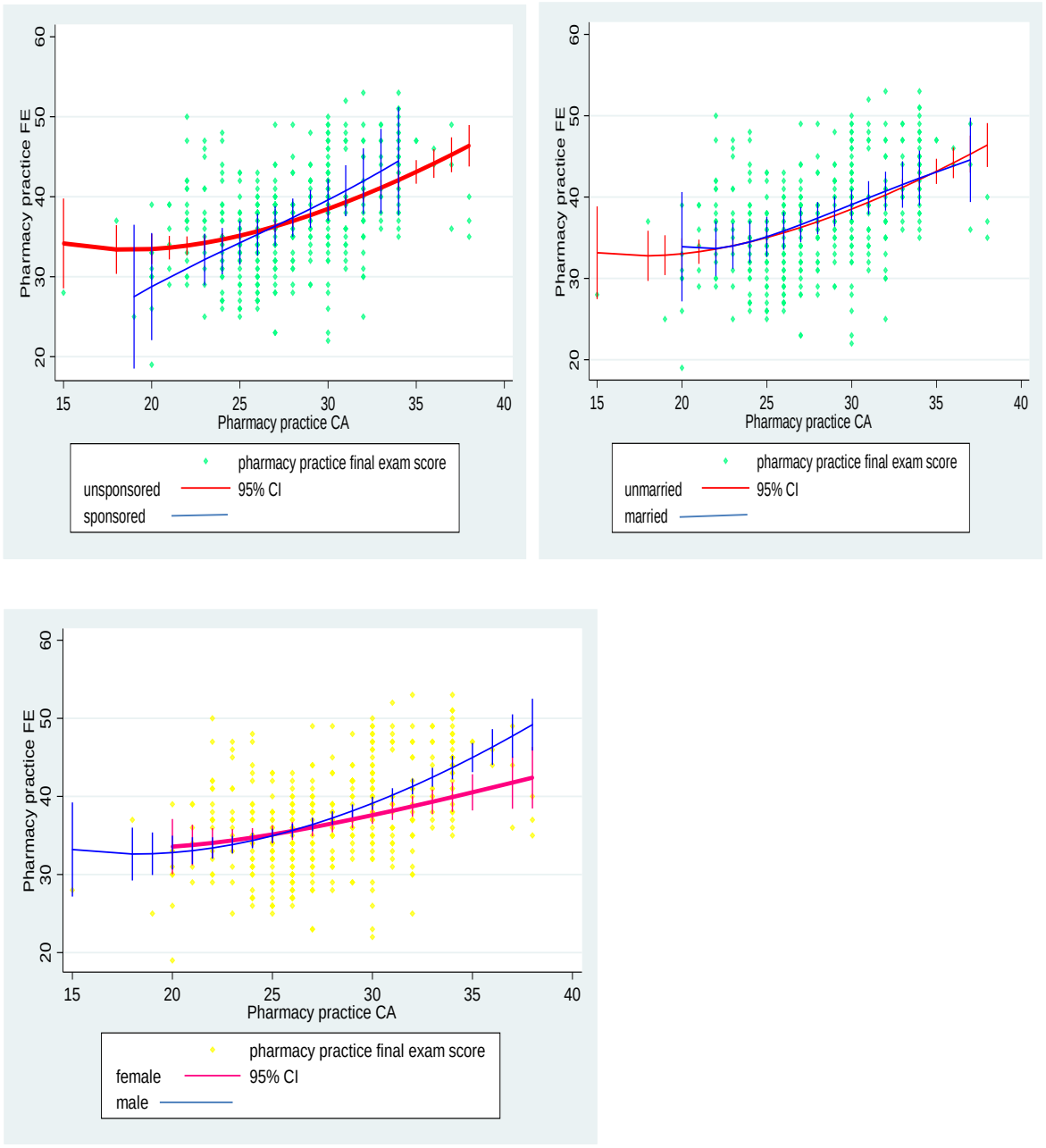
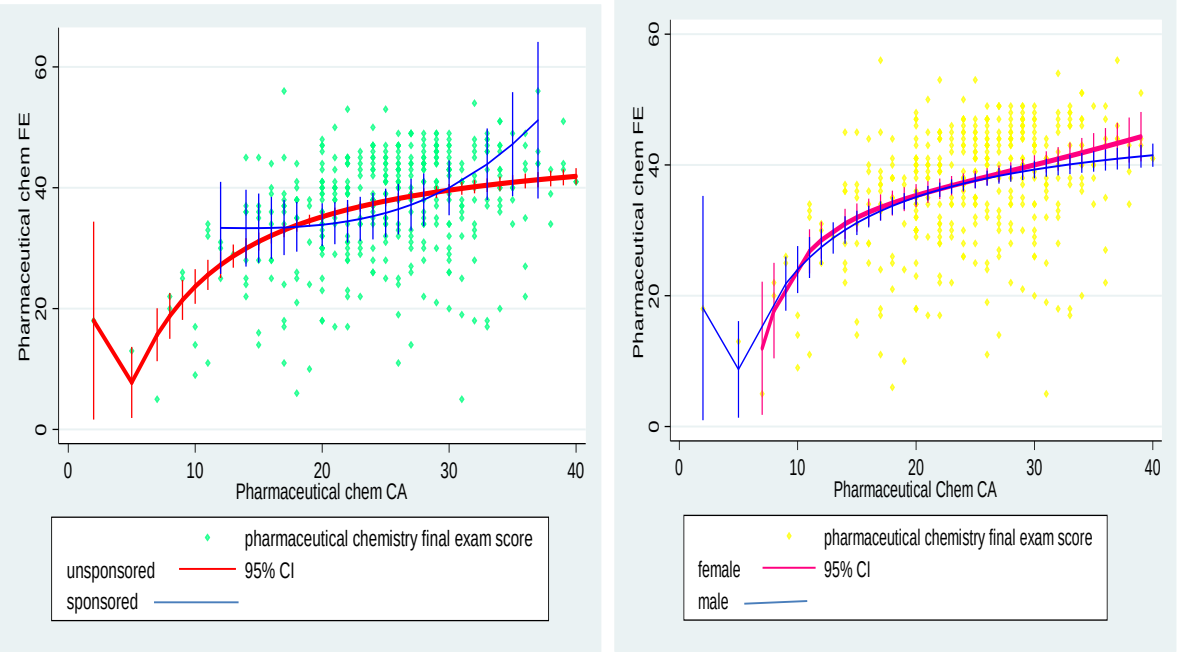


Figure 0.25: Predictive Model of Course Specific Third-Year Pharmacy Practice CA Score as a Predictor of Pharmacy Practice FE Score given Sex, Marital Status and Sponsorship are Constant



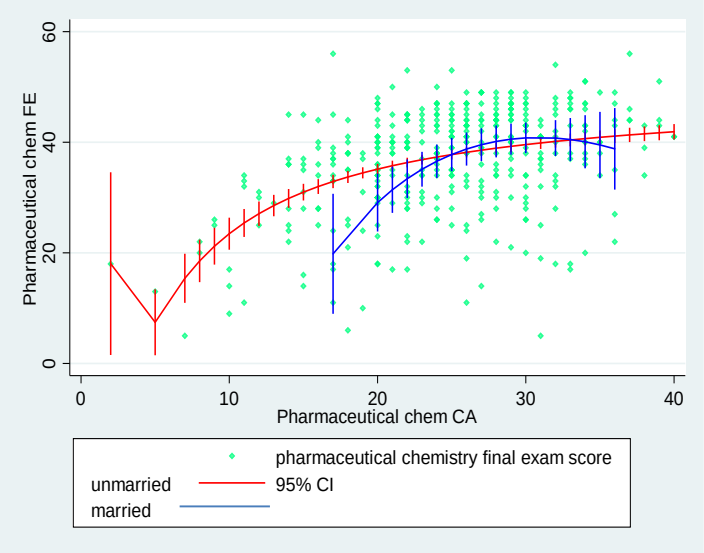


Figure 0.26: Predictive Model of Course Specific Third-Year Pharmaceutical Chemistry CA Score as a Predictor of Pharmaceutical Chemistry FE score given Sex, Marital Status and Sponsorship are Constant

In the fourth-year models, statistically significant model fits were obtained with Pharmacology adjusted R^2=0.21 (F=10.0, p<0.001), Pharmaceutics adjusted R^2=0.08 F=3.39, p<0.001), Bio Pharmacy adjusted R^2=0.50 (F=36.78, p<0.001), Medicinal Chemistry adjusted R^2=0.19 (F=8.27, p<0.001) as shown in Table 4.29 below.

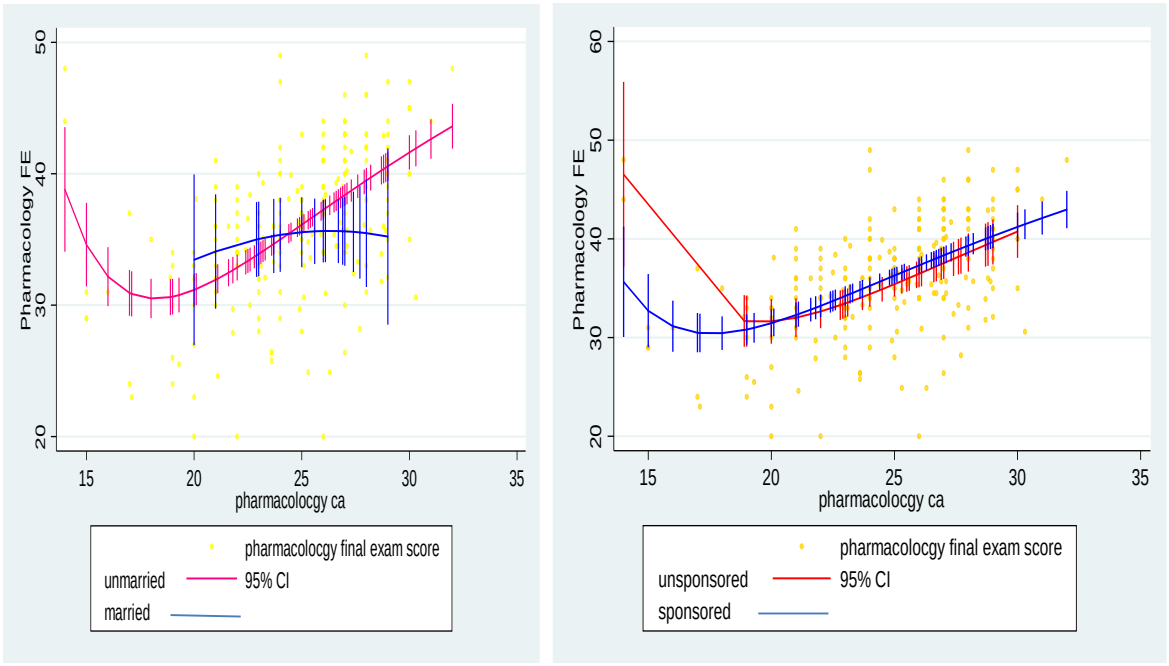
Additionally, partial effect plots were constructed in order to estimate the relationship of the course specific CA score on the respective FE score given sex, marital status, sponsorship are

constant. The graphs were produced in order to estimate or predict the outcome variable based on the course specific CA score as a predictor upon successful running of multiple regressions. Figures 4.27, 4.28, 4.29 and 4.30 shows the predictive relationships by course.

Table 0.26: Adjusted Multivariate Regression Models for Fourth-Year CA Score as a Predictor of Course Specific FE Score

	B	**95% CI**	**P value**
Pharmacology FE score			
Married	-1.54	-4.90 to 1.82	0.369
Male	-0.82	-2.34 to 0.69	0.285
Age	0.13	-0.16 to 0.42	0.386
Sponsored	0.53	-1.37 to 2.44	0.582
Level of entry into University	-0.80	-3.71 to 2.10	0.586
Pharmacology CA score	0.74	0.54 to 0.94	0.000*
Pharmaceutics FE score			
Married	0.28	-3.42 to 3.99	0.880
Male	0.50	-1.19 to 2.18	0.560
Age	-0.05	-0.37 to 0.28	0.770
Sponsored	0.09	-2.02 to 2.20	0.933
Level of entry into University	2.18	-1.02 to 5.37	0.181
Pharmaceutics CA score	0.47	0.24 to 0.70	0.000*
Bio Pharmacy FE score			
Married	-2.28	-5.66 to 1.10	0.185
Male	-0.23	-1.76 to 1.30	0.771
Age	-0.003	-0.30 to 0.29	0.985
Sponsored	-2.07	-3.40 to -0.14	0.036*
Level of entry into University	-0.59	-3.49 to 2.32	0.691
Bio Pharmacy CA score	1.06	0.92 to 1.21	0.000*
Medicinal chemistry FE score			
Married	0.21	-3.60 to 4.02	0.912
Male	0.03	-1.68 to 1.74	0.968
Age	0.27	-0.06 to 0.61	0.104
Sponsored	0.34	-1.80 to 2.48	0.754
Level of entry into University	-1.48	-4.74 to 1.79	0.374
Medicinal Chemistry CA score	0.64	0.45 to 0.82	0.000*

CA is Continuous Assessment; FE is Final Examination
Pharmacology adjusted R^2=0.21, F=10.0, p<0.001; Pharmaceutics adjusted R^2=0.08, F=3.39, p<0.001; Bio Pharmacy adjusted R^2=0.50, F=36.78, p<0.001; Medicinal Chemistry adjusted R^2=0.19, F=8.27, p<0.001.
**p<0.05 significant values different from reference category adjusted for explanatory variables marital status, sex, age and sponsorship.*



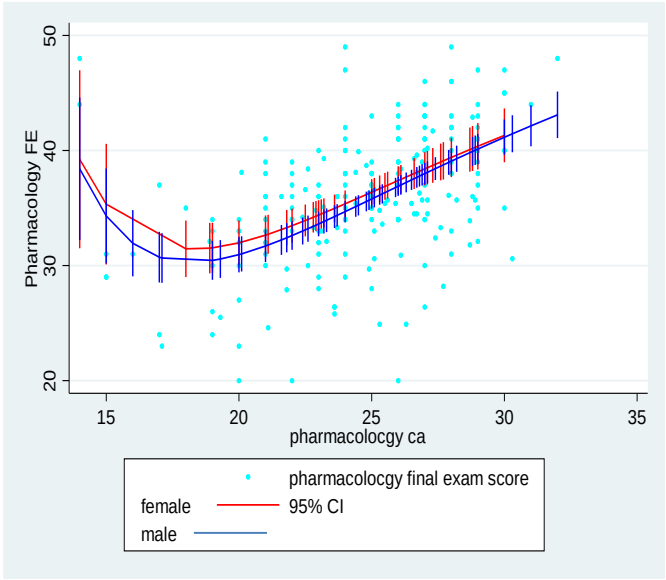
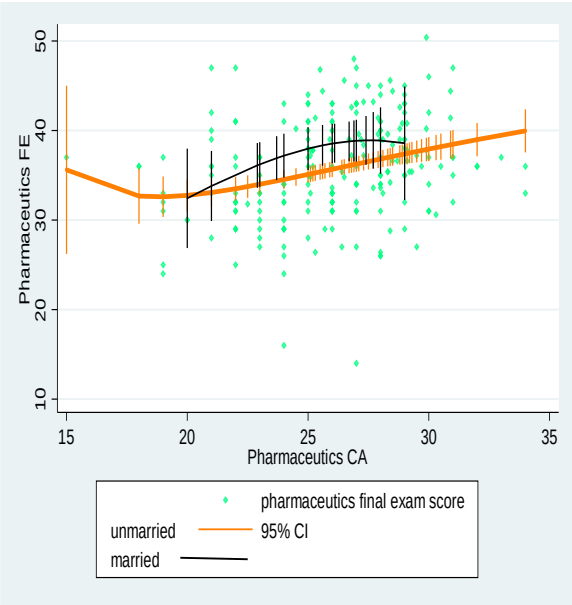
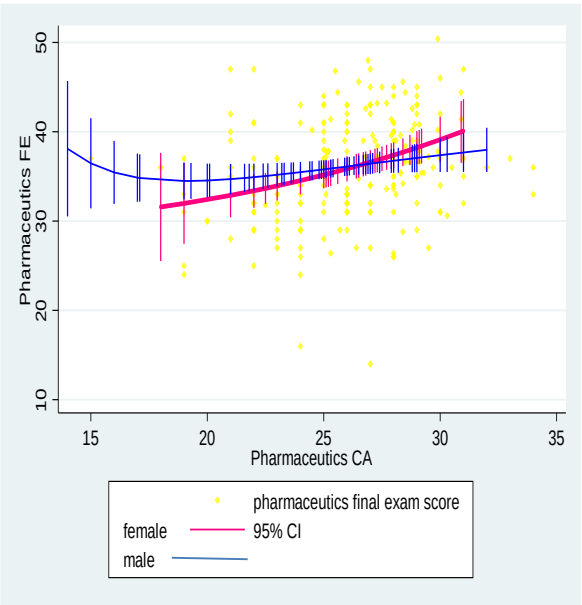


Figure 0.27: Predictive Model of Course-Specific Fourth-Year Pharmacology CA Score as a Predictor of Pharmaceutical Chemistry FE Score given Sex, Marital Status and Sponsorship are constant





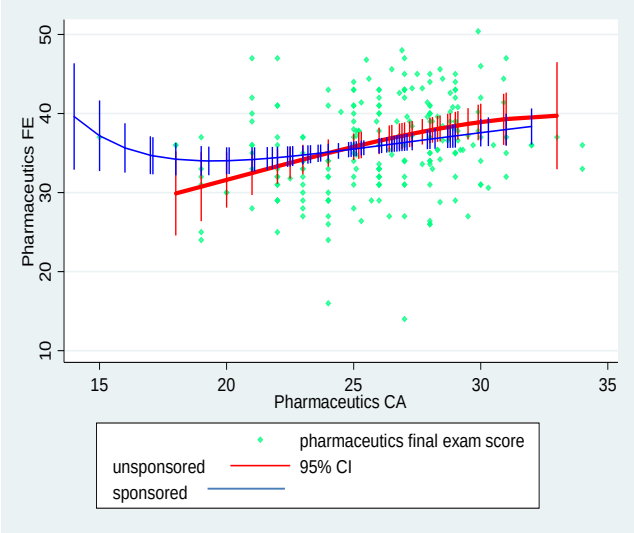


Figure 0.28: Predictive Model of Course Specific Fourth-Year Pharmaceutical Chemistry CA Score as a Predictor of Pharmaceutical Chemistry FE Score given Sex, Marital Status and Sponsorship are Constant

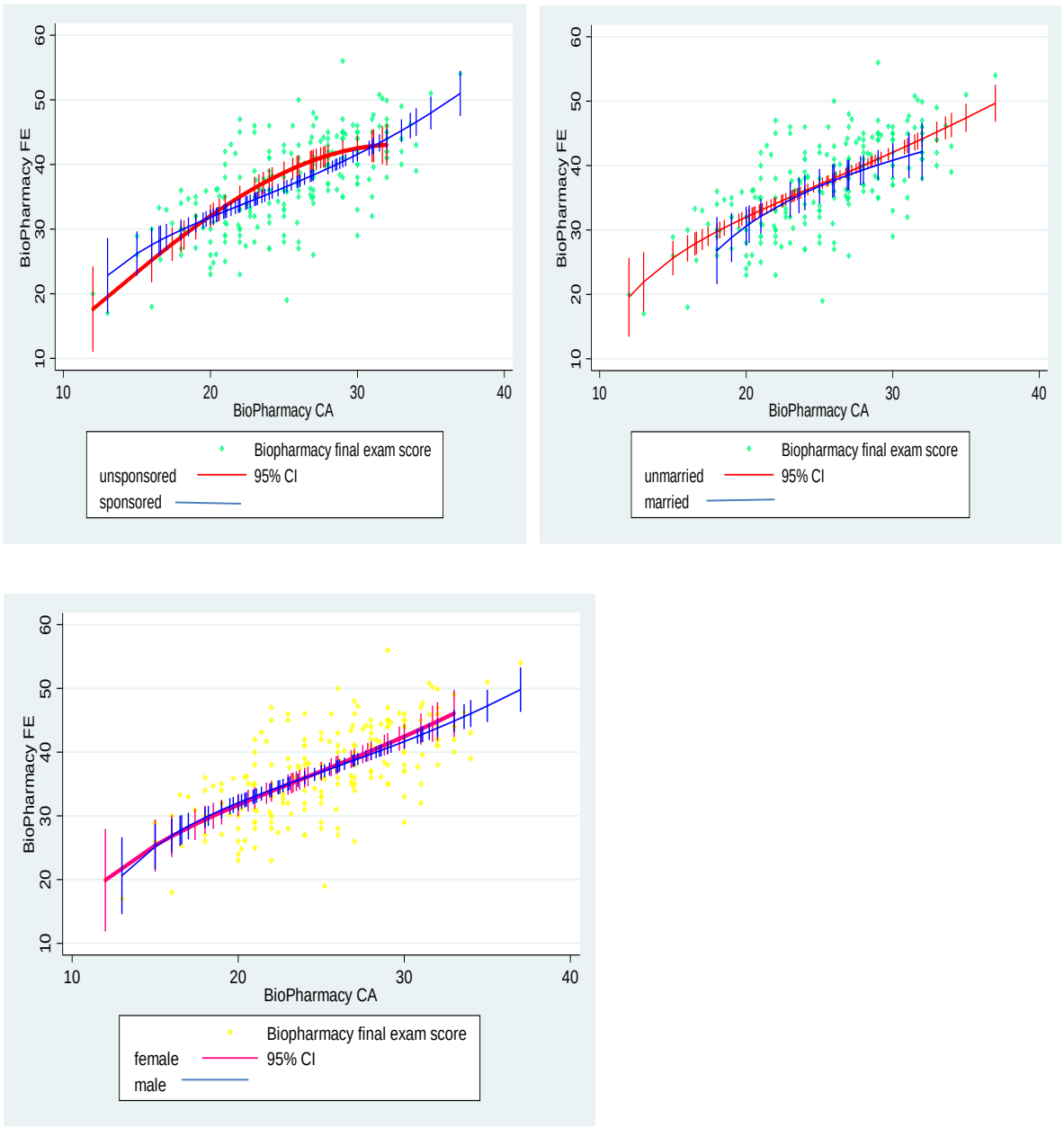


Figure 0.29: Predictive Model of Course Specific Fourth-Year Bio Pharmacy CA score as a Predictor of Bio Pharmacy FE Score given Sex, Marital Status and Sponsorship are Constant

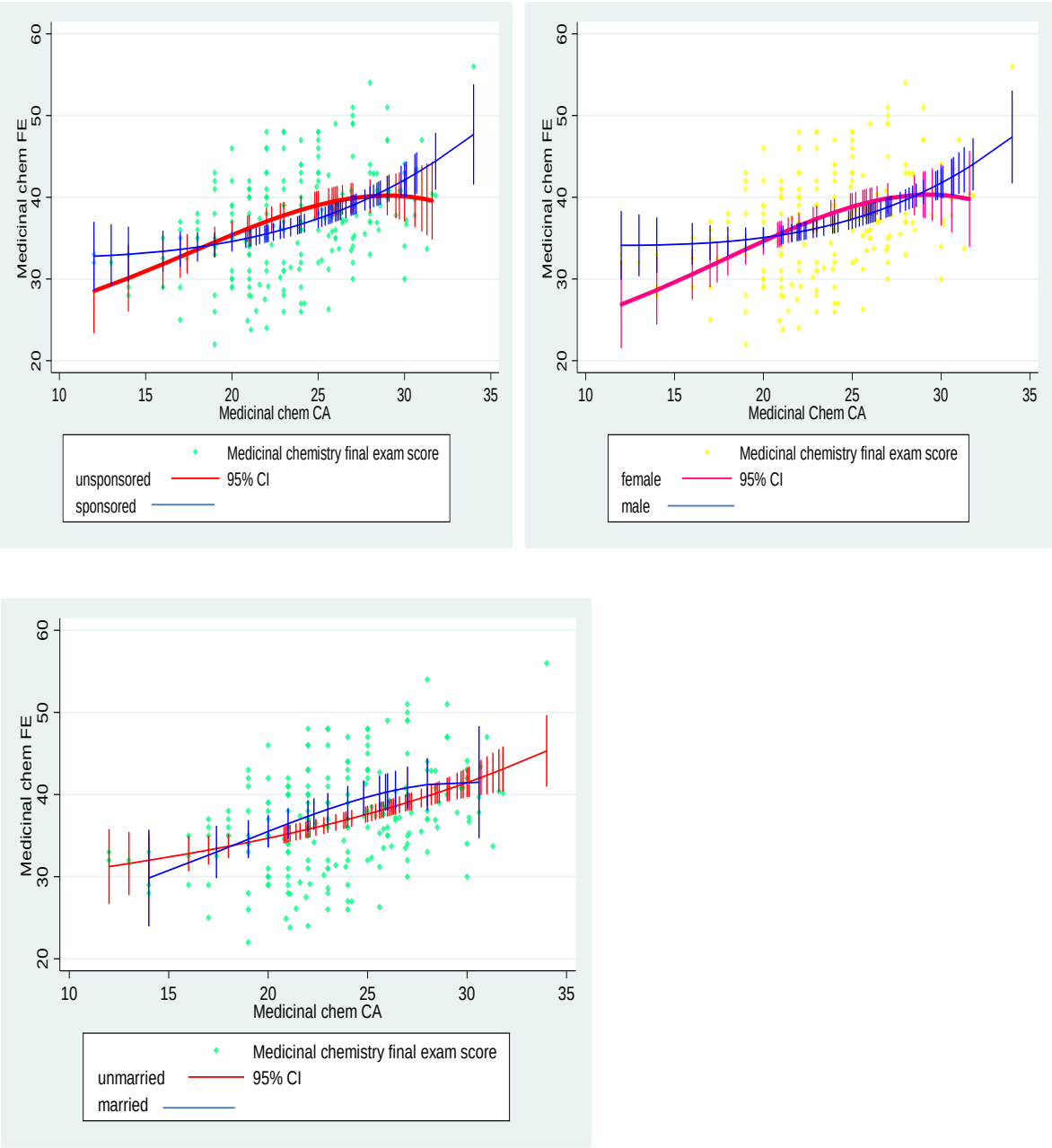


Figure 0.30: Predictive Model of Course Specific Fourth-Year Medicinal Chemistry CA Score as a Predictor of Medicinal Chemistry FE Score given Sex, Marital Status and Sponsorship are Constant

Similarly, in the fifth-year models, statistically significant but weak model fits were obtained with Pharmacology adjusted R^2=0.25, F=11.89, p<0.001; Clinical Pharmacy adjusted

R^2=0.19, F=8.29, p<0.001; Pharmacy Practice adjusted R^2=0.20, F=8.72, p<0.001 as shown in Table 4.27 below.

Furthermore, partial effect plots were constructed in order to approximate the relationship of the course specific CA score on the respective FE score given sex, marital status, sponsorship are constant. The following graphs were produced to estimate the outcome variable based on the course specific CA score as a predictor upon successful running of multiple regressions as shown in the Table 4.27 below. Figures 4.31, 4.32 and 4.33 shows the predictive relationships by course.

Table 0.27: Adjusted Multivariate Regression Models for Fifth-Year CA Score as a Predictor of Course Specific FE Score

	B	**95% CI**	**P value**
Pharmacology FE score			
Married	-0.20	-2.62 to 2.22	0.870
Male	-0.15	-1.30 to 1.00	0.800
Age	-0.13	-0.43 to 0.15	0.364
Sponsored	-0.43	-1.71 to 0.85	0.511
Level of entry into University	2.18	0.01 to 4.35	0.049*
Pharmacology CA score	0.75	0.56 to 0.93	0.000*
Clinical Pharmacy FE score			
Married	-2.15	-1.16 to -0.42	0.036*
Male	0.13	-0.85 to 1.10	0.799
Age	0.12	-0.12 to 0.36	0.340
Sponsored	0.48	-0.60 to 1.56	0.379
Level of entry into University	0.42	-1.41 to 2.25	0.653
Clinical Pharmacy CA score	0.46	0.32 to 0.60	0.000*
Pharmacy Practice FE score			
Married	1.75	-1.75 to 5.26	0.324
Male	0.28	-1.41 to 1.98	0.742
Age	-0.20	-0.62 to 0.22	0.342
Sponsored	0.27	-1.60 to 2.15	0.774
Level of entry into University	2.02	-1.17 to 5.20	0.213
Pharmacy Practice CA score	0.86	0.61 to 1.10	0.000*

CA is Continuous Assessment; FE is Final Examination
Pharmacology adjusted R^2=0.25, F=11.89, p<0.001; Clinical Pharmacy adjusted R^2=0.19, F=8.29, p<0.001; Pharmacy Practice adjusted R^2=0.20, F=8.72, p<0.001.
**p<0.05 significant values different from reference category adjusted for explanatory variables marital status, sex, age and sponsorship.*

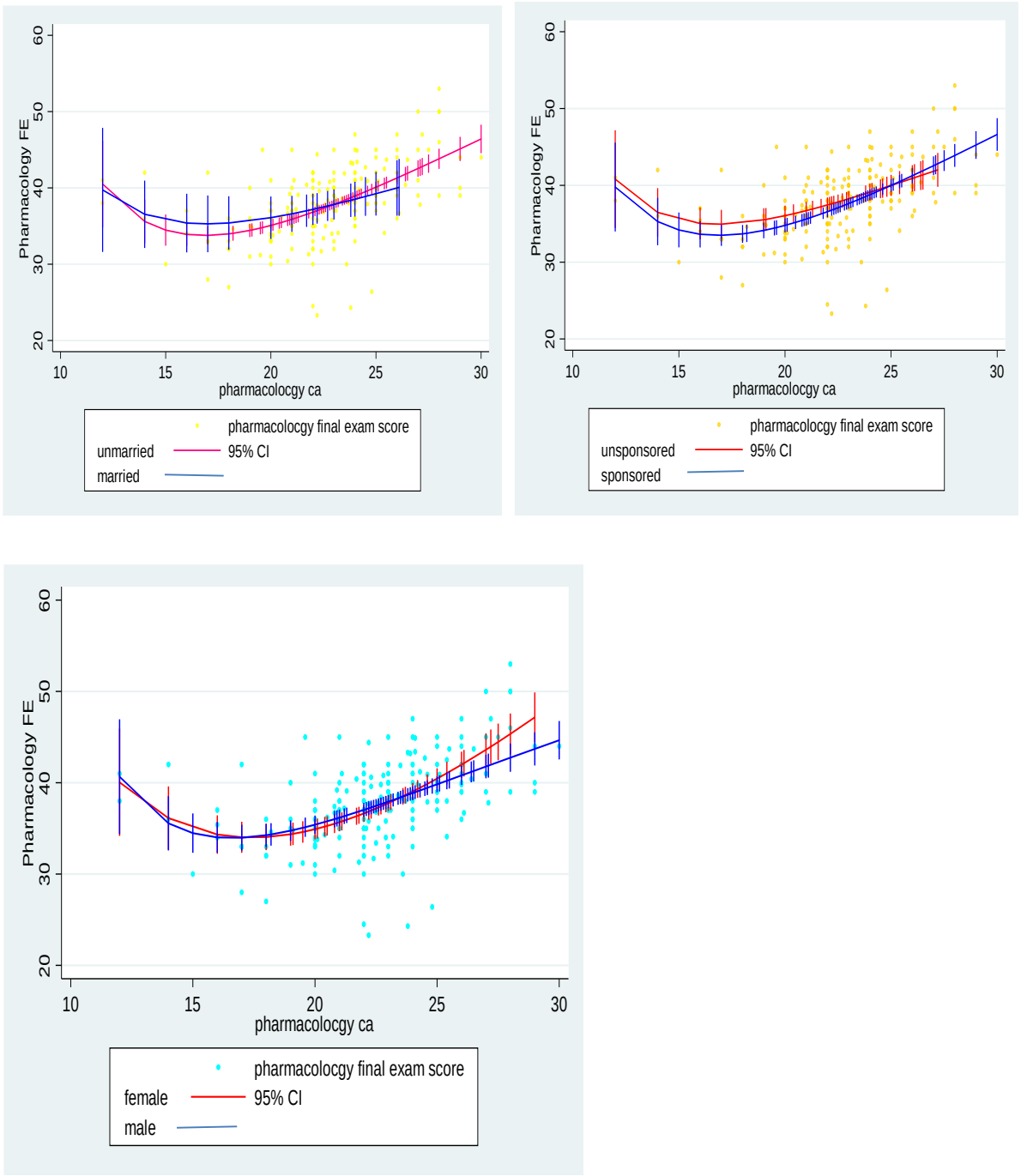
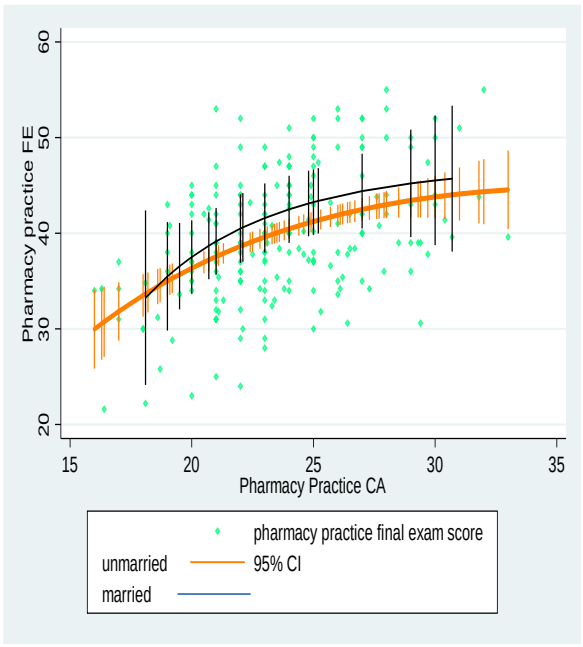
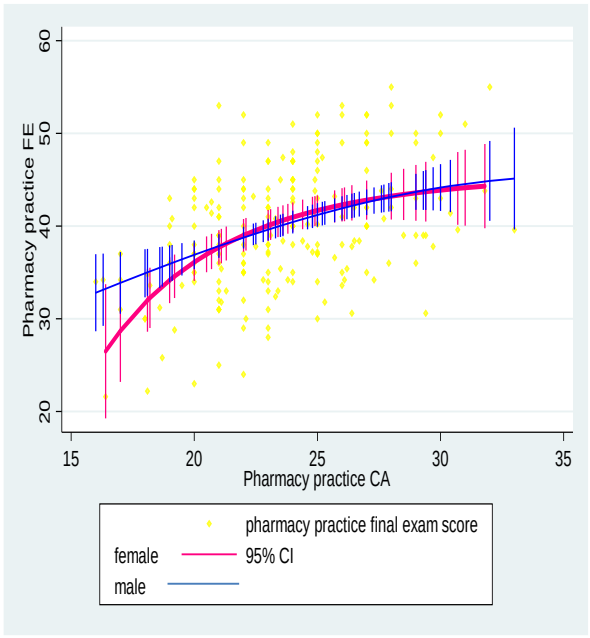


Figure 0.31: Predictive Model of Course Specific Fifth-Year Pharmacology CA Score as a Predictor of Pharmacology FE Score given Sex, Marital Status and Sponsorship are Constant





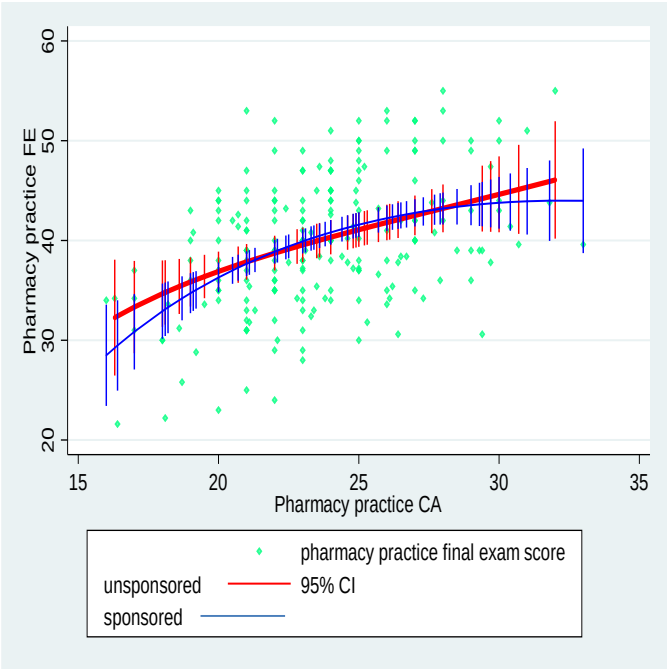


Figure 0.32: Predictive Model of Course Specific Fifth-Year Pharmacy Practice CA Score as a Predictor of Pharmacy Practice FE Score given Sex, Marital Status and Sponsorship are Constant

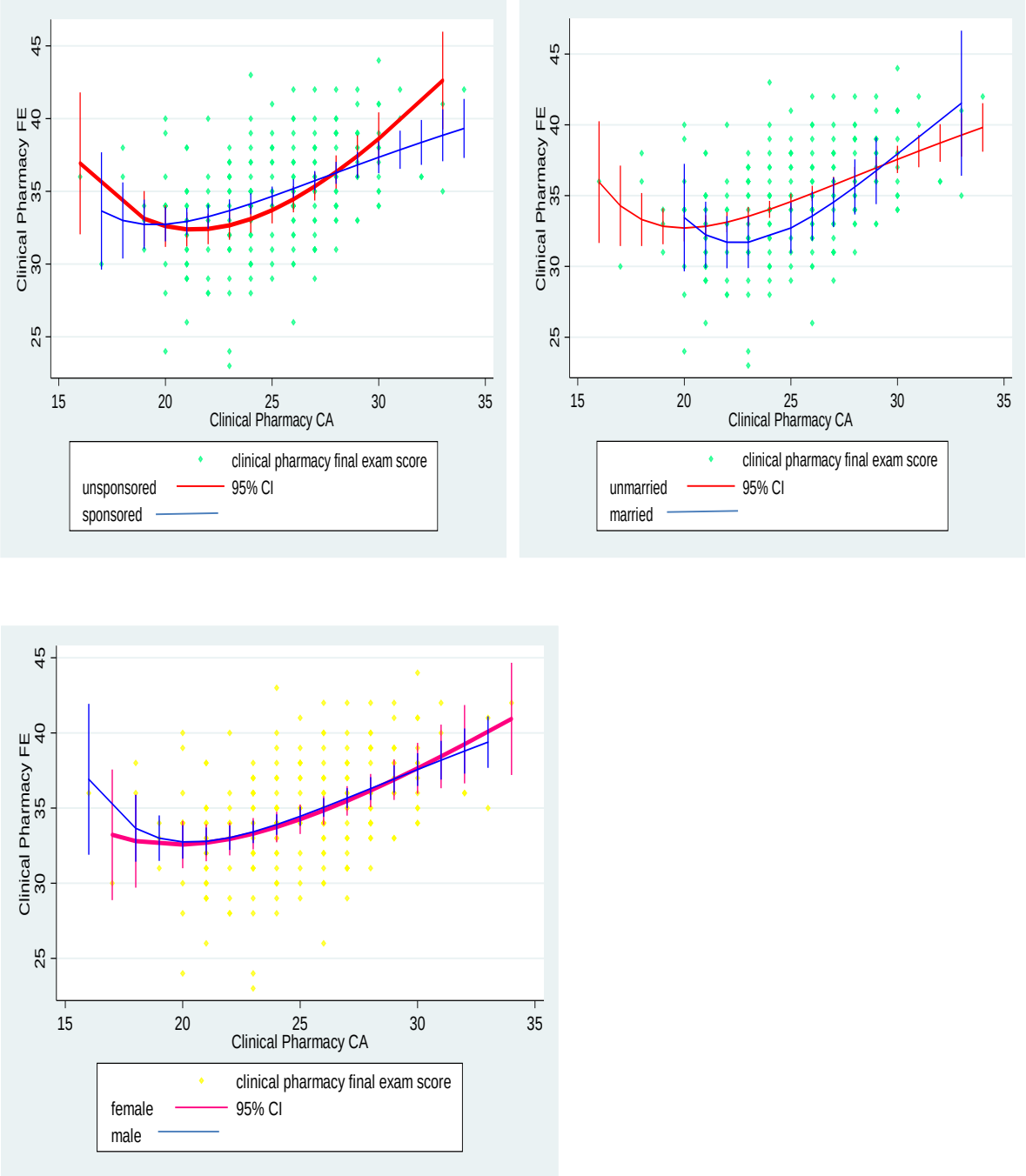


Figure 0.33: Predictive Model of Course Specific Fifth-Year Clinical Pharmacy CA Score as a Predictor of Clinical Pharmacy FE Score given Sex, Marital Status and Sponsorship are Constant

4.2.6 Summary of the Quantitative Results

There was a statistically significant positive correlation between course-specific CA scores and the FE scores as well as the GPA scores across all the courses examined. The surprising finding

after further analysis was that the median GPA scores observed in the study were below the University of Zambia School of Medicine acceptable GPA score of 2.5. There was also observed, a significant difference between the course-specific mean CA scores and the respective FE scores. Multiple linear and logistic regression revealed that the CA score had predictive validity on the FE score, GPA and pass or fail assessment outcomes. Additionally, examinees, whose CA score was (Less than) <20 demonstrated capabilities of passing in all the courses examined.

4.3 QUALITATIVE RESULTS

4.3.1 Introduction

This section presents results and findings from the three (3) FGDs conducted with the pharmacy examinees and examiners based on the interview guide that was developed in response to objective number three of the study. The objective was exploring the perceptions and experiences of the examinees and examiners regarding the current examination policy and practices. A FGD was conducted with the third-year pharmacy students at EHC and the other with a combined fourth- and fifth-year pharmacy students at UNZA. EHC pharmacy diploma program is affiliated to the UNZASHS and thus, has all examination policies and practices in line with the UNZA. As highlighted above, UNZA oversees the examination processes of the pharmacy diploma program as a result of the affiliation status. The study, therefore, sought to explore the experiences and perceptions of the examinees at the two institutions. The examinees FGDs results are presented first followed by the examiners interrogating their perceptions and experiences regarding the current examination and assessment policy.

4.3.2 Demographic Characteristics

Two FGDs were conducted with the third-year EHC students and fourth- and fifth-year students at UNZA using a structured interview guide that was developed. The focus group

discussion comprised of about 10 participants each with an equal mix in sex distribution. The participants' ages ranged from 21 to 26 years and the other related participant's characteristics are summarised in Table 4,28 below.

Table 0.28: Demographic Characteristics of the Examinees FGDs at the two Institutions

Variable		**EHC**	**UNZA (4th and 5th Years)**
Sex	Male	5	5
	Female	5	5
Marital status	Married	2	1
	Unmarried	8	9
Sponsorship	Sponsored	2	7
	Not sponsored	8	3
Level of entry	Year 1	10	9
	Year 3	0	1
Age Range (years)		21 to 24	22 to 26

4.3.3 Examinees Perceptions and Experiences on the Examination Policy

The themes were designed to capture the tenets of an effective assessment policy as illustrated in Figure 4.34 below. The focus group interview guide for the examinees had five key discussion points including: Awareness and Implications of the assessment policy, Strengths and weaknesses, Feedback on assessments and justification of Pass or Fail decisions, Opinion on supplementary examinations, Factors affecting performance in assessments. The discussions were hinged around these key areas whilst allowing the participants to express their understanding, familiarities and views of the current University of Zambia assessment policy.

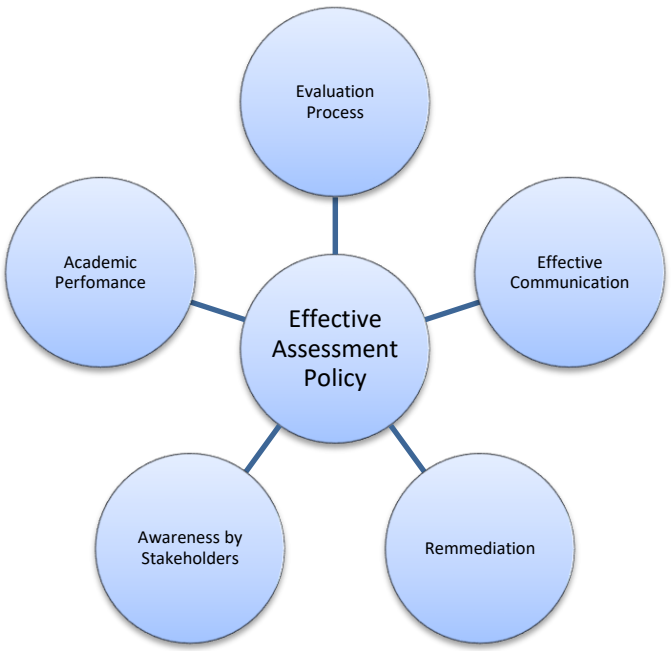


Figure 0.34: Conception of Themes

4.3.3.1 Awareness and Implications of the Examinations Policy at Training Institutions (Theme 1)

Examination of the data revealed that the participants from both FGDs (FGD 1 = EHC and FGD 2 = UNZA) were aware about the existence and enforcement of the examination policy in the respective training institutions. The participants were all in agreement regards the policy and did indicate that they had to take a number of assessments types such as written tests, individual assignments and practicals as a way of contribution to the CA score which is calculated out of 40. They also indicated that the examination policy was clear on the allocation of the marks on a continuum of 0 to 100. This implied that the CA was allocated 0 to 40 marks while the FE score was allocated 0 to 60 marks and an individual student required to pass both the CA and FE in order to progress in their studies. One participant explained how she understood the policy:

"I know that I have to pass the CA by at least 20 marks out of 40 since this gives me a better chance to pass the final examination also which is out of 60 marks in any particular course.

So I have to work hard in my school and I have also heard that I need to attend at least 80 % of the scheduled lessons for me to be allowed to sit the final exam, but I don't know how this is implemented here" ***FGD 1 - Participant 10***

The data also revealed that the students had not been officially communicated to regarding the detail of the entire assessment policy and the implications thereafter. The examinees were in agreement that there was need to be sure of the policy document so that the students are aware of the exact content and implications of either failing or passing the CA. Eventually, it was agreed that assessment policies are very critical in any academic environment as a number of high stakes decisions are made in reference to the aforementioned. Thus, effective communication and enforcement of such policies is cardinal and cannot be ignored by the key stakeholders, especially if quality assurance is to be attained. One participant had this to say:

"I really do not understand the impact of this policy because I have seen other students being allowed to sit the final examination even when they have a failed CA score of less than 20. Nevertheless, I feel it's necessary to have a policy so that we as students are also guided during the course of our learning processes" ***FGD 1, Participant 5***

4.3.3.2 Interrogation of the Strengths and weaknesses of the Policy (Theme 2)

Examination of the data concerning the strengths and weaknesses of the policy as perceived and experienced by the examinees, was generally agreed that the policy was good and that it helps the student to prepare for the examination especially if they performed poorly during the course of the academic year. Among the strengths that were mentioned and identified by the participants include:

"Generally, helps you to prepare for the examination while trying to applying equal effort in all the courses" ***FGD 1, participant 6****.*

"It motivates you to study extra hard so that you attain the 50 % pass mark" ***FGD 2, Participant 5.***

"Adjustments are made during studies to ensure that the poorly performed course is attended to and ultimately. Pressure mounts to address the weaker course" ***FGD 2, participant 3.***

When asked about the weaknesses concerning the assessment policy, the following highlights were realised:

"The policy is not fair as the bigger allocation of 60 is given to the final examination score, so why should I be denied an opportunity to sit the final examination when I have 60 marks to work with and the pass mark here (UNZA) is 50 marks out of 100 marks, no no.., that's not good…., because who knows, maybe I can still clear the exam even with a failed or low CA" ***FGDs 2, Participant 1.***

"Only a few lecturers talk about it and even emphasise the policy itself, so if maybe all the lecturers can be talking about it and emphasising on it, maybe the implementation and awareness was going to be different from now" ***FGD 1, Participant*** *3.*

The above experiences and perceptions are of prominence realising that assessment policies are meant to guide high stakes decisions, especially in tertiary level educational settings. Leaving room for examinees to uncertainty in the assessment policies existence and its implications tends to affect the quality of assessments in general.

4.3.6 Feedback on CA Scores (Theme 3)

Timely feedback on assessment outcomes is very important and contributes to the general achievement of quality assessment, especially in health training institutions. Examination of the data concerning lecturers giving feedback to the examinees, was found to be poor feedback given in terms of the quality, timing after assessment and the nature of communication. It was

also found that Lecturers, in general, did not have a plan or did not share the assessment plan to the examinees in order for them to plan as such. Some participants had this to say:

"Feedback on assessments is generally poor because we sometimes go to write the final examination without knowing the CA scores. This not fair for me because it affects how I perform during the study break and also in the examination room" ***FGD 2, Participant 4.***

*"Lecturers seem not to plan for the assessments especially in view of the course load were we have to study and pass all the core courses. So like this, it very difficult to study and plan for all the tests given by all the lecturers sometimes at the same time. It like they also don't have departmental meetings to allocate themselves dates for these tests and assignments. It is not fair…. In fact, here, only one lecturer does provide the communication for his tests and assignments and as a student, you are aware from the start of the academic year when you expect the assessments****" FGD 1, Participant 9****.*

*"For me communication is very important and notice on the timings for the assessment is also key. but in this institutions, you hear this lecturer calling for a test, and the next and the next and so pressure mounts at the same time and that affects the study mode and learning to some extent****" FGD 1, Participant 7****.*

"The feedback we get from CAs will normally just be figures such as 6/10. Or 70%. It is not detailed to a point where you as a student knows exactly what went wrong in the test or assignment for you not to get 100%. So I think that they (Lectures) must detail the feedback so that you don't make the same mistake during the final examination" ***FGD 2, Participant 11****.*

Quality and timely feedback on assessment in higher training institutions cannot be over emphasised.

4.3.7 Perceptions and Experiences on Supplementary Examinations (Theme 4)

According to the assessment policy, supplementary examinations are those given to candidates that fail the initial final examination by an aggregated score of between 45% and 49% in at least one or two courses provided the CA was passed i.e. >20 % and above. The participants were all for the idea that this provision in the policy was welcome. They were all in agreement that given a number of unforeseen circumstances, such as: academic pressure and increased workload, bad marking practices by examiners, sicknesses and funerals among other reasons, supplementary examinations give an opportunity for examinees who might not have performed well to re-sit and prove themselves. It was also agreed that the CA score tends to affect the examinees performance during the final examination. The higher the CA score, the less the study effort in the final examination and vice versa. Some of the participants had this to say;

"When my CA is high say above 30%, I know that for me to be able to pass this course, it does not have to take so many marks compared to course where I have a poor CA score. This means that I will put more effort in the course that I did not perform well so that I ensure that I pass the examination" ***FGD 2, Participant 2***.

"For me…, the CAs scores motivate me to get better grades, and so I ensure that for all the courses, I put in my very best so that I graduate with a merit or even distinction. So I regard CAs as a motivation to getting good grades" ***FGD 1, Participant 8***.

It is thus agreeable by the participants from both FGDs that based on their experiences, the supplementary examination policy aspect is acceptable in an academic and higher training institution.

4.3.8 Experiences on the Factors Affecting Academic Performance (Theme 5)

There are a variety of reasons that literature has demonstrated about factors affecting academic performance in higher training institutions. This inquiry was meant to highlight some of the

experiences faced by the participants regarding factors that affected their performance in assessments in general. The factors were abridged as follows:

- Poor communication of the academic calendar and assessment dates.
- Little or no study breaks given and ultimately not enough time to prepare for the examination.
- High student to Lecturer ratio which results in poor individual student attention.
- Methods of assessment used sometimes do not match with competency being assessed for.
- Financial support or sponsorship was also cited as a factor that may affect academic performance.
- Failure to communicate course outlines and content by the lecturers does affect preparation and performance by students.
- High course load was also cited as one of the factors.
- Lecturer's poor teaching skills and attitudes.
- Marriage was cited as a contributor to poor academic performance.

On examination of the data, the factors affecting academic performance in higher training institutions were as highlighted above. Some of the participants during the discussions had this to say:

"*My performance during examinations is affected by the way the tests are set and prepared by our lecturers. Some of them like to prepare and repeat Multiple Choice Questions (MCQs) which are sometimes not nicely phrased and so, I am just made to memorise old past papers. My aim is just to pass the examination and sometimes end up not having learnt anything in some courses…"* ***FGD 2, Participant 6***

"I sometimes admire my friends who are sponsored by the government and other sponsors. It relieves the pressure of thinking about where the tuitions fees are going to come from for this semester and next. So think that someone who is sponsored should be able to perform better academically than someone not sponsored. But again, I have seen that because of the painful process that your parents go through to raise your tuition fees, you are forced to study extra hard and ultimately do better than the ones who sponsored. So, I think it's a two-way kind of thing" ***FGD 2, Participant 1***.

"Some of our lecturers don't communicate to us the course content of the courses they teach us, so you find that your caught unaware of the topics and also the times for the tests. Others will just tell you that we are having a test tomorrow morning without giving you ample time to study and prepare for the examination. I think that an organised system of communication of the material to be taught and the dates for all the activities relating to our education is very important" ***FGD 1, Participant 9***.

Students' academic performance in higher training institutions is affected by a variety of factors which may need to be considered in the development of assessment policies. This is important because assessment decisions in higher training institutions are high stakes and thus should be evidence based and aligned to best practices.

4.4: Perception and Experiences of the Examiners

The focus group interview guide for the examiners had three key discussion points including: awareness and implications of the assessment policy, Strengths and weaknesses, Feedback on assessments and justification of pass/ fail decisions. The discussions were hinged around these key areas whilst allowing the participants express their understanding, familiarities and views of the current University of Zambia assessment policy. An explanation and description of the

participant's demographic characteristics as well as the emerging themes based on the focus group discussion guide are outlined below.

4.4.1 Demographic Characteristics

One FGD was conducted based on the interview guide developed for the examiners from both the EHC and UNZASOHS. The FGD comprised of eleven (11) participants (7 males and 4 female). The participants' ages ranged from 35 to 46 years with a duration of practice in the academe at less than ten (10) years. The largest class size the participants have handled was up to 150 students in one sitting. The thematic areas are presented based on the analysis done while a narrative of the findings is also provided.

4.4.2 Awareness and Implications of the Examinations Policy at Training Institutions (Theme 1)

Examination of the data revealed that the participants were aware of the existence and implementation of the examination policy in the respective training institutions. The participants were all in agreement regarding the policy dictates and they did indicate that student numbers were among the reasons implementation was a challenge. Participants also mentioned that the CA policy in general is such that, a student was required to pass the CAs by a score of 20 and above out of 40 while the final examination is allocated a score of 60. A number of assessment methods were being used to cumulatively assign a score depending on the performance of the individual student. Assessment methods that examiners use include written tests, viva voce, practical and written assignments as a way of contribution to the CA score calculated out of 40%. They also indicated that the examination policy was clear on the allocation of the marks on a continuum of 0 to 100%.

4.4.3 Weaknesses and Strengths of the Examination Policy (Theme 2)

Regarding the examiners perceptions on the weaknesses and strengths of the policy, it was agreed that the policy allows educators to monitor student learning process and also get and give feedback to understand further areas of emphasis provided they are scheduled regularly. It was further discussed and agreed that effective implementation of the policy was a challenge due to different circumstances such as student numbers and lecturer workload.

Examiners also did indicate that the CA scores had an implication on the approaches to teaching and learning by the learners. This was so based on the fact that depending on the CA scores, an educator had an opportunity to give the necessary feedback to the students and sometimes lead to the educator changing their teaching and facilitation of learning approaches and methods. Some interesting reactions from participants include:

"The CA tests and assignments that we give to our students do help us get the necessary feedback based on how they perform. Those that do poorly can be accorded an opportunity to get more information and you as a lecturer can actually help such students to ensure they do the best. The only challenge that comes with our system is the huge student to lecturer ratio making it difficult for us to sometimes individualise students learning. At the end of the day, it also gives you as lecturer time to identify areas of weaknesses and strengths for your students and then work on them by way of changing maybe the way you approach the teaching and maybe give more practical scenarios for the slow learners to catch up" ***Participant 5***.

Regarding emphasis of CA policy during instruction and teaching, it was discussed and agreed that this is dependent on the lecturer themselves, since some did while others didn't. Others felt that it was not necessary and fair for a student to be denied to write the final examination especially that any course is rated on a continuum of between 0 to 100%. Some of the participants had this to say:

"I really do emphasize to the students the importance of having to pass the CA as it gives them a better chance of passing the Final examination. I think that it's imperative that all lecturers do this so that students are made aware of this cause" ***Participant 1***.

"I really see no need for a student to be denied entry into the final examination based on him or her having failed the CA. I mean, if a course is rated/ graded on a continuum of between 0 to 100%, then there is no need to make a decision of failing a student based on the CA score. it is better that a composite score is used to make that high stake decision" ***Participant 3***.

4.4.4 Assessment Feedback and Efficiency in Submission of CA Results to Students and Administrators (Theme 3)

In a higher training institution such as UNZA, it is necessary that an efficient and effective feedback system and the mechanism is put in place. Realising this important aspect of assessments, examiners were asked to discuss their experiences and perceptions regarding the current status and policy guidelines surrounding the assessment feedback mechanism.

The results yielded indicated that an implementation system is actually in place but was hardly adhered to, due to a number of various factors. Among the factors that were discussed hindering effective and efficient provision of CA feedback to both the students and administrators include huge Lecturer workload and lecturers to student ratio. Others also did indicate that the traditional hard copy method of CA submission also contributes to the delay in the submission of CA scores to administrators. It was further agreed by the discussants that, in this age and era, the use of Information Communication Technology (ICT) in assessments was the way to go as this has demonstrated efficiency in other universities that have embraced ICT.

Regards CA feedback to students, it was further discussed that due t the large lecturer to student ratio, feedback was not always detailed to enable a student realise their weaknesses and

strengths about the assessment. Other examiners indicated that they did provide group feedback in tutorial sessions other than individually in view of the large student numbers. It was further discussed that even with a high CA score, certain students still couldn't pass the course and therefore, a high or Low CA score was not a guarantee that a student will pass or fail the course respectively. Some of the opinions include;

"This issue of submitting hard copy CA results tends to consume a lot of our time especially when you have a lot of students in a class. I think that devising a computerised system would really reduce on the time we spend on developing the assessment scores in hard copy. Again to compound the problem comes the issue of administrative inefficiencies were at the time you are required to print and deliver the results, the printing services ae unavailable. Now hoe do achieve efficiency like this? I support the idea of the paperless age and I think that is the way to go" ***Participant 2***.

"Giving detailed and effective feedback to students is again dependant on a number of factors we have already discussed, such as huge student numbers and workload. I think that to some extent, that tends to compromise on the quality of the assessments because ideally, we need to give individualised student feedback so that the student can learn and realise their weaknesses and strengths in the different courses" ***Participant 4***.

"My opinion is that a CA score cannot predict how a student will perform in the final examination, although when you have a high CA score you may stand a better chance. So to some extent, passing or failing the CA score cannot guarantee a pass or fail score in the final examination" ***Participant 7***.

4.5 Conclusion

This chapter has presented the results based on the research question that was developed. The quantitative results followed by the qualitative results have been presented in response to the

specific objectives of the current study. This was in view of the mixed method study design used and the discussion chapter will then merge the findings.

CHAPTER 5: DISCUSSION

5.1 Introduction

This chapter presents the discussion of results in relation to the literature that informed the study. The discussion brings together the results of both quantitative and qualitative arms and interrogates them in respect of the current trends and phenomenon regarding assessment policies and practices. The chapter is divided into a number of sections related to the findings and cross references have been made based on the design of the study. The discussion addresses the specific objectives of the current study and these are: a) To describe the demographic characteristics and compare the course specific CA score and FE score as well as the overall performance within and among courses (Pharmacology, Pharmaceutics, Pharmacy Practice, Medicinal/Pharmaceutical chemistry and clinical pharmacy) for pharmacy students examined between 2013 and 2017 at UNZASOM/HS and EHC; b) To assess the predictive validity of CA score on the course specific pass or fail and GPA in Pharmacology, Pharmaceutics, Pharmacy Practice, Medicinal/Pharmaceutical chemistry and clinical pharmacy for pharmacy students examined between 2013 and 2017 at UNZASOM/HS and EHC; c) To determine the predictive validity of CA score on the course specific FE score in Pharmacology, Pharmaceutics, Pharmacy Practice, Medicinal/Pharmaceutical chemistry and clinical pharmacy for pharmacy students examined between 2013 and 2017 at UNZASOM/HS and EHC; d) To explore the perceptions and experiences of Pharmacy examiners and examinees regarding the current UNZASOM/HS and EHC examination policy and practices.

The demographic characteristics of the study participants are discussed initially followed by the various aspects that relate to the CA and predictive validity on the pass or fail examination outcome as well as the GPA. The predictive validity of the CA scores on the FE scores are then presented last. The findings for the third objective are discussed in relation to the first and second objective.

5.3 Demographic Characteristics

In the whole, there were more males than females enrolled in this study accounting for 531 (62.1%) and 324 (38.9%) for the females distributed as follows: - 250 (61%) compared to females 160 (39%) in the third-year participants with a significant statistical difference in the sex distribution n =410, $p<0.0001$. In the fourth-year participants there were more males 148 (65%) compared to females 80 (35%) with a significant difference in the proportions $p<0.0001$. For the fifth-year participants, the same trends were noted with the proportion of males accounting for 133 (61%) while that of the females were 84 (39%). This was as expected since currently, the Health Professions training programmes in Zambia are still male-dominated. According to the Central Statistical Office (CSO, 2014) the number of females enrolling for health professions training programmes has remained low with the females graduating 67 (32.8%) and 137 (67.2%) for the males.

The findings of the study are contrary to the Government of the Republic of Zambia's (GRZ) vision on gender as is contained in the "Vision 2030" to achieve gender equity and equality in the socio-economic development process by 2030. In this regard, the government adopted the National Gender Policy (NGP) in 2000 which addressed the need to build and strengthen national capacity for advocating and mainstreaming gender in the development process. The policy was aimed at" achieving full participation of both women and men in the development process at all levels in order to ensure sustainable development and attainment of equity and equality between sexes" (GRZ, 2014). Accordingly, enrolments for female candidates in the health professions education field must be encouraged in order to achieve this well-meaning vision.

In the third-year group, there were more unmarried participants representing 366 (89%) than married participants represented by 44 (11%), $p<0.0001$. For the fourth-year group, there was

a statistically significant difference in the proportions of the unmarried 200 (88%) compared to the married 28 (12%); p<0.0001. Further, 192 (88%) participants were unmarried while 25 (12%) were married presenting a significant statistical difference in the proportions by marital status P<0.0001. Early marriage interferes with the education and career development of particularly women than men as it often results in early child bearing and high fertility rate for women (CSO, 2014). This precipitates low education and literacy levels, low gainful employment leading to economic dependency on men, and unequal power distribution among women and men. The results are interesting in that there were fewer married participants than the unmarried which is a positive indication that participants did not engage in marriage and related activities giving them enough time to concentrate in their studies.

With regards academic sponsorship, total of 376 (92%) participants were non-sponsored while 34 (8%) were sponsored; p<0.0001 in the third-year participants. In the fourth-year group, the majority 163 (72%) of the participants were sponsored compared to 65 (28%) that were not sponsored demonstrating a significant statistical difference in the proportions p<0.0001. For the fifth-year group, there were 151 (70%) participants sponsored compared to 66 (30%) that were not sponsored demonstrating a significant difference in the proportion by sponsorship p<0.0001. Educational sponsorship is provided to students who cannot support their education independently due to financial crises by various agencies and organizations that sponsor a student's education. Educational sponsorship is a catalyst to individual and national development that empowers and supports would be candidates in times of financial crises (CSO, 2014; Travis, Doty and Helitzer, 2013) In the quest to enhance human capital development for health, GRZ and other agencies could enhance various sponsoring programs for students to access so that they can get reliable and independent in the later years of their lives. Thus, students can get sustainable financial support for their education.

The median age of the third-year participants was 24 years with an Inter Quartile Range (IQR) of 23 – 24 years old while that of the fourth-year participants was also 24 years (IQR: 23 – 25). For the fifth-year participants, the median age was 25 years (IQR: 24 – 27). The results of the current study are similar to the educational indicators published by the Organisation for Economic Co-operation and Development (OECD, 2013). The report indicates that compared with 2005 the median age of first graduation from university has decreased from 25.2 to 24.7 years and that younger students, those at the 25th percentile of the age distribution, graduated at age 23.2 in 2011 compared with 23.6 in 2005 while older students, at the 75th percentile, graduated aged 27.9 compared with 28.7 in 2005. Students are thus graduating noticeably earlier across the age distribution, and the numbers of students graduating relatively late has fallen particularly significantly.

There were more fourth-year participants 183 (81%) that had enrolled into university at year one compared to 45 (19%) that entered into university in year three with a significant statistical difference $p<0.0001$. For the fifth-year participants, 170 (78%) had entered into university in year one while 47 (22%) did so in year three demonstrating a significant difference in the proportions; $p<0.001$. At the University of Zambia, the level of entry takes into account prior learning and credits such that candidates that have acquired a certain level of education are exempted from taking courses (UNZA, 2013). In most academic institutions, applications for credit and exemptions are strongly encouraged to be made in different situations including but not limited to: Application for admission to the university; Transferring between university programs; Successful completion of cross-institutional study, or successful completion of a study abroad or exchange programs.

5.4 Predictive Validity of CA Scores on Pass or Fail Across Courses

The results in this study demonstrated inconsistencies in the general performance of the participants in the CA scores, FE scores in relation to the pass or fail examination outcome across all the courses. This could be attributed to a number of factors of which some could include demographic factors. The strengths of the associations between the demographic characteristics and pass or fail were tested and the findings are discussed below.

5.4.1 Association of Demographic Characteristics with Pass or Fail Across Courses

The results in this study show that there is no association of sex with whether a student will pass or fail a course. Thus, sex did not significantly influence examination outcome of pass or fail. Based on these results and considering the different results from various studies, no generalizations can be made regarding the influence of sex on academic performance and further, passing or failing a course (Rathnakar *et al.*, 2014; Richardson, Abraham and Bond, 2012).

Regarding marital status, it was also observed that there existed no statistically significant difference between the married and non-married with reference to whether they pass or fail any of the courses. The findings are comparable to the results by Kyoshaba (2009) who studied the factors affecting academic performance of undergraduate students at Uganda Christian University and found that marital status had no influence on the academic performance of an undergraduate student.

Regarding academic sponsorship, it was observed that there was no significant relationship with pass or fail across all the courses under study. Sponsorship is not about advancing unqualified individuals; rather, it is about identifying "high potentials," that is, high-performing individuals who are unrecognized by leadership as well as the vulnerable in society.

Educational sponsorship is provided to students who cannot support their education independently due to financial crises by various agencies and organizations that Sponsor a student's education. Educational sponsorship is a catalyst to individual and national development that empowers and supports would be candidates in times of financial crises (CSO, 2014; Travis, Doty and Helitzer, 2013) In the quest to enhance human capital development for health, GRZ and other agencies could enhance various sponsoring programs for students to access so that they can get reliable and independent in the later years of their lives. Thus, students can get sustainable financial support for their education. This is also in a quest to enhance the attainment and access to basic human rights such as education at university level.

Regarding the age of the participants, the results demonstrates that there was no significant relationship of age with the academic performance of pass or fail across the courses. This is consistent with the findings of other studies indicating that age barely had an effect on academic performance (Sheard, 2009; Trueman and Hartley, 1996). Accordingly, there is no significance evidence to relate age with academic performance and more so, whether a student would pass or fail a course in higher education.

In a related study conducted by McManus *et al.* (2013) dabbed UKCAT-12 where they investigated educational attainment, aptitude test performance, demographic and socioeconomic contextual factors as predictors of first year outcome in a cross-sectional collaborative study of 12 UK medical schools. They found that UKCAT scores and educational attainment measures were significant predictors of outcome. UKCAT predicted outcome better in female students than male students, and better in mature than non-mature students. Incremental validity of UKCAT taking educational attainment into account was significant, but small. Medical school performance was also affected by sex and ethnicity. Multilevel modeling showed no differences between medical schools in predictive ability of the various

measures. The study concluded that UKCAT has predictive validity as a predictor of medical school outcome, particularly in mature applicants to medical school but offers small but significant incremental validity which is operationally valuable where medical schools are making selection decisions based on incomplete measures of educational attainment.

5.4.2 Relationship of CA Scores and Course Specific Pass or Fail Outcome

In order to obtain a detailed summary of the relationship between the course specific pass or fail examination outcome, demographic characteristics and the individual course CA scores, a multivariate multiple adjusted logistic regression models were designed. The odds ratios for each of the predictors in the fitted models are shown in tables 4.21, 4.22 and 4.23 above. Based on the results of the regression models that were fitted, there was generally observed higher odds of passing a specific course given a pass in the CA score. This implies that a student that passes a CA score in a specific course has higher odds of passing that course based on the logistic regression analyses that were conducted. Therefore, passing a course specific CA score does provide positive predictive validity of whether an examinee may pass that course.

Other scholars also did find similar results which demonstrate predictive validity of an assessment on a later assessment outcome. Husbands *et al. (*2014) for instant, investigated the predictive validity of the UKCAT in the final years of medical school aimed to examine the predictive validity of the UKCAT and compare this to traditional selection methods in the senior years of medical school. The Pearson's correlations and multiple linear regression analysis to were used to predict examination scores. Multiple regression analysis showed the UKCAT made a statistically significant unique contribution to variance in examination performance in the senior years and concluded that the UKCAT appears to predict performance

better in the later years of medical school compared to earlier years and provides modest supportive evidence for the UKCAT's role in student selection within these institutions.

Similarly, Sartania *et al*. (2014) examined the associations which UKCAT scores, school science grades and pre-admissions interview scores had with performance indicators, particularly final composite scores that determine students' postgraduate training opportunities and overall ranking, and honours and commendation. They found that despite its predictive value declining as students' progress through the course, UKCAT was associated with the final composite scores and concluded that UKCAT has a modest predictive power for overall course performance at the University of Glasgow Medical School over and above that of school science achievements or pre-admission interview score and that UKCAT is the most useful predictor of final ranking.

Realizing this outcome in the current study, it was necessary to conduct further analysis to establish whether the students whose CA score was failed (<20) would go on to pass in the specific courses. Thus, performance of the examinees whose CA was passed and failed respectively was compared with the examination outcome of course specific pass or fail. As shown in Figures 4.1, 4.2 and 4.3, there was a significant statistical difference in the median total scores between the examinees whose CA score was >20 and <20 respectively in all the courses considered in the study. However, the examinees whose CA score was <20 demonstrated the capabilities to pass in all the courses considered in the study based on the median final total scores which were above the UNZASOM/HS pass or fail criteria which is arbitrary set at 50% score and thus, any score below the set standard demonstrates failure in expected proficiency levels and a student will have failed the assessment in that particular course or subject. Ideally, the total score is arrived at after the combination of both the CA (40%) and FE (60%) scores in a specific course or subject.

These results demonstrate that even when an examinees CA score is perceived as not being enough for a particular candidate to sit for a FE as enshrined in the assessment policy, examinees do have the capabilities to pass the courses. Given these findings and taking into account that there are several factors that influence academic performance in HPE, the current study argues that there is no justification to deny an examinee to sit the FE based on their having failed the CA score which is rated out of 40%, i.e. <20. Additionally, recognising that the total mark represents an examinee's attainment on the performance continuum implied by the proficiency levels and is represented on a test score range from 0 – 100%, making a high stakes decision based on 40% for the CA alone, may not be objective, fair and defensible. Norcini *et al.*, 2011, 2013 do argue also that due to the increasing demands for accountability, Health training institutions are required to define standards of quality assurance in the assessment of their trainees through defensible, valid, reliable, and robust assessment policies and practices such that society can have confidence in the professional competence of the graduates once they are registered to practice. Additionally, other pharmacy training institutions such as the University of Auburn, School of Pharmacy academic guidelines do not emphasise on a passed CA score before an examinee is allowed to sit the FE (Auburn University, 2017).

5.5 Relationship of CA Scores and GPA Scores Across Courses

According to Messick (1996) and McAlpine (2002), they suggested that predictive validity can be determined by calculating the correlation coefficient between the results of the assessment and the subsequent targeted behaviour, in this regard, the GPA. The stronger the correlation between the assessment data and the target behaviour, the higher the degree of predictive validity the assessment possesses. In the current study, there was a statistically significant positive correlation between CA scores and the GPA scores across all the courses examined as shown in figures 4.4, 4.5 and 4.6 in the results chapter. This implies that a increase the CA

score will result in an increase in the GPA score and this is expected as the computation of the GPA takes in to account the CA score. The surprising finding after further analysis was that the median GPA scores observed in all the courses under study was below the UNZASOM/HS acceptable GPA score of 2.5 as shown in Figures 4.7, 4.8 and 4.9. This to a larger extent could be an indication that most students concern is probably to pass the given courses in their year of study unlike focusing on the attainment of a high GPA. This finding further supports the earlier argument that there may be no justification of denying a student from sitting the FE based on having failed the CA score in a specific course given that both the examinees whose CA score was pass and failed respectively still demonstrate capabilities of passing the specific courses although the later may attain a lower GPA.

As suggested in literature, GPA is a numerical figure representing the average level of academic achievement based on numerical grade scores attributed to letter grades representing a level of achievement and mastery. The low GPA scores observed may be suggestive of poor mastery of expected competencies since CA scores and pass or fail data is used as a measure of student's progress toward mastery of the expected competency (Payne, 2013; Perie, 2014). The implication of this finding could be that HTIs may utilize CA scores and processes in emphasizing formative learning and ensuring an effective feedback mechanism between the learner and the facilitator of learning.

It has been agreed generally that assessment is seen as a primary quality assurance mechanism by which health training institutions and professional licensing organizations can assure the public of acceptance levels of competence among their trainees and practitioners (Norcini, 2005; Norcini *et al*., 2013). Therefore, CA has been understood as an on-going, diagnostic, classroom-based process that uses a variety of assessment tools to measure learner performance (MoE, 2007; Ecclestone, 2002; Gibbs and Simpson, 2004). It is an educational policy in which

students are examined continuously over most of the duration of their education, the results of which in some cases are taken into account in the SA as is the case at UNZA (McAlpine, 2002; Gardner, 2006).

Literature has also suggested that CAs which are sometimes called interim or benchmark assessments, occupy a somewhat gloomy place between formative and summative assessment (Ababio and Dumba, 2013; Payne, 2013; Perie, 2014; Harlen, 2006). CAs typically occur two or three times or as prescribed in the curriculum during a course or school year, and the data are used to measure a student's progress toward mastery of the expected competency (Payne, 2013; Perie, 2014). This proposition is consistent with the results of the FGDs conducted in this study were the participants did indicate that the CA should be used to help the students learn and also help the lecturers in identifying the areas of weakness and strength of the relationship. This is true as it has an effect on most of the assessment outcomes including the GPA of the learner which demonstrates to some extent, the level of mastery of a particular course of study by the learners.

As was submitted in a study by Ababio and Dumba (2013), they indicated that benchmark assessments have many purposes, some of which include "instructional, evaluative, and predictive" which are used "to inform classroom instruction". Brown (2007) also agreed that multiple reasons exist for schools to use benchmark or CA assessments including gauging student learning, providing actionable information for teachers, predicting high stakes scores, and pacing of the delivery of standards. In order to mitigate the limitations of end of year summative assessment, HTIs including UNZA must use CAs to test more often and use the CA scores data to adjust instruction, and most importantly, utilize multiple types of assessment in the classroom with student participation (Stiggins, 2005).

All this effort is proposed by literature in order to meet accountability goals, such that schools have to link everyday classroom practices with school wide assessment outcomes and develop data-driven practices (Kapambwe, 2010). Norcini et al. (2011) asserts that effective summative assessment is typically medium or high stakes and is primarily intended to respond to the need for accountability to the stakeholders of which the learners are key in the learning process.

The results observed in the FGDs show that timely feedback on assessment outcomes was generally poor based on the participants' perceptions and experiences. Literature has demonstrated that timely feedback is very important and contributes to the general achievement of quality assessment especially in health training institutions. Examination of the data concerning lecturers giving feedback to the examinees established that there was poor feedback given in terms of the quality, timing after assessment and the nature of communication. It was also found that lecturers in general did not have a plan or did not share the assessment plan to the examinees in order for them to plan.

In a related study by Allen (2016) which sought to determine if preadmission variables or combination of variables are able to predict on-time graduation in a doctor of pharmacy program using secondary data such as student transcripts and files, they found that having a prior degree, lack of unsatisfactory grades in non-science courses, and pre-pharmacy GPA were significant predictors of on-time graduation.

Demaree, Vaugh and Tolley (2014) also investigated the predictive validity of Teacher Performance Assessment (TPA) for Teaching Credential Candidates. The authors examined the relationship between teaching credential candidates scores on the Performance Assessment for California Teachers and three other measures of candidate effectiveness including GPA. They used a Pearson's test of correlation and found that there was no predictive validity between individual student mean scores and the GPA.

Meagher, Lin and Stellato, (2006) conducted a study whose objective was to examine the validity of Pharmacy College Admission Test (PCAT) scores for predicting GPAs of students in years 1-4 of pharmacy programs. They found that PCAT scaled scores and entering GPAs were positively correlated with subsequent GPAs while the regression analyses also showed the predictive value of the PCAT scores, especially in combination with entering GPAs. They concluded that both PCAT scaled scores and entering cumulative GPAs showed moderate to strong predictive validity as indicators of candidates likely to succeed in pharmacy school. This is an indication that certain types of assessment may predict the performance in a later assessment. Other scholars such as McCall, Allen and Fike, (2006) also conducted a related study were they investigated predictors of academic success in a Doctor of Pharmacy program at Texas Tech University. They found that completing advanced biology courses and obtaining a Bachelor of Science degree prior to pharmacy school were each significantly correlated with a higher mean GPA while concluding that advanced biology coursework and a science baccalaureate degree were significantly associated with academic success in pharmacy school.

In a related study conducted by Poole, Shulruf, Rudland and Wilkinson, (2012) were they compared the predictive validity of the Undergraduate Medicine and Health Sciences Admission Test (UMAT), the admission GPA, and a combination of both, on outcomes in all years of two medical programs. 1346 students were selected since 2003 using UMAT scores and attending either of New Zealand's two medical schools while regression models incorporated demographic data, UMAT scores, admission GPA and performance on routine assessments in the analysis. They found that the net predictive power of admission GPA was highest for outcomes in Years 2 and 5 of the 6-year program, accounting for 17–35% of the variance; UMAT score accounted for < 10%. The highest predictive power of the UMAT score was 9.9% for a Year 5 written examination. Combining UMAT score with admission GPA improved predictive power slightly across all outcomes. Neither UMAT score nor admission

GPA predicted outcomes in the final trainee intern year well, although grading bands for this year were broad and numbers smaller. They concluded that the ability of the general cognitive test UMAT to predict outcomes in major assessments within medical programs is relatively minor in comparison with that of the admission GPA, but the UMAT score adds a small amount of predictive power when it is used in combination with the GPA. These findings demonstrate that the predictive validity of one assessment on another may vary depending on the circumstances and variables being considered. Similarly, it is important to establish the predictive validity of the highly emphasized CA score on the FE score and examination outcomes of pass or fail and the GPA in the Zambian setting in a pharmacy school

As already discussed above, GPA is a numerical figure representing the average level of academic achievement based on numerical grade scores attributed to letter grades representing a level of achievement. The low GPA scores observed may be suggestive of poor mastery of expected competencies and cannot be ignored since the GPA is a measure of student's progress toward mastery of the expected competency (Payne, 2013; Perie, 2014). Instead of highly emphasing on the pass or fail as the assessment policy at UNZA is suggestive, a paradigm shift towards the introduction and utilization of credit points and GPA scores would be more appropriate unlike the current practice. A student is supposed to meet a certain GPA score inorder to be certified and or meet the graduation requirements for a specific profession. This is the current practice in other higer training insttiyutions were the GPA is used as a measure of students academic achievement as is demonstrated in a study conducted by Azmi, Ali, Wong and Kumolosasi (2014) who evaluated internal factors that affected pharmacy students' academic performance and determined whether these factors had significant effect on student's Cumulative GPA and year of study. The authors used a cross-sectional survey approach (questionnaire-based) to collect data from 1,018 pharmacy students drawn from 5 Malaysian public institutions of higher learning. Their findings showed that students' academic

performance as measured by cGPA was associated with academic competency, test competency, time management skills, and test anxiety. These findings have very important considerations to be made by HTIs in the third world countries such as UNZA. We are therefore suggesting that a there be a paradigm shift in the assessment policies and practices from emphasizing CA pass or fail to mastery of expected course competencies by way of attainment of a good or acceptable GPA scores.

This proposition is in agreement with the finding of a study conducted by Kidd and Latif (2003) that aimed at assessing the extent to which 7 traditional and novel predictors contribute to overall pharmacy GPA using a convenience sample and a blinded retrospective record review of the first 3 class years of Doctor of Pharmacy students at Shenandoah University's, School of Pharmacy (Classes of 2000, 2001, and 2002). They found that Pharmacy College Admissions Test (PCAT) score, essay score, California Critical Thinking Dispositions Inventory (CCTDI) and Skills Test (CCTST) were all significant predictors of pharmacy academic success and GPA. The study concluded that the study of predictors of pharmacy students' performance by examining the role of critical thinking in students' performance is crucial and is thus cannot be ignored.

5.6 Relationship of Course Specific CA Scores and FE Scores Across Courses

In the current study, a correlation between the CA scores and FE scores was done and as shown in figures 4.20, 4.21 and 4.22 in the results chapter, there was a statistically significant positive correlation between course specific CA scores and the respective FE scores. The findings entail that an increase in the CA score could reflect an increase in the FE score. On further analysis, multivariate multiple regression models were designed considering marital status, sex, age, sponsorship, level of entry, course specific CA scores were considered as the predictor variables while course specific FE score were outcome variables in the models as shown in

Tables 4.28, 4.29 and 4.30 in the results chapter. The results indicate that the CA score has predictive validity on the FE score based on the correlations and regression models conducted.

These findings are in agreement with a study conducted by Payne (2013) who used a mixed method approach/ design to explore the nature of a benchmark assessment program and how well the benchmark assessments predicted End-of-Grade (EOG) and End-of-Course (EOC) test scores in an American Indian school district. The study identified five major themes and used them to develop Dimensions of Benchmark Assessment Program Effectiveness model: Professional Development, Assessment Literacy, Data Literacy, Instructional Practice, and Program Effectiveness. Among other findings, the study found that Benchmark assessment scores correlated strongly with the EOG and EOC scores except in two areas. Benchmark assessment scores predicted EOG and EOC scores well. Other studies disagree with the current study such as the one conducted by Brown (2007) who investigated the predictive validity of selected benchmark assessments used in the Mid-Atlantic region on state assessment, they found that the evidence of the predictive validity of benchmark assessments was generally lacking with respect to the state assessments tests.

The current study also did explore some of the factors that could affect students' performance, and among them included: Poor communication of the academic calendar and assessment dates; High student to Lecturer ratio which results in poor individual student attention; Methods of assessment used sometimes do not match with competency being assessed for; Financial support or sponsorship; Failure to communicate course outlines and content by the lecturers. Several scholars have indicated a plethora of factors that could affect students' academic performance in assessments. Kappe and Van der Flier (2012) investigated the combined predictive validity of intelligence and Personality factors on multiple measures of academic achievement. Students in a college of higher education completed a survey that measured

intelligence, the Big Five personality traits, motivation, and four specific personality traits. Student performance was measured with GPA and time to graduation, as well as with five specific performance measures: regular exams, skills training, team projects, internships, and a written thesis. The findings also demonstrated poor evidence of the predictive nature of intelligence and personality on measures of academic achievement. In the current study the quantitative results did not show any association or correlation of the CA scores, FE scores and the GPA with demographic characteristics that were considered.

In the quest to establish whether an assessment can act as a guide to future teaching and learning, Martin and Jolly, (2002) investigated the predictive validity and estimated cut score of an Objective Structured Clinical Examination (OSCE) on later performance in clinical examinations medical undergraduate students. They found that the poor performance in the OSCE was strongly associated with later poor performance in other clinical examinations. Students in the lowest three deciles of OSCE performance were 6 times more likely to fail another clinical examination. The study concluded that performance in an OSCE taken early in the clinical course strongly predicts later clinical performance. Similarly, a study conducted by Houglum, Aparasu and Delfinis, (2005), that sought to determine which admissions criteria are valuable in selecting pharmacy students by determining which criteria are significant predictors of success or failure using retrospective data of 309 students. They found that predictors of failure included average grade in organic chemistry courses and gender while predictors of success included grades in math and science pre-pharmacy courses and prior attainment of a bachelor's degree and concluded that academic predictors of success and failure shared common variables, but there were predictors of success that were not predictors of failure.

Kuncel *et al.,* (2005) conducted a study aimed at comparing the validity of the Pharmacy College Admission Test (PCAT) and pre-pharmacy GPA in predicting performance in

pharmacy school and professional licensing examinations using the Hunter and Schmidt psychometric meta-analytic method. After reviewing relevant research articles from multiple databases, correlations between the PCAT and GPAs or individual course grades were the most commonly presented data. The study found that the PCAT and pre-pharmacy GPA were positively correlated with first, second, and third-year GPA and National Association of Boards of Pharmacy Licensure Examination for first-year GPA. They concluded that both PCAT scores and pre-pharmacy GPA were moderate to strong predictors of grades earned in pharmacy programs and scores on licensing examinations.

In a related study conducted by Meagher *et al*., (2009), they explored the utility of the Team Objective Structured Bedside Assessment (TOSBA), a novel ward-based formative assessment tool, in predicting student performance in the final clinical examination. They found that there was a clear relationship between student performance in the TOSBA and performance in the final examination while student performance in the OSLER showed a poor relationship with performance in the final examination compared with the TOSBA. They concluded that TOSBA performance is a strong predictor of subsequent performance in the final examination.

A study conducted by Norcini *et al*., (2014) investigated the relationship between scores on Step 2 Clinical Knowledge (CK) and patient outcomes for International Medical Graduates (IMGs). The findings of the study provided evidence for the validity of Step 2 CK scores. The results support the use of the examination as an effective screening strategy for licensure. The findings do provide related evidence of the predictive nature of a given assessment on a subsequent one. Similar studies such as the one conducted by Tejada *et al.*, (2016) which investigated the ability of University of Maryland Eastern Shore School of Pharmacy's admissions criteria to predict students' academic performance in a 3-year pharmacy program and to analyse transferability to African-American students. They found that Pharmacy College

Admission Test (PCAT), GPA, interview, and observational scores combined with previous pharmacy experience and biochemistry coursework predicted the students' academic performance except second-year (P2) experiential performance. They concluded that both PCAT and GPA were predictors of didactic performance, especially in non-African Americans. Pharmacy experience and observational scores were predictors of experiential performance, especially in African-Americans. The current study has also devised regression models that could be used to predict the FE score given specific conditions as demonstrated in the results.

Arising from the predictive nature of the CA score on the FE score established in the current study and taking into account the other findings discussed so far in relation to literature, it is important for educators and policy makers to be aware of the implications thereof. Categorically and significantly emphasising that only students with a passed CA score be allowed to sit a FE may not be objective and credible as earlier mentioned. The highly significant emphasis attached to the examination policy at UNZA may be misplaced as students' performance during the CA and FE are highly affected by several factors as outlined by some scholars above. Realising that an individual student's academic achievement is made on a continuum of 0 to 100, it is a truism that high stakes decisions about the academic progress or certification of an examination candidate be made upon aggregation of the CA scores and FE scores unlike the position highlighted in the current assessment policy.

5.7 Students Performance in Course Specific Achievement Against other Courses

The current study observed the relationship of students' academic achievement in a specific course against the other courses during the year of study. It was found that the performance of a student in one course had a statistically significant difference when compared to the other courses. This was suggestive of the fact that there are several factors that may affect the way a student performs in one courses versus the others, such as course load or difficult level of the

course, lack of or unavailable reference resources, poor pedagogical skills of the educators and so on. This was also consistent with the findings of another test that conducted to compare the total examination scores among the courses under study and a similar picture was observed. Similarly, among the reasons to this observation is that unalike courses are weighed differently and therefore, the time and investment in general a student will take to achieve the predetermined learning outcomes in the different courses may be dissimilar as well.

The findings of the current study are in agreement with a study that was conducted by Beekhoven, De Jong and Van Hout, (2003) titled 'different courses, different students, same results? an examination of differences in study progress of students in different courses'. They did multilevel analysis and the results showed that there was in fact such variation between courses and that the variation was only partially explained by individual characteristics and course characteristics. At the individual level, sex, initial ability, academic fit, expectation and commitment are important factors they considered. After controlling for these individual factors, some courses still turn out to be more effective than others in getting their students to earn credits. Furthermore, students in courses with a high proportion of women made more progress than students in courses with a high proportion of men. Additionally, courses with a high average number of student study hours per week do better. These findings may be suggestive that the performance of a student in a particular course is not predictive of the performance in the next course. Arising from the earlier findings, a course specific CA score may be predictive of the FE score but not for the other courses.

5.8 Assessment Policy and Practice Implications in Higher Training Institutions

Realising that there exists no agreed definitive separation between the types of assessments i.e. SA and FA, in our context the CA falls somewhere between formative and summative because they offer data for prediction, for program evaluation, and for identifying student learning

needs (Taras, 2012; McAlpine, 2002). Other scholars such as Downing, Tekian and Yudkowsky (2006) and Ian and Robson (2007), do indicate that the FEs and the assessment results in general arrive too late to influence instruction or increase student learning and as such, schools need to know where students are performing at different points during the year while they can still adjust instruction. Similarly, the current study does highlight some of the constraints to effective feedback during CAs and the main reason is the high student to lecturer ratio and pedagogical insufficiency among the lecturers. However, while the CA scores data are generally used for summative purposes, literature suggests that most schools and educational institutions use the data to adjust instruction and provide interventions to students, which is a formative characteristic of assessment (Bates *et al.* 2013: Payne, 2013).

The discussion in literature seems to be ongoing about how HTIs can effectively efficiently utilise assessment outcomes. Ultimately HTIs have the responsibility to ensure that they are accountable to the key stakeholders in higher training by way of ensuring that assessment practices are credible, valid, reliable, feasible and acceptable. The use of evidence in assessment policies and practices will ensure a mechanism of defensibility and thus, the current study suggests the utilisation of CA scores data in emphasising formative learning and ensuring an effective feedback mechanism between the learner and the facilitator of learning as affirmed by Norcini *et al.,* 2011.

5.9 Summary

This chapter has discussed the study findings and integrated the findings into the available and existing literature. A comparison to the existing literature has been made in order to substantiate the study findings but in instances where the current study finds contrasts to the existing literature, arguments have equally been presented to justify them. The study has highlighted the predictive nature of the CA score on the FE score and examination outcomes of pass or fail

and GPA. The CA score has demonstrated predictive validity on the FE score and GPA of pharmacy students examined between 2013 and 2017 at the UNZASOM. A counter-argument has been discussed regards the emphasis of an examinee to have their CA score passed before they can be allowed to sit the FE.

The chapter has further merged the findings of both the case study and the cross-sectional study realising that the study design was a mixed-method convergent parallel. The implications to practice and policy have been highlighted but are further discussed in chapter six.

CHAPTER 6: CONCLUSIONS, LIMITATIONS AND RECOMMENDATIONS

6.1 Introduction

This chapter presents the conclusion, limitations and recommendations of the study based on the findings and discussion. This chapter brings together, the summary of the emerging information and provides the contribution the current study has made to the body of knowledge while offering as well as suggesting some recommendation in relation to the practice of assessments in higher training institutions.

6.2 Conclusions

The conclusions has beeen presented in relation to the specific objectives of the study.

i. There was no association between the various demographic characteristics included in this study with academic performance or course-specific pass or fail and the GPA. Therefore, there are no generalisations that can be made regarding the influence of demographic characteristics on academic performance.

ii. The course specific CA scores predicted well the assessment outcome of pass or fail and the GPA. Furthermore, there was a statistically significant positive correlation between course specific CA scores and the GPA scores across all the courses examined.

iii. The current study has established that there was a statistically significant difference in the academic performance of a student in one course compared to the other courses within the same year of study. This is suggestive of the fact that the performance of a student in one course may not be predictive of the performance in another course or rather a different course during the same year of study.

iv. The current study observed a statistically significant positive correlation between course specific CA scores and the respective FE scores. Further analysis using multivariate regression, the CA score had predictive validity on the FE score.

v. All the participants (examinees and examiners) in the FGDs were aware of the existence of the examination policy.

vi. Some of the strengths identified are that students were made to work extra hard in order to meet the policy requirement of having to pass the CA while on the other hand, students did not invest enough time to achieving mastery of the competencies expected of them as a weakness.

vii. Poor and untimely feedback by the lecturers was also identified.

viii. Examinees indicated that some lecturers had a poor attitude towards work while some demonstrated pedagogical insufficiency.

ix. Factors affecting students' academic performance include: Poor communication of the academic calendar and assessment dates by faculty; Little or no study breaks given and ultimately not enough time to prepare for the examination; High student to Lecturer ratio which results in poor individual student attention; Poor assessment methods used against competency; High course load was also cited as one of the factors; and Faculty pedagogical insufficiency.

6.3 Limitations

The findings of the current study should be interpreted with consideration of the following limitation:

Interpretation should be limited to pedagogical settings that use a similar examination policy and practices as the one under interrogation. Given the conditions as those considered in the current study, the results could be generalized to such settings.

6.4 Recommendations

Given the limitation of the study above, the current study recommends the following to UNZASOM/HS, Educators, Examiners, Policy Makers and HTIs with a similar examination policy and practice:

i. CA scores could be predictive of course specific pass or fail and GPA and therefore, HTIs could use the CA scores data to adjust instruction, and most importantly, utilize multiple types of assessment in the classroom with student participation in order to enhance students' attainment of mastery of the expected competencies and ultimately, attainment of higher GPA scores. Further, examination policy and practices could emphasize more on the attainment of a specific GPA rather than just course specific pass or fail dependent on the profession being trained and certified.

ii. Examination candidates should not be denied access to the final exam based on the fact that they had a failed course specific CA score. The results have shown that in as much as there is an inherent correlation in the CA score and the FE score, there existed a statistically significant difference in the mean course specific CA and respective FE score. Additionally, partial effect plots that were generated did demonstrate that students that had a low CA score had a potential to get high grades as well as a high FE score. Further, high stakes decisions should not be made based on partial results i.e. CA score, but on the total aggregated score reflected on the continuum score scale of between 0 to 100. HTIs may utilize CA scores and processes in emphasizing formative learning and ensuring an effective feedback mechanism between the learner and the facilitator of learning and engage more of student centered approaches to learning. This is in view of the poor communication and ineffective feedback mechanism that was identified.

iii. High enrollments rates in HTIs had a negative implication regards individual student feedback and academic performance. Individualization of students has been identified as one of the good attributes of an effective educator and training institution as a whole. HTIs should engage in pedagogical practices that will ensure student involvement by way of reducing the student to lecturer ratio as well as mechanisms that will ensure utmost accountability of the training institutions to the key stakeholders in the environment. Ultimately, policy makers and faculty must respond accordingly to these contemporary expectations because when well implemented, CA is a powerful catalyst for quality improvements in education.

6.5 Future Research Direction

Further research is required to confirm the validity and reliability of the assessments or examinations administered in HTIs. This is because psychometric rigor of assessments is cardinal in ensuring quality and effective mastery and attainment of core competencies especially in HPE.

Additionally, more research is needed to confirm the nature and quality of CA methods, scheduling and quality of feedback the facilitators of learning administer and give to the learners. Other research areas would be to establish the relationship of assessment methods, CA scores and cumulative GPA in HPE.

Lastly, the predictive validity of class attendance on academic performance and GPA would also be an area of interest regards research in this contest.

6.6 Contribution to the HPE

The study has numerous benefits to medical education (HPE) most of which are located in the nature of the assessments policy and practices in HTIs. The study has established the

relationship between the CA scores, FE scores, course specific pass or fail and the GPA. Further, regression models have been developed and proposed to estimate the probable course-specific FE score and GPA. Educators can additionally use the partial effect plots generated to verify and estimated FE score or GPA based on the examinees CA score given the respective conditions of sex, marital status and sponsorship.

Based on the results, HTIs such as UNZA is required to define standards of quality assurance in the assessment of their trainees such that society can have confidence in the professional competence of the graduates once they are registered to practice. There is increasing demands for accountability through defensible, valid, reliable, and robust assessment policies and practices of which this study has attempted to provide.

Finally, the study has also provided a valuable framework for designing interventions to improve policies and practices in assessments. A 3 LENs assessment model provides and demonstrates some of the considerations HTIs can make in determining performance and competency attainment as well as pass/fail decisions. Following through admission into HPE programme, a trainees' competency attainment is measured by ensuring that they pass all the courses using the arbitrary set 50% standard, accumulate the required credit points/Units of the programme and meet the specific cumulative GPA for the programme. Using these criteria for certification and meeting graduation requirements, HTIs can be assured of ensuring that their graduates have met the prescribed standard using the 3 LENs assessment model. The Figure 4.35 below demonstrates the developed assessment model.

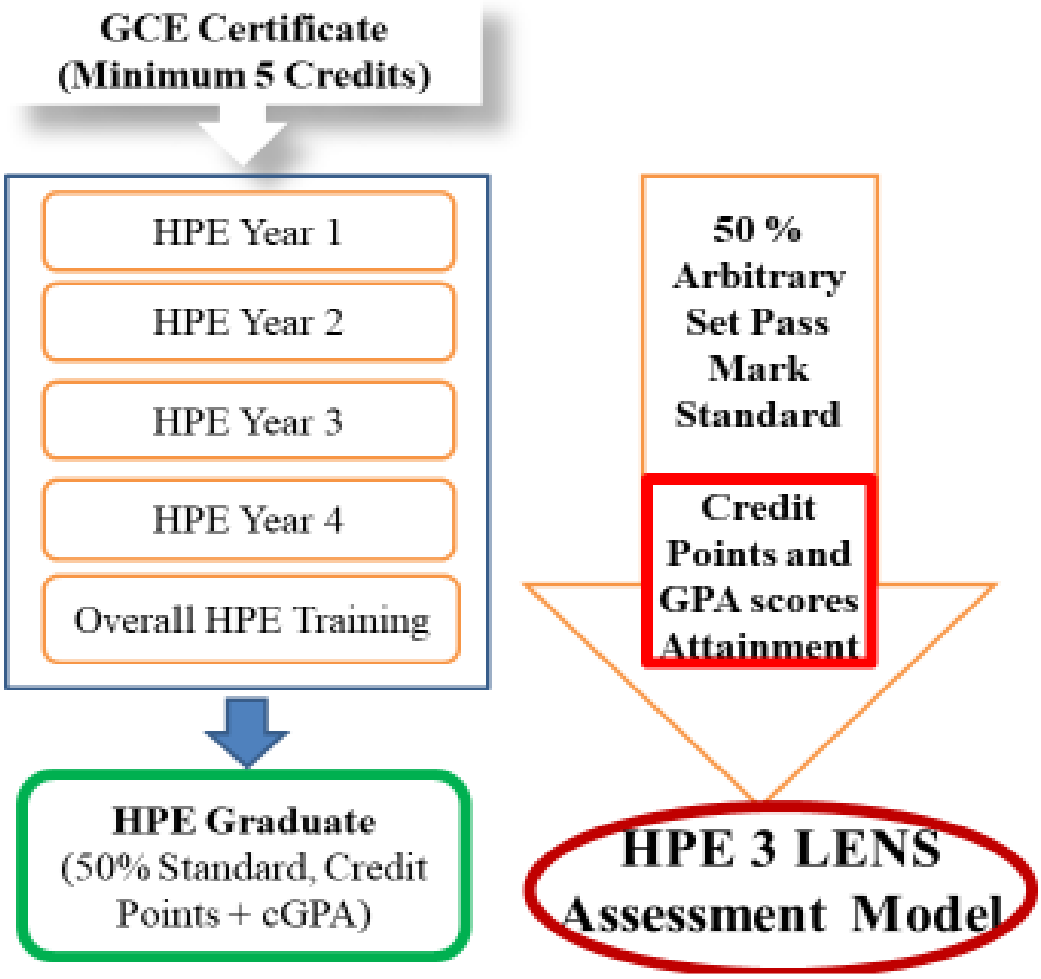


Figure 4.35: The 3 LENs Assessment Model

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APPENDICES

Appendix I: Information Sheet

Research Title

The Predictive validity of Continuous Assessment scores on the final examination scores and assessment outcomes for Pharmacy students examined at the UNZA and EHC.

Invitation

I Michael M. Chigunta, a PhD candidate in the department of Medical Education Development in the School of Medicine, University of Zambia is inviting you to take part in a research study on the predictive validity of CA scores on the FE scores and examination outcomes of pass or fail and GPA and explore the experiences and perceptions of pharmacy examinees and examiners regards the examination policy. You may choose to participate or not as you are under no obligation to do so and your decision is entirely voluntary. Your participation will require that you sign a consent form in the presence of a witness while you're not participation will not take any privilege away from you. Note that your participation will not result in any immediate benefits to you but in the enhancement of pedagogical skills and assessment policies and practices for future students.

Purpose of the Study

The study seeks to determine the predictive validity of the CA scores on the FE scores and examination outcomes of pass or fail and GPA while exploring the experiences and perceptions of pharmacy examinees and examiners. The study will help bring out information as to whether there is need to strongly emphasise the re for student

Procedure

If you agree to participate in this study by signing the consent form, you will then be requested to take part in any of the following components of the study that focusses on assessment policies and practices;

1. For students, focus group discussions,
2. For Examiners, one focus group discussion.

You will also be allowed to make suggestions on how you think assessment or examinations practices can be enhanced.

Risks and Discomforts

There are no risks or discomforts by your participation in the study apart from engaging your time during the interview which will be recorded basically to help in the data collection and analysis.

Benefits

As earlier highlighted, your participation in this study will have no direct benefit or monetary gain in exchange for the information. However, your participation is highly valued and will be able to provide information on the pedagogical skills as well as the assessment policies and practices that are necessary in order to enhance the much needed accountability in assessments.

Confidentiality

You are rest assured that your participation and any information you give will be highly confidential to the extent as permitted by law. Your names will be concealed and will thus, be identified by your initials. Your participation as earlier mentioned will not in any way affect your performance in your academic activities including your Grades.

For Further information

In case you have any questions or clarification regarding any aspect of the study, you are encouraged to contact any of the following;

1. Michael M. Chigunta, University of Zambia, Department of Medical Education Development, P.O Box 50110, Lusaka or email; shisolo2015@gmail.com
2. Prof. S.S Banda, University of Zambia, Department of Medical Education Development, P.O Box 50110, Lusaka or email; ssbanda2007@gmail.com.
3. The Chairperson, University of Zambia Biomedical Research Ethics Committee, University of Zambia, P.O Box 50110, Lusaka.

Appendix II: Informed Consent form

Research title:

The Predictive validity of Continuous Assessment scores on the final examination scores and examination outcome for pharmacy students examined at the UNZA and EHC.

You are being asked to take part in a research study on the predictive validity of CA scores on the FE scores and how they influence the pass rate, attrition rate and GPA. The study is being done as partial fulfilment for the award of the Doctor of Philosophy degree in Medical Education and is being supervised by Prof. S.S Banda of the University of Zambia, School of Medicine. The research study has further been approved by the University of Zambia Biomedical Research Ethics Committee (UNZABREC).

By signing below, you are agreeing that you have been explained to and that you understand the scope of the study. You are further confirming that all questions about your participation have been answered satisfactorily and you are aware of the potential benefits and risks associated with the study. Your participation in the study is on voluntary basis without any monetary benefits.

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Name of participants *Signature of participant*

Date

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Name of person obtaining consent *signature of person obtaining consent*

Appendix III: Quantitative Data Collection Spread Sheet

Student ID	COURSE A		COURSE B		COURSE C		COURSE D		Age	Sex	Entry into University	Marital status	Sponsor ship
1	CA	FE	CA	FE	CA	FE	CA	FE					
2													
3													
4													

Appendix IV: Interview Protocol/ Schedule for Educators/Examiners

Research title: The Predictive Validity of CA scores on the FE scores and examination outcomes of Pharmacy students examined at UNZA and EHC.

Date of Interview: _____ Time **of Interview:** _____

Location: _____

Interviewer: Michael Chigunta M.

Interviewee Code: _____

Introduction:

1. Thank you for taking the time to participate in this study.
2. I will be interviewing several staff members from the Department of pharmacy for this study.
3. I want to reassure you that this interview is strictly confidential. Pseudonyms will be used to maintain confidentiality when necessary. You are free to decide not to participate in this study or to withdraw from the study at any time without adversely affecting your relationship with me, or indeed your Institution. Contact persons for the project and the Institutional Review Board are provided on the Informed Consent Form in case you have questions or concerns. I have a copy for you to sign and one for you to keep for your use.
4. I am going to record this interview so that the interview can be transcribed (a typed copy of the interview will be made) and we have an accurate rendering of your responses.
5. It is important that I maintain the integrity of your words and intentions; therefore, I may ask you to review the transcription if I have any difficulties with the interpretation.

6. I am interested in your perceptions and understanding of the current examinations policy and its implementation at your institution and how you perceive the CA scores in relation to the FE scores in the courses you teach as well as your teaching experience.
7. Please feel free to discuss your views openly. From time to time, I may have additional questions to further understand a concept that you have shared.
8. Let's begin. Please state your name, teaching experience and give verbal permission to record this interview by repeating this statement, "I (your name) at UNZASOM/EHC willingly give my permission to record this interview."

Part I.

1. What do you believe is the purpose of the CA program / policy?

2. What do you think are the strengths of the CA policy?

3. What are some the weaknesses of the CA policy?

4. What do you think are some of the purposes of the CA policy in relation to student learning?

5. How do you use the CA scores during the course of the semester/academic year?

Probe: How do the scores influence your teaching approaches?

Part II.

6. How do your students perceive the CAs that you administer?

Probe: How do you emphasise to the students on the need to have their CAs?

7. How soon do you give feedback after the CA is given?

Probe: Do the students ask for their results or feedback.

8. What other types of data would you like to see from the CA program especially regarding its implementation?

Probe: Do you think it is justifiable to deny a student an exam or penalise a student on account of failed CA?

Part III.

9. How many years have you taught?

10. How many years have you taught at this institution?

11. How efficient are you in the submission of the CA score results to the administrator's e.g., HoD, examinations office.

Thank you again for participating in this interview. Please remember that your responses will remain anonymous.

Appendix V: Interview Protocol/ Schedule for examinees

Dissertation Study: The Predicative Validity of CA scores on the FE scores and examination outcomes of Pharmacy students examined at UNZASOM and EHC.

Date of Interview: _____ Time **of Interview:** _____

Location: _____

Interviewer: Michael Chigunta M.

Interviewee Code: _____

Introduction:

1. Thank you for all for taking time to participate in this study.
2. I want to reassure you that this interview is strictly confidential. Pseudonyms will be used to maintain confidentiality when necessary. You are free to decide not to participate in this study or to withdraw from the study at any time without adversely affecting your relationship with me, or indeed your Institution. Contact persons for the project and the Institutional Review Board are provided on the Informed Consent Form in case you have questions or concerns. I have a copy for you to sign and one for you to keep for your use.
3. I am going to record this interview so that the interview can be transcribed (a typed copy of the interview will be made) and we have an accurate rendering of your responses.
4. It is important that I maintain the integrity of your words and intentions; therefore, I may ask you to review the transcription if I have any difficulties with the interpretation.
5. I am interested in your perceptions and understanding of the current examinations policy and its implementation at your institution and how you perceive the CA scores

in relation to the FE scores as students including your experiences since you started your studies at this institution.

6. Please feel free to discuss your views openly. From time to time, I may have additional questions to further understand a concept that you have shared.
7. Let's begin. Please state your names, year of study and give verbal permission to record this interview by repeating this statement, "I (your name) at UNZASOM/EHC willingly give my permission to record this interview."

Part I.

1. What do you believe is the purpose of the CA program / policy?

Probe: Do you know the examinations policy?

2. What do you think are the strengths of the CA policy?

3. What are some the weaknesses of the CA policy?

4. How does the CA policy influence how you perform in your studies?

5. How do you think the CAs influence your learning abilities?

6. How do you use the CA scores during the course of the semester/academic year?

Probe: Do the CA scores influence your studying across courses or study approaches?

Part II.

7. How do your lecturers perceive the CAs that they administer?

Probe: How do they emphasise to the students on the need to have their CAs?

8. How soon do your lecturers give feedback after the CA is given?

9. What other types of data would you like to see from the CA program especially regarding its implementation?

Probe: Do you think it is justifiable to deny you an exam or penalise you on account of failed CA?

10. How do you consider supplementary exams? Or what's your view/take regarding supplementary exams?

Probe: Do you think its fail not to consider the contribution of the CA score to the Supplementary exam score?

Probe: if yes/No then Why?

Part III.

11. How many years have you been enrolled at this institution?

12. Have you ever failed any of the courses you take?

13. Do you think it's possible to fail/pass with a high/ low CA respectively?

14. How do you think the CA policy can best be implemented at this institution?

Probe: Would you like to add or comment anything about CAs and assessments in general?

Thank you again for participating in this interview. Please remember that your responses will remain anonymous.