

Efficiency Evaluation of EAP Teacher Performance at a Tertiary Level Using DEA: A Case Study in Eastern Mediterranean University

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ABSTRACT

Identifying significant indicators of teaching-learning performance affecting the efficiency of teachers in tertiary level at university is an indispensable factor in upholding the quality of teaching in English for Academic Purposes (EAP) courses in higher education. The present study has tried to evaluate the relative efficiency of teachers' performance in English for Academic Purpose (EAP) courses, followed by identifying the most significant indicators of teaching-learning performance using Students' Course-instructor Evaluation (SCE) survey and the students' final grades. Furthermore, it attempts to prioritize the significant teaching indicators affecting the teachers' performance in English for Academic courses.

For this purpose, the study applies Data Envelopment Analysis, Performance Improvement Management Software (PIM-DEA) on related courses for 10,000 students' data in four consistent academic years. First, the efficiency performance of EAP teachers is evaluated and later, a sensitivity analysis and weight analysis are applied to identify the most significant learner-instructor indicator which has impact on the EAP teacher performance. Identifying the significant learner-instructor analysis is done in two different methods in PIM-DEA to prove the validity of the analysis. The study is finalized with an interview with EAP teachers to ameliorate the efficiency performance of EAP teachers. The result of the analysis accentuates the significant indicators that impact the teachers' performance. It reveals that the degree of student satisfaction in relation to assignments, exams, and grading systems are significant factors related to the efficiency of teacher performance. The study has

been finalized by concrete proposals for teachers to enhance the quality of teaching performance in EAP classes.

Keywords: Data envelopment analysis, efficiency, English for academic purpose, students' course-instructor evaluation survey

ÖZ

Yüksek öğretimde öğretmenlerin verimliliğini etkileyen öğretme-öğrenme performansının önemli göstergelerinin belirlenmesi, eğitim kalitesinin devamı için vazgeçilmez bir etkidir. Bu çalışmada, Akademik Amaçlı İngilizce (AAİ) sınıfları için öğretmenlerin performanslarının göreceli etkinliğini değerlendirme ve bunu takiben Öğrencilerin kurs-eğitmen değerlendirmesi (ÖKD) anketi ve öğrencilerin final notları kullanılarak öğretme-öğrenme performansının en önemli göstergeleri belirlenmeye çalışılmıştır. Bunun yanında, öğretmenlerin AAİ sınıfları için İngilizce performansını etkileyen önemli öğretim göstergeleri önceliklendirilmiştir. Bu amaçla, bu çalışmada, dört ardışık akademik yılda, 10.000 öğrencinin verileri için ilgili derslere Veri Zarflama Analizi'ni (VZA) uygulanmıştır. Yapılan analiz sonucunda, öğretmenlerin performansını etkileyen önemli göstergeler vurgulanmaktadır. Çalışma, AAİ sınıflarındaki öğretim performansının kalitesini artırmak için öğretmenlere somut öneriler getirilerek sonuçlandırılmıştır.

Anahtar kelimeler: Veri zarflama analizi, verimlilik, akademik amaçlı ingilizce, öğrencilerin ders-eğitmen değerlendirme anketi

WITH LOVE AND ETRNAL APPRECIATION

***TO MY MOST BELOVED FAMILY FOR THEIR
UNCONDITIONAL LOVE***

&

TO MY MOTHER'S SOUL FOR HER ONGOING

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LIST OF ABBREVIATIONS

BALEAP	British Association of Lecturers in English for Academic Purpose
CFTEAP	Competency Framework of Teaching English for Academic Purpose
DEA	Data Envelopment Analysis
DMU	Decision Making Units
EAP	English for Academic Purpose
SCE	Students' Course-instructor Evaluation Survey
TEAP	Teaching English for Academic Purposes

Chapter 1

INTRODUCTION

The purpose of this chapter is to present information about the current challenges to higher education and to emphasize the importance of the quality evaluation in higher education. It covers the background, the statement of the problems, research questions and the significance of the study and finally the definition of the related keywords.

1.1 Background of the Study

Higher education, among other social settings, has been affected by some challenges due to the rapid socio-economic changes of the 21st century. Some of these challenges can be considered as threats, while others can be considered as opportunities for higher education, Altbach (2005) named them as (i) massification, (ii) internationalization and ranking, and (iii) world-class universities. In Altbach's point of view (2009), two challenging mega trends to higher education are massification and internationalization, while Shin and Harman (2009) consider massification and globalization as two mega-trends influencing contemporary higher education.

Massification can be defined as an extension of enhanced access and the increasing scale of higher education which can have an impact on financial issues, governing methods, quality, curriculum faculty and student demographics. Shin and Harman (2009) further explain that massification is the creation of new types of institutions,

such as non-degree awarding institution, generally a more vocational organization, as the main providers of expanded opportunity. Therefore, massification can be regarded as a threat to the enrollment and attraction of international students for all reputable universities.

For instance, Iran encountered a similar problem when the government increased the capacity of the state universities by 50% in 2008, as well as establishing private institutions and training centers. In line with Iran case, North Cyprus, is another example with a population of about 300.000 in the Northern part of the island hosts 24 universities, in three different categories:

- State-owned trust universities, like Eastern Mediterranean University, and Lefke European University.
- The universities which are privately owned, such as Girne American University.
- Turkish universities that have been established by new legislation, such as the Middle East Technical University in Kalkanlı.

All these new universities clearly signify the fact that massification is a process everywhere and as Altbach (2005) and Shin and Harman (2009) stated it is an influencing factor of Higher Education. We may try to understand the role of massification in relation to quality of instruction and the efficiency of instructor.

Internationalization, as mentioned earlier, is another mega trending challenge to higher education. Altbach (2009) distinguishes it from globalization, stating that globalization is an economic and academic context which is considered part of the reality in the 21st century, while internationalization contains policies and practices

that are undertaken by institutions and academic systems, or even among individuals attempting to cope with the global academic environment. Programs for international students, branches for campuses, establishing English-medium programs and degrees, and cross-border collaborative arrangements are specific initiatives of internationalization; and monitoring its initiatives and ensuring quality is integral to international higher education (Altbach, 2009). Naturally, there is a need to attract more international students as is the case in many other countries. Student mobility becomes an important issue because the number of international students is considered a significant indicator of institutional competitiveness (Ullbeg, 2015). Therefore, mobility, that is students' movement from country to country, is considered to be a critical issue worldwide.

Considering the increase in the number of established universities and other higher education institutions, coupled with people's reluctance to continue their studies, it can be inferred that universities have been put into a competitive arena with a remit to attract international students by improving the quality of their education and their facilities. As Shin (2009) points it out, there will be a competition with contradictory goals among well-established higher education institutions to expand access on the one hand and to improve quality on the other.

Montoneri et al. (2012) state that universities must enhance their reputations to ensure their future due to the increasingly competitiveness in HE in the world. Therefore, higher educational institutions need to improve quality, which plays a significant role in implementation strategies. Even in most European states, national systems of evaluation have been created to ensure the desired quality (Thune, 1998).

To evaluate the quality of higher education, there is a need to define quality first, and to define the factors contributing to its audit and evaluation. There are different views concerning the definition of quality in this respect, and here we refer to Harwey and Burrows (1992) who discusses the relationship between quality and standards of higher education. They identify five concepts of quality in higher education as: i) quality as being exceptional, ii) quality as perfection or consistency, iii) quality as fitness for purpose, iv) quality as value for money, v) quality as transformative, which is interpreted as the empowerment of students in developing new skills and knowledge which is the focal point of this study. As stated in Cave (1997), the Council for National Academic Awards in 1990 identified six core dimensions related to educational quality as, a) curriculum design, b) content and organization, c) teaching, learning and assessment, d) students' progression and achievement, e) students support and guidance, learning resources; f) quality assurance and enhancement (p.46).

As already mentioned, to evaluate quality, we need to consider the contributing indices. Cave (1997) states that to establish a system of quality audit and quality assessment, there is a need to define their relationship with performance indicators, as well. In educational context, one of the prominent performance indicators affecting quality at micro level is teacher performance in classroom and its evaluation as it is an integral part of quality assessment (Avalos-Bevan & Bascope, 2017; Derrington & Campbell 2018; Elstad & Christophersen, 2017; Flores & Derrington, 2018). The performance evaluation of teachers and academicians seems crucial in upholding quality which directly influences learners' performance and most importantly their satisfaction of teacher performance, course contents, and

assessment (Bini, & Masserini, 2016). One of the widely used measures for evaluating teaching quality in higher Education is the Students' Course-instructor Evaluation survey (hereafter SCE) (Vanacore & Pellegrino, 2019). SCE survey is an extensively utilised measure for the evaluation of teaching quality in higher education (Vanacore & Pellegrino, 2019). EAP teachers normally are provided feedback on their performance by their managers, colleagues and to a lesser extent by their peers and students, as students' Course-instructor evaluation survey. Weerasinghe and Fernnado (2017) define students' satisfaction as a temporary attitude founded on available services, facilities and educational experience. Feedback provided by students is considered as a valuable indicator with regards to the curriculum and teaching quality and performance (Surujlal, 2014). For most part of the research, the extent of teacher performance effectiveness is evaluated from the perspectives of course content (Wang et al, 2014), classroom observations (Garrett & Steinberg, 2015), novice teacher's performance (Darling-Hammond, Newton & Wei, 2013), in-classroom behaviour displayed by the teachers (Seidel & Shavelson, 2007) along with the assessment of teaching effectiveness and the cognitive attributes of the educators (Klassen & Tze, 2014).

Despite the importance of students' satisfaction that can be a significant contributor to enhancing teacher performance, limited amount of research is concerned with the investigation of student's feedback with regards to the educational system at micro level that encompasses class activities, curriculum and teacher performance efficiency. Furthermore, students' satisfaction in higher education utilise uniform statistical data analysis illustrations to evaluate EAP teacher performance, such as applying percentage and variance.

The Students Course-instructor Evaluation (hereinafter SCE) survey, completed by the students at the end of each semester, can have both individual and administrative uses in an institution or department. Taking into account its individual application, it can be applied to inform the instructors about their shortcomings and strengths in teaching which certainly contribute to the improvement of their students' learning, and thus enhancing the quality of education. The SCE feedback can be very reliable, can be multi-dimensional, can focus on the quality of instruction rather than course content (a far harder thing for learners to assess, especially in mid-course), and can be useful at administrative level when it comes to personnel selection (Marsh, 2007). The results obtained from SCEs can be applied later to evaluate the instructor's effectiveness of teaching-learning activity which can be used in the process of promotion, tenure decisions and annual reviews.

In the United States of America, students' questionnaire has been a significant characteristic for a systematic review of teaching in higher education. Students' ratings have always provided sufficient data to evaluate teaching in colleges in the US, Cook (1989). Almost 75 percent have applied students' ratings which provide indicators of the quality of instruction (Ory & Parker, 1989). In Australia and UK, data driven from students' evaluation is valued and considered as a valuable Performance Indicators in 1990s. Using data driven survey can be the most direct way that instructors' teaching performance can be assessed and evaluated regardless of classroom observation by instructors and peers. By means of doing modification on SCE's and specific statistical applications, quality assessment on the basis of effectiveness and efficiency can be made.

Cave (1997) discusses the concept of quality in the development of evaluative states, and refers to efficiency and effectiveness as performances that incorporate inequality, in which higher education was no exception. Lindsay (1992) considers effectiveness and efficiency as two dimensions of institutional performance components to ascertain whether a department is able to attain its goals, and if it can apply its resources efficiently. In sum, effectiveness can be the compatibility between outputs that are the main goals and other criteria in relation to efficiency. In fact, the concept of effectiveness connects outputs with inputs. Martin (2006) considers efficiency improvement and transparency as the principal challenges for all European countries since the declaration of Bologna, which, as it states, “emphasized the creation of the European area of higher education as a key way to promote citizens' mobility and employability and the Continent's overall development” (Barrette, 2017, p. 214).

Therefore, quality can be improved by assessing the efficiency of the teaching indicators, since they are in direct relation to the students' learning performances. At this point, it would be necessary to define what in fact efficiency means.

Efficiency in education is defined as achieving the greatest amount of education output from a given level of inputs. In an educational context, inputs refer to teaching performance, course contents, exams and assignment in class and output is the yields of the input, such as students' achievement and learning.

Efficiencies can be assessed by applying various quantitative evaluation methods, through statistics, regression, stochastic frontier analysis, Data Envelopment Analysis (thereafter, DEA). Martin (2006) considers DEA as a method which can

handle multiple inputs and multiple outputs, which makes it an attractive choice of technique for measuring the efficiency of higher education institutions (HEIs).

DEA is a non-parametric assessment approach, that has been applied in various fields for performance benchmarking and relative efficiency measurement among homogeneous evaluated units, commonly called Decision Making Units (DMUs). To express it more clearly, DMU is a group of entities in an educational context which are directly and indirectly influenced by the educational service. As pointed out in Cooper, Seiford, and Zhu (2000), DEA has also been applied to propose new views into activities (and entities) that have previously been assessed by other methods. It is proven to be useful in uncovering relationships that remain hidden from other methodologies, (Cooper, et al. 2000). A significant amount of research has been conducted which has applied DEA for assessing the efficiency of higher education in different countries, among which we can refer to the university of Australia by Avkiran (2001), Abbot & Doucouliagos, (2003); the university of Spain by Pina & Torres (2003), Groot and Garcia-Valderrama (2006); the university of China by Li & Ng (2000), and in Canada by McMillan & Datta (1998). Each study considered different factors related to teaching techniques, research conducted by instructors, and other internal and external aspects based on the aims of the study.

1.2 Statement of the Problem

SCE survey has become an indispensable part of the evaluation process to uphold the quality of education at Eastern Mediterranean University. Its validity and reliability have been tested by the committee members of the university in 2001. The survey has been applied in evaluation at faculties and departments in order to get accreditation such as ABET in engineering faculties and AQAS in English Language

Teaching Department. However, it has been observed that, the SCE analysis related to the quality has not been paid full attention in the whole institution, specially, the School of Foreign Language unit for evaluating the teacher performance of EAP course. Moreover, the survey always focuses on evaluating the quality of the instruction and the degree of effectiveness of the instructors' performance on students' learning. However, it has never been applied to evaluate the degree of efficiency performance of instructors or to identify the significant teaching-learning indicators involved in teaching performance.

Last but not least, the DEA has been applied to evaluate the efficiency performance of HE in large scale, for instance, Nazarko and Šaparauskas (2014), the efficiency performance of 19 Polish universities; Wolszczak-Derlacz (2017) the efficiency in higher education institutions in Europe and the U.S. However, surprisingly, it has not been applied for the evaluation of efficiency of teacher performance in small scale, such as classroom.

1.3 Purpose of the Study

The current study aims at finding and evaluating efficiency of EAP teacher performance applying DEA. Furthermore, it tries to identify the most significant teaching-learning indicators which affect the efficiency of teacher performance and the students' achievement. Applying DEA enables the researcher to prioritize the teaching-learning indicators, as well.

The study attempts to open a new way of evaluation and analysis of the results of SCE questionnaires and the students' final grades, and a different interpretation of the students' test scores related to their feedback towards their course of study. The

research is conducted in the Modern Language Division, a branch of the Preparatory School in Eastern Mediterranean University, which offers reading and writing courses for academic English. Students who study in an English medium department take academic English - provided that they have already passed the proficiency exam.

1.4 Research Questions

This research attempts to identify the fundamental indicators of teaching-learning indicators which can have significant effects on the efficiency of EAP teacher performance. In order to achieve this aim, four English academic courses are considered. The focus is on the academic courses offered to the students who have already passed the proficiency exam. In order to investigate the major indicator, the following questions were put forward:

- 1) What is the efficiency level of EAP teacher performance in the Academic reading-writing classes?
- 2) Which indicators have (the most) significant impact in the efficiency of teaching performance and students' learning in EAP classes?
- 3) Which indicators need to be improved to ameliorate the inefficient EAP classes?
- 4) How can the efficiency of teaching-learning in EAP classes be improved as perceived by instructors?

1.5 Significance of the Study

The study is significant for several reasons. Firstly, the research applies DEA software program (Performance Improvement Management, thereafter PIM-DEA) which has been applied in some higher education institutions on a large scale, but to

the best knowledge of the researcher only a few research has evaluated teaching performance on a small scale, using PIM-DEA.

Secondly, it aims at evaluating the efficiency performance of EAP teachers and identifying the (significant) teaching-learning indicators which are believed to have impact on the efficiency of EAP teacher performance. It is believed that identifying the significant teaching-learning indicators can unveil some hidden facts related to these indicators and improve the quality of education.

Thirdly, the students' course-instructor evaluation survey (SCEs) has been applied to assess the effectiveness of teachers' teaching performance but not to reveal the degree of its efficiency in relation to improving quality and the learners' learning.

In this study, freshman language learners of general English courses are considered only. Gender differences are not taken into account in this study; both male and female students are considered together. Age is regarded as a constant variable.

1.6 Definition of the Key Terms

- **Data Envelopment Analysis:** It is a data-oriented approach for evaluating the performance of a set of peer entities called decision making units (DMUs) which require multiple inputs to produce multiple outputs for measuring the performance of educational institutions, departments, courses, and students. In this study, inputs are course contents and teaching skills and outputs are students' satisfaction of assignments, exams and grading.
- **Decision Making Unit (DMU):** It refers to a group of entities within an organization that directly or indirectly influence the educational service

provided. In this research, DMUs are used for context, the class, EAP teachers and the students.

- Effectiveness: It is the fact of producing the result that is intended, or successful. In an educational context, effectiveness is defined as the ability of a school or institution to gain its institutional goals such as teaching required knowledge and transmitting cognitive thoughts and methods (Cornali, 2012).
- Efficiency: It is defined as a measure of the ability of an organization to produce the maximum output of acceptable quality with the minimum of time, effort, and other inputs.
- Efficiency is considered as the ability of an organization, a School of Foreign Languages, producing the service or outputs while applying minimum level of resources (for more information, check Sherman & Gold (1985).
- Input: It refers to the products, services and material obtained from suppliers to produce the outputs delivered to stakeholders in quality glossary.
- Inputs in this study refer to teacher performance, course contents and materials delivered in class.
- (<https://asq.org/quality-resources/quality-glossary/t>)
- Quality Assurance: It is defined as techniques that monitor operations and test outputs in order to ensure quality consistency by identifying errors and opportunities to improve. It is a holistic approach covering all the processes in a higher education institution, in order to serve the students and other stakeholders in expected quality standards (Kahveci, Uygun, Yurtsever & İlyas, 2012).
- Output: It is defined as the total number of students that finally acquire educational success in their school life. Output is considered to be the end

product of the educational inputs, and is realized by a thorough process of evaluation, and ensures the desired goals of output have been achieved.

- Performance indicators: They are defined as the levels of performance and achievement of teachers, managers, institutions, and local authorities which are monitored against national standards and against targets which may be imposed by government policy (Sivertsen, 2010).

Chapter 2

LITERATURE REVIEW

2.1 Introduction

This chapter presents a comprehensive review of the research to date on the importance of quality assessment as well as its contributing indicators in higher education. Further, it reviews teaching models and instructors teaching in English for Academic Purposes course. It also introduces Data Envelopment Analysis, its role in quality assessment and teacher performance evaluation and reviews the key performance indicator in higher education. The chapter concludes with the pertinent studies conducted in teacher performance evaluation and a summary.

2.2 Quality of Teaching in Higher Education

Quality has received increasing attention since higher education is more exposed to the massification and internationalisation challenges (O'Neil & Palmer, 2004). Quality is a concept which cannot be described or understood easily. It is a value-laden term that is subjectively associated with what is worthwhile and good. Green (1994) defines the traditional notion of quality as the concept of providing a special and distinctive product or service that confers status on the own. In higher education, quality can have multiple aims, such as effectiveness in achieving institutional goals, and meeting important needs (Green, 1994).

Throughout the literature, five different views of quality are recognized in higher education: (a) reputational, collective agreement about the quality of a given

institution usually used in ranking, (b) resources, the assumption on the better input (student, teachers, facilities), (c) outcome, based on the perspective that quality is to be judged by universities' products as graduates, publications, (d) content and valued-added, assessed based on the contribution to the intellectual and personal development of the students (Astin, 1985).

To achieve the quality, higher education is required to set the delivery, production, and presentation with extremely high standards which can only be achieved at great expense or use of scarce and unachievable resources by most of the population. Recently, higher education focuses more on improving their quality of education and invests on their significant resources, such as teacher professional development towards improving service quality applying accreditation criterion (Martinez-Carrea, Cegarra-Navarro & Cepeda-Carrio, 2015). In relation to the quality of teaching, there can be two different questions, whether we are concerned with the quality of inputs, such as human and physical resources, outputs in the shape of graduates, or the process of teaching and learning itself (Green 1994).

Quality in EAP contexts, can be evaluated with the current framework offered by specialist accreditation of EAP course (Blaj-Ward, 2014), named as British Association of Lecturers in English for Academic Purpose (BALEAP). The BALEAP Accreditation Scheme (BAS) is a UK-based full institutional BALEAP member, which highlights features of good teaching performance and make advisable, essential, and desirable recommendations to enhance the quality of teaching and build capacity and secure standard (Blaj-Ward, 2014). BAS accreditation focuses on observation of teaching, and a detailed attention is paid to ways of measuring student performance and progress and to curriculum structure and

content (Blaj-Ward, 2014). Several studies have been conducted in other countries which evaluate quality from various perspectives, for instance, the international association of Evaluation and Accreditation of Quality in Language Services (EAQUALS) concerns about the identification of learners' and course participants' needs (Bocanegra-Valle, 2010). In Japan, a guide to theoretical and conceptual framework has been designed for quality evaluation (Surujlal, 2014), and a commission on program accreditation of English language program defines standards in EAP (Surujlal, 2014).

Institutional accreditation, provided primarily by regional associations of colleges and universities, and specialized accreditation of specific program areas. These programs are carried out by professional associations and provide evidence that institutions or programs meet specified minimum requirements and criteria. This encourages institutional teaching quality improvement. Accreditation processes normally require an institutional self-study that emphasizes peer review and focuses on the assessment of teacher performance, student academic achievement as an important outcome, along with measure and tool for program improvement. Considering the evaluation of teaching and learning process, two main factors of quality can be the evaluation of 'efficiency' and 'effectiveness' of teacher performance.

2.2.1 Efficiency vs. Effectiveness

Lindsay (1982) considers effectiveness and efficiency to be the two dimensions of institutional performance in the evaluation of quality. Effectiveness can be seen as the compatibility between outputs as the main goals; however, efficiency can be defined as 'using limited resources to promote society's objectives as fully as

possible' (Kenny, 2008). There might be confusion over its' application; however, it can be an appropriate goal for educational system, when properly applied. Efficiency, in fact, refers to a comparison of inputs and their related outputs. In this study inputs and outputs will be selected from the items of SCE questionnaire and the students' final grades.

Viljoen (1994) describes efficiency as relating to 'how well an activity or operation is performed' (p.9) while effectiveness relates to performing the correct activity or operation. Efficiency measures how well a university does what it does, but effectiveness raises value questions about what the university should be doing in the first place. Efficiency, in this research, refers to how well EAP teachers perform at allocated time and course material to achieve the best students' achievement.

Efficiency in education occurs at a time when outputs can be test results or value added and are produced at the minimum level of resources, such as financial or the minimum staff number and course content in a restricted time (Johns, Portela & Thanassoulis, 2017). That is, the target in efficiency is to achieve maximum result (output) utilising minimum effort (inputs) at a restricted time. Therefore, efficiency can be seen as arising from expending the least amount of time, effort, or money on the development of an acceptable product or accomplishing a certain goal, in this case learners' performance. Both efficiency and effectiveness are performance indicators in quality assessment. As indicated in Figure 2.1, efficiency focuses on getting the maximum output (students' satisfaction with grades and assignment, and final grades) with minimum input which is teacher performance and course. However, effectiveness measures if actual output meets the desired objectives (Bartuševičienė & Šakalytė, 2013). Effectiveness determines the policy objectives of

the university or the degree to which a university realizes its own goals (Zheng, 2016). On the other hand, efficiency measures the relationship between the inputs and the outputs or how successfully the inputs have been transformed into outputs (Bartuševičienė, et al., 2013). In our case, the inputs are ‘course contents’ and ‘teachers’ teaching skills’ and the outputs are the ‘students’ satisfaction of assignments, exams and grades and their final grades’.

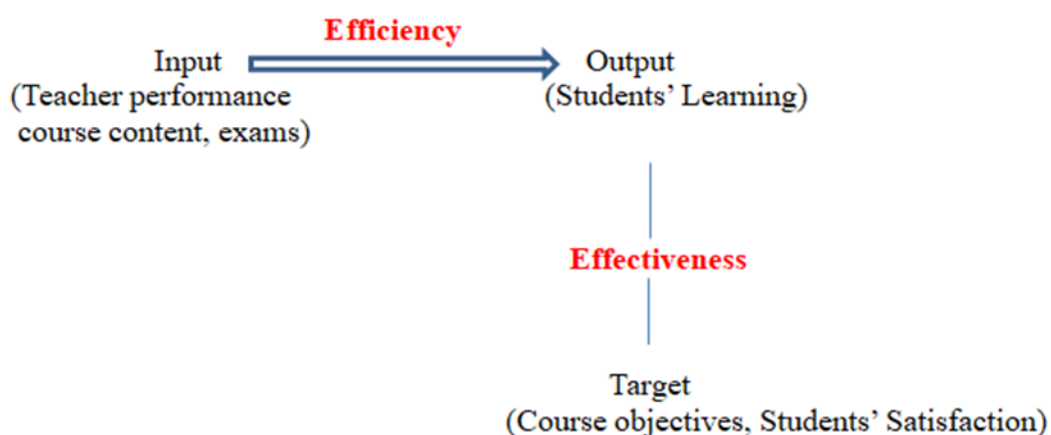


Figure 2.1: Efficiency and effectiveness

Efficiency in Education is frequently confused with educational effectiveness, and at times. The two terms are (inappropriately) used interchangeably. Educational effectiveness can be defined as ‘whether or not a specific set of sources has a positive impact on the learners’ achievement and, if so, its degree’ (Shohoudi, Zandi, Faridi, Fathi & Safari, 2015). The Australian Learning and Teaching Council (2008) considers teaching efficiency as one of the basic standards of teaching approaches that encourage the learners to learn. Bell (2005) mentions that despite little agreement among some aspects of teaching efficiency, almost all research studies come to a conclusion that efficient teachers seem highly interested in the topic of their teaching and try to provide a relaxing and safer environment for learning. Shouhodi et.al, (2015) state that classroom management, use of students’ idea,

organization of materials, flexibility, use of different teaching methods, task-orientedness and respecting students are the most important characteristics of efficient teachers. Furthermore, Kreber (2002) considers control over content and teaching subjects as the further dimensions of teaching efficiency. Four different types of knowledge for teaching efficiency are described as (i) knowledge of content, (ii) general pedagogical knowledge, (iii) pedagogical content knowledge, and (iv) knowledge of learning and learners (Rüütman & Vanaveski, 2009). In foreign language context, students praise those teachers whose attributes can reduce concerns and anxiety in learning a foreign language. Having a considerate and friendly relationship with the students is expected from teachers (Bruce, 2013). In a study carried out by Agbetsiafa (2010, as cited in Shouhodi et.al, 2015), there is a positive correlation between students' perception of teaching efficiency, effective relationship, facilitating learning and clarity of course elements, course evaluation and feedback.

2.3 English for Academic Purpose (EAP) in Higher Education

Several scholars define EAP from different perspectives. EAP refers to English for Academic Purpose, what differentiates it from general English, is its focus on specific purposeful uses of language, which uses context-reduced language, more abstract texts and depends less for its coherence on an immediate context comparing with the language of every day interaction (Cummins, 1982). In EAP, the curriculum designers examine the target language features in academic texts and the teachers focus on these features in their classes, therefore, specificity reflect the kind of data collected by the researchers, the way it is collected, and the theories used to understand it (Hyland, 2016). The focus on specificity, as stated by Hyland (2016), unfolds the key concepts such as genre, discourse community, authenticity, audience,

and communicative purpose (p.17). Flowerdew and Peacock (2001) define EAP as teaching English aiming at studying or conducting research in that language. In fact, EAP is the language and related practices that the learners need to study or work in English medium higher education (Gillette, 2011); therefore, its aim is to teach some of the linguistic and cultural practices involved in studying or working through the medium of English (p. 1).

There are some controversial debates in this regard. For some researchers EAP is a subcategory of English for Specific Purpose (ESP), a branch of English with other fields, General Purpose and Social Purposes, along with (EOP) (Jordan, 2002). EAP is usually considered to be a branch of ELT, a type of (ESP) in which teaching content matches the language, practices and the educational needs of the learners (Gillette, 2011). However, Alexander, Argent, & Spencer (2008) argue that in EAP the focus is on the cognitive skills like critical thinking and language content is limited to academic discourse and the texts based on academic genre, while, in ELT the emphasis is more on language learning and little emphasis is placed on study skills. In conclusion, it is better to make a distinction between language study skills which play a main role in EAP course and general study skills that are not related to languages (Hyland, 2016). Like any other programs in higher education, the quality of EAP is considered essential to improve the quality of teaching and the program. British Association of Lecturers in English for Academic Purpose (BALEAP) Accreditation Scheme, managed by a committee of volunteers, is course-specific, multifaceted, and comprehensive to ensure that the learners' needs are met (Blaj-Ward, 2014). Quality evaluation focuses on not only the degree of success of the

EAP learners but also on the quality of the models applied by the instructors in course.

2.3.1 Review of Related Studies in EAP

The importance of teacher performance evaluation as an integral part of quality has been emphasized in many research (Avalos-Bevan, 2018; Derrington & Campbell, 2018; Elstad & Christophersen, 2017; Flores & Derrington, 2018). In higher education, the performance evaluation of teachers and academicians seems crucial in upholding quality which directly influences learners' performance and most importantly their satisfaction (Bini & Masserini, 2016; Gómez & Valdés, 2019). One of the widely used measures for evaluating teaching quality in Higher Education is the Students' Course-instructor Evaluation survey (SCE) (Vanacore & Pellegrino, 2019). The teacher evaluation like EAP teachers attracted a great deal of attention in the quality assessment of higher education which can be evaluated through several methods from two different aspects, effectiveness or efficiency, as two main concepts in quality evaluation. In higher education, EAP teachers usually receive feedback from the superiors, peers or colleagues to a lesser extent and students as evaluation of their performance. Students' satisfaction as defined by Weerasinghe and Fernando (2017) is the temporary attitude resulting from educational experience, facilities, or services. Teachers consider students' feedback as a valuable indicator of the quality of their teaching performance and the curriculum (Surujlal, 2014). In other words, they adjust their teaching methodology, syllabus and evaluation, accordingly. In the majority of the research, the degree of the effectiveness of teacher performance has been evaluated from different perspectives in higher education, such as course content (Hsu, 2017), examining teacher effectiveness using observations in the classroom (Garrett & Steinberg, 2015), effectiveness in novice teachers'

performance (Darling-Hammond et al., 2013), in-classroom behaviors of teachers (Seidel & Shavelson, 2007), and psychological characteristics of the teachers and evaluating teaching effectiveness (Klassen & Tze, 2014).

In evaluating teacher efficiency, we can refer to Shohoudi, et al, (2015) who measure teaching efficiency by Safari's scale, consisting of 24 items and five dimensions: content presentation skills, control over content, lesson plan development, learning evaluation and class management and concluded that teachers' efficient teaching impact students' academic self-efficacy, which orienting them toward self-directed learning. These items of the scale are also the reflection on quality teaching. Some research had also been conducted on evaluating teacher performance in EAP courses in general (Avalos-Bevan, 2018; Flores & Derrington, 2018; Lejonberg et al., 2018; Su et al., 2017; Thanassoulis et al., 2017; Tuytens & Devos, 2017). Applying DEA to assess English writing progress of university students using "MY Access" in Taiwan, the work by Montoneri, Moslehpour & Chou (2011) aims at analyzing the progress of the students in writing and the motivation to apply DEA to calculate students' relative learning efficiency in English writing. Ersoy (2021) aims at performance evaluation of distance education departments of public universities in Turkey for the 2018–2019 academic year applying DEA. The study aimed at comparing and ranking the efficient measurement among universities. Another study conducted by Lee and Johnes (2022) in which they employed a network data envelopment analysis model that truly reflects the production process of HE and incorporates qualitative and quantitative data drawn from the UK Teaching Excellence Framework (TEF) in order to capture the impact from teaching quality and the graduate employment outcomes.

Application of data envelopment analysis on the indicators contributing to learning and teaching performance by Montoneri, Lin, Lee & Huang (2012) aims at designing a diagram of teaching performance improvement mechanism to identify key performance indicators for evaluation to help teachers focus their efforts on the formulated teaching suggestions. They have applied DEA to explore the quantitative relative efficiency of 18 classes of fresher students studying a course of English conversation in a university in Taiwan between 2004 and 2006.

As it is clear, students' satisfaction of teaching has significant contribution in improving teacher performance, limited research has focused on students' feedback on educational system at micro level, which includes the study of efficiency of teacher performance, designed curriculum, and class activities. Furthermore, in the majority of the students' satisfaction studies in higher education, regular statistical data analysis illustrations, such as using variance, percentage are applied to evaluate EAP teacher performance. Yet, to come up with more objective results, distinctive methods can be applied.

2.4 Teaching Models in EAP Classes

EAP teaching practices have gone through several phases from product-focused approach, process-focused approach and genre-focused approach and models. As Princas (1982) outlined, the product approach considers writing as being basically about linguistic knowledge with a focus on the appropriate use of vocabulary, grammar, and cohesive device. The process approach, on the other hand, emphasizes that students should be instructed to move through generation of ideas, data collections, organizing and revising, and finalizing the text. Genre based approaches came under the spotlight following the shift from product-oriented approach to

process-oriented approaches (Hyland, 2014). This approach considers writing as both linguistic (as in product approach) and social context-based (focusing on communicative purpose). Hyland (2004) states the following advantages of genre-based approach; i) it is explicit, this makes clear what is to be learned and facilitate the acquisition of writing skills; ii) it is systematic and provides a coherent framework for focusing on both language and contexts need-based; iii) it ensures course objectives and content are driven from the students' needs. However, there are two concerns about this approach. Byram and Feng (2004) points out that genre-based approach underestimates the skills required producing content, and that it neglects learners' self-sufficiency. Likewise, if teachers spend class time explaining how language is used for various purposes and for a range of readers, learners are likely passive. Therefore, the genre-based approach is blamed for restricting learners' creative thought about content and is criticized in that it overlooks natural process of learning and learners' creative creativity (Badge & White, 2000). Finally, Bawarshi (1999) believes that genre-based approach, at its best, helps learners to identify and interpret literary text, while at its worst, and interferes with the learners' creativity.

A recent model suggested by Badge and White (2000) for writing instructions is a process-genre approach which includes the strength of above-mentioned three approaches. In this approach, teaching writing skill is in fact the combination of previously discussed approaches as in providing i) the learners with input as in product approach (knowledge about language); ii) the purpose of writing as in genre approach (knowledge about the context); iii) drawing on learners' potential as in process approach (skills in using language). Reonal (2015) mentions that integrative use of process and genre-based approach helps the students to improve their skills in

using language by experiencing a whole writing process as well as gaining knowledge of the context and the purpose of their writing. Kim and Kim (2005) stated that in this approach, writing is viewed as involving knowledge about language (as in genre approach), knowledge of the context in which writing happens and especially the purpose for the writing (as in genre approach), and skills in using language (as in process approach). Hence, process genre approach allows the students to take benefit from the process of writing; prewriting, drafting, revising and editing and get familiar with the text they are going to produce.

The process-genre approach in Babalola (2012) have some characteristics, such as the learners' creative thinking, the structure of text, the knowledge of linguistic features, and the social function of the text. The procedure of process-genre approach are preparation, modeling and reinforcing, planning, joint constructing, independent constructing, and revising stage (Badger & White, 2000; Yan, 2010).

Several researches have been conducted regarding various practices of EAP teaching models. Uzun & Topkaya (2020) study the effects of genre-based instruction and genre focused feedback on second language writing performance. Bruce (2019) explores the application of critical thinking to teaching academic genre-based approach. Therefore, teachers are required to choose approaches which can accommodate time, students' needs and the practice in order to promote a better writing activity in classroom. Using an appropriate approach for teaching writing is expected to encourage the students to deliver their ideas into a proper writing.

2.5 EAP Teachers' Knowledge and Competencies

A general definition for the concept of competency is the level of skills, knowledge, and attitudes (Tigelaar, Dolmans, Wolfhagen, & Van Der Vleuten, 2004). Koster and Dengerink (2008) define teachers' competency as the combination of skills, knowledge, personal characteristic, and values which empower the teacher to act appropriately and professionally and convey them in coherent way. Teacher competency, as stated in Roostin (2019), is classified into four areas: personal competency: illustrating certain characteristics such as maturity, faith and devotedness, stability and sensibility, professional competency: the teachers' ability to master engineering, science or other subjects, social competency: the ability of teachers to be part of the teachers' community such as socializing and communicating effectively with teaching staff, teachers, students and students' parents, and pedagogical competency: teacher's ability to manage the students' learning. These points are all signifying the norm of quality tied to efficiency of teachers which foster students' learning, that is, the output of the designated inputs. According to the above-mentioned classification, the evaluation of teacher competency consists of standardized core battery test to measure communication skills, professional and general knowledge and a specialty area test to measure understanding of the content and methods. Delamere (1985) classifies evaluating teacher competency into three main categories as test of knowledge (e.g. second language acquisition process, learning theory, psychology of education, psycholinguistics, sociolinguistics, effective learning strategies , skills, and attitudes, etc.), skills (e.g. assessment and diagnostic skills, teaching techniques-"a bag of tricks", flexibility and ability to "switch gears" when necessary in the classroom, etc.) and attitudes (e.g. Interpersonal skills, Intercultural awareness and intercultural skills,

Empathy with students, etc.) (p. 329-330). British Association of Lecturers in English for Academic Purpose (BALEAP) describes the required knowledge and skills for EAP teacher in a competency framework which consists of 11 specific teacher competencies. This framework is divided by four main areas, such as, academic practice, EAP students, program implementation, and curriculum development (Gillete, 2011). An EAP teacher according to this framework will be capable of facilitating the students' learning of the language, strategies and skills needed for studying in a further or higher education context (Gillete, 2011). Evaluating EAP teacher competency can play a crucial role in upholding the quality of teacher performance. Each of these four main areas will be discussed in the next section. A summary of the 11 specific competencies is illustrated in table 2.1.

Table 2.1: BALEAP specific competency frameworks

A Units	Academic practices	an EAP practitioner will:
A1	Academic contexts	have sufficient knowledge of the organisational, educational and communicative policies, practices, values and conventions of tertiary education to operate successfully in such academic environments.
A2	Academic discourse	have a high level of systemic language knowledge including knowledge of genre and discourse analysis.
A3	Academic disciplines	be able to recognise, explore and apply to their professional practice, knowledge of disciplinary differences and how they influence the way knowledge is expanded and communicated.
B Units	The student	an EAP practitioner will:
B1	Student needs	understand and apply knowledge of students' prior learning experiences, their expectations, their personal, linguistic and academic needs and the academic literacy requirements of their target academic situation.
B2	Student learning	understand the relevance of individual differences to practice and the role and importance of critical thinking and autonomy in academic contexts and will employ tasks, processes and interactions that enable students to develop these.
C Core Units	Course delivery	an EAP practitioner will:
C1	Teaching practice	be familiar with the approach, methods and techniques of communicative language teaching, be able to locate these within an academic context and apply these to the design and planning of learning activities and to teaching the language and skills required by academic tasks and processes.
C2	Assessment and feedback practice	be able to assess academic language and skills competence using appropriate formative and summative assessment and provide appropriate feedback.
D Units	Programme development	an EAP practitioner will:
D1	Course design	understand the main types of language syllabus and will be able to deliver and transform a syllabus into a course or programme that addresses students' needs in the academic context within which the EAP provision is located.
D2	Quality assurance & enhancement	be able to use, design and implement a range of quality assurance and enhancement instruments and utilise results to inform development of own teaching practice, course quality and the student academic experience.
E Unit	Professional development, research and scholarship	an EAP practitioner will:
E		recognise the importance of applying to their practice the standards expected of students and other academic staff whilst engaging individually and collaboratively in continuing professional development, research and scholarship in the TEAP discipline.

2.5.1 Academic Practices

Teachers' role in higher education is multifaceted and complex. Academic practices refer to all contractual responsibilities of teachers in higher education which aims at pursuing excellence in various directions, such as teaching, research and scholarship, academic administration, management, and supervisions (Fry et al. 2008). According to BALEAP Competency framework, academic practices can be classified into three main areas: i) academic context (teachers' sufficient knowledge of organization and educational policies, ii) academic discourse (teachers' high level of systematic language knowledge of genre and discourse, iii) academic disciplines (the ability of teachers to recognize and explore disciplinary differences and apply to their professional practice). Several research conducted in quality evaluation of academic practices performed by EAP teachers. Recently, social media tools such as Facebook or Research Gate, media-sharing platform like YouTube and content creation services like Blogs or Wikis have become popular tools which affect the current practices of academics in higher education.

Various studies have focused on the function and role of social media in scholarly lives (Li & Greenhow, 2015). Some authors believe that using social media seems to engage learners and academicians more in an effective way (Veletsianos, 2013; Li & Greenhow, 2015) or it can enhance teachers' professional identity (Fitzmaurice, 2013). Charles (2022) investigates the studies conducted in EAP context dated from 1975-2019. Her aim was to ascertain the most frequently researched topics and their variety over the 45 years. In her research, the results of genre and academic literacy of academic practice are among the lowest number of the research conducted in the

given period. The question is whether using social media can improve EAP teacher performance effectively or efficiently.

2.5.2 The Student

The development of societies has always been closely related to the outputs of Higher Education (HE) system. Students in higher education are expected to be equipped with accurate and qualified teaching systems to be able to achieve more efficient learning outcomes, specifically because HE institutions are strongly linked to students' future achievements and higher employability rate (Rhodes, 2012). More specifically, EAP students will be more satisfied in terms of learning performance if teachers can meet their educational needs.

Students in EAP courses, according to BALEAP, are considered from two main perspectives, their needs, and their learning. Students' needs matter in syllabus design in EAP course. Hyland (2002) emphasizes that EAP course is most successful if it is adjusted to the needs of specific circumstances of students. For this reason, course design usually involves working with different departments, lecturers, and students.

Regarding the students' needs, various studies have been conducted on designing content and curriculum in EAP. For instance, Hyland (2002) recommended EAP curriculum managers to start from students' rights and needs within the context (p. 282), an overview of involved choices which cover areas of formatting the programme, daily schedule, pedagogical principles, management of classroom pattern (e.g., team-teaching, self-instruction) and classroom performance (e.g., teacher-managed classrooms, use of listening and computer lab, etc.). Gillette (2011) considers conducting needs analysis, objectives, and goal setting, and devising and

evaluating syllabuses as the primary stages of curriculum that need to be managed. Therefore, the first stage in EAP syllabus design is to investigate the needs and rights of the students, and later determine the content, tasks, and assignments of the EAP program, which meets the objectives of the course. Many scholars believe that the early stage in course design is significant. Gillette (2011) mentions that what the students need to know in their English-medium academic contexts is the starting point. Hyland (2002) and Baştürkmen (2003) emphasize that important decisions need to be made at the early stages on the course type, whether it should be linguistically wide which focuses more on general academic language and practice, or it should be narrowed and concentrated on the language needed for a special subject or task, according to the needs of the students. Several case studies illustrated how course developers worked with particular needs of the learners and that developing course might be pedagogically, linguistically or financially motivated (Baştürkmen, 2014). All the points put forward above, are the indicators of the notion of quality which in fact is the key to learning.

Considering quality in higher education, McNaught (2013) defines quality and the various approaches to quality assessment and the establishing quality system, as throughout the process of curriculum, quality needs to be considered dramatically. Grabe and Stoller (2013) provide an in-depth discussion of innovations and draw attention to its characteristics, and various methods in curriculum and syllabus design. As Bocanegra-Valle (2010) states a quality assurance approach supervises the extend in which teaching material have been improved to meet the learning objectives need and to the extend these objectives have been attained and the degree they have been covered. Heyworth (2006) suggests that the outcome of need analysis

can be used as a basis for critical reflection about teaching, which can improve teaching quality and help teachers achieve their professional growth. Moreover, several attempts have been made to link quality assurance to need analysis and teaching performance evaluation, such as: students' evaluation of program (Bardi & Muresan, 2012); continual assessment of target need of learners to improve the quality (Belcher, 2009). Furthermore, BAS, quality accreditation framework, examine teaching and curriculum structure and content to ensure learners' needs are met. This accreditation involves observation and that the issue of teaching and a closer focus is paid to curriculum structure and content and to the students' performance and progress (Blaj-Ward, 2014). Bocanegra Valle (2015) believes quality teaching is achieved only when it is related to an effective need analysis and the related curriculum in English for Academic Purpose (EAP).

The second important factor considering in BALEAP competency framework for EAP students is their learning. There are a variety of factors influencing student achievement and other learning outcomes, for instance, Centra & Potter (1980) believe that conditions within the school or the community and the inherent characteristics of the student influence their achievement. Medley (1977) states that teacher performance is in direct relation with students' learning. The obvious way to a lay person to evaluate a teacher, is by measuring how much the students learn from their teacher in class. Teachers consider students' achievement as a valuable indicator of the quality of their teaching performance and the curriculum (Surujlal, 2014). Warring (2015) considers teacher performance as most influential educational and predictor factor of students' achievement, as well. Students' achievement is a crucial element in evaluating EAP teacher performance and enhancing quality in

higher education. In most of the research, the degree of the effectiveness of teacher performance are evaluated from various perspectives in higher education, such as course content (Hsu, 2017), examining teacher effectiveness and students' achievement in the classroom (Garrett & Steinberg, 2015). However, few studies have been conducted in evaluating the efficiency of teacher performance and students' learning performance.

2.5.3 Course Delivery

Course delivery is one of the main units of teaching English for Academic Purpose (TEAP) which includes teaching practice, assessments, and feedback (Ding & Campion, 2016). In fact, course delivery is the list of areas of professional knowledge and values comprises points such as 'how to select and adopt appropriate course materials. Since the advancement of internet has had a crucial impact on education nowadays, teachers are forced to embrace and integrate it in their course delivery. EAP with its characteristics of using authentic course material is no exception in this regard. There have been several studies on using internet, online classes, and educational tools in course delivery. Constantinou (2018) studies on educational tools such as, G Suite for Education analyzes the ease and problems encountered during use and their efficiency in teaching and learning process. In a similar study, Soliman (2016) investigates the efficiency of the application of flipped classroom in EAP course delivery and discusses the challenges that might be faced. Amer and Daher (2019) investigate Moodle as a learning management system in EAP course delivery and note a significant motivation in students' performance. Alizade, et al (2019) evaluated a blended course delivery in a university in Japan and study the students' perception on the usefulness of the course. All the already mentioned studies investigate the quality of course delivery in EAP course, however,

few studies have investigated the efficiency of EAP teacher performance and its relationship with students' learning.

2.5.4 Program Development

EAP programs play a crucial role in English-medium instruction of higher education as they help students move from general English to Academic English and is a program which increases students' motivation for improving their language. However, according to a study published by British Council (2015), there are some shortcomings in EAP program implementation due to a lack of relevant material and content which impact effective delivery of the course by EAP instructors. Therefore, quality evaluation for EAP program seems a necessity to ensure the value-added and the relevance of these programs. The aim is to systematically monitor these programs to ensure the quality of the materials and instructions (Tsou & Chen, 2014). However, the challenge for higher education and EAP programs is the lack of the way and experience to effectively evaluate their quality (Staub, 2018).

Several evaluation models have been suggested for quality evaluation. Tsou and Chen (2014) points out that the evaluation should aim to investigate whether or not the learners' needs are fulfilled, whether or not the tasks and materials are authentic, and whether or not the course can successfully foster the autonomous learners. In an ideal situation, Norris (2016) believes that quality evaluation will be possible through a systematic formative and summative evaluation of the program by the EAP instructor. The tension, however, is that the assessor is often considered as a primary responsibility for EAP practitioners (Hsu, 2017). As EAP program has a crucial impact on teachers' performance and students' learning, the evaluation of its quality seems highly significant.

2.5.5 Professional Development, Research and Scholarship

Academic staff is expected to transmit knowledge through teaching along with producing new knowledge through research (Szromek & Wolniak, 2020). Therefore, students are taught by active people in research in their subjects and in an environment with current practical research experience (Mackay, 2017). English teachers in higher education are no exception in this regard. Just like other academic staff members, they are required to conduct research and use the findings in their classes to improve the quality of service. Professional development in higher education is highly valued all over the world, as it is one of the vital issues for quality enhancement of teaching. According to Nicoll and Harrison (2003), the rationale for the importance of professional development, can be as follows: the need to re-conceptualize teaching and learning for the purpose of increasing and widening participations; the desire to enhance students' learning experiences; the changing nature of academic work due to globalization and increasing use of communication and information technologies; the importance of competitiveness and flexibility to increase efficiency and effectiveness (p.23). As stated by Nicoll and Harrison (2003), promoting better teaching performance through professional development is an essential part of quality and excellence. In this respect, teacher performance evaluation has long been a controversial process in education and is significant in quality assessment at universities. Warring (2015) emphasizes the evaluation of teaching quality as it influences learners' achievement. Since its goals and procedures, as positioned by administrators, may help define the standards of the educational system (Collopy & Arnold 2009). Ter Bogt and Scapens (2012) believe that teacher performance is related to the quality of the provided education, number of students, and the awarded degrees. These performance measures are applied at

organization level; however, individual teachers are responsible for the quality of their performance in class. Traditionally, student experiences and perceptions play a crucial role in evaluating teaching quality (Collopy & Arnold, 2009; Bedggood & Donovan, 2012). Although the use of student assessment in teacher performance evaluation is controversial (Balam & Shannon, 2010; Warring, 2015), much of the research consider student evaluation valid and consistent (Liu, 2012).

2.6 Teacher Performance Evaluation in Higher Education

Faculty and teacher evaluation have long been controversial processes in education and are seen significant in quality assessment at universities (Warring, 2015), since its goals and procedures may help define the standards of the educational system. Within the broad area of educational evaluation, two types emerging from different motives are identified, formative and summative evaluation.

Formative evaluation provides the teachers with information, judgments, and suggestions and is intended to help them improve their performance. On the other hand, summative evaluation provides information for decision-making with respect to recruitment, firing, tenure, promotion, assignments, and salary, is geared less for the teachers, more for the administrators (Millman, 1991).

However, teacher performance evaluation might be conducted from a variety of perspectives, beyond the basic summative or formative orientation of an evaluation process. Four commonly evaluated teaching aspects are competency, competence, performance, and effectiveness (Pennington & Young, 1989). These aspects have been defined by Coker (1978) as:

“Teacher competency, a specific knowledge, ability, or value position that a teacher which is believed to be important to success as a teacher. Teacher competence, the repertoire of competencies a teacher possesses..... Teacher performance... it is defined in terms of teacher behaviour under a specified set of conditions.... Teacher effectiveness, the results a teacher gets; it is defined in terms of what [students] do, not what the teacher does or can do.” (pp. 14-15).

Different sorts of requirements, standards of performance, and evaluation mechanism are implied for each of the above- mentioned perspectives on teacher evaluation. Moreover, teachers may be evaluated by a range of methods which can be more or less effective for certain purposes and circumstances of evaluation. These methods include teacher interviews, competency test, student evaluation of teacher performance, student achievement, faculty self-evaluation, classroom observation, and peer review (Pennington &Young, 1989). In the following section, the student evaluation of teacher performance is considered in detail as it is one of the main factors of the current study.

2.6.1 Student Evaluation of Teacher Performance

Students’ evaluation of teacher performance, as defined by Weerasinghe and Fernnado (2017), is the temporary attitude resulting from educational experience, facilities, or services. Teachers consider students’ feedback as a valuable indicator of the quality of their teaching performance and the curriculum (Surujlal, 2014). Al-Momani (2016) believed that faculty, students, and administrators claimed the method of assessing teachers by student evaluation to be reliable, valid and useful. In fact, the student rather than the administrators or teachers are the observers, who evaluate teachers in the classroom (Darling-Hammond, Wise, and Pease, 1983).

Students’ satisfaction is highly correlated with quality in higher education. Ping (1993) believes that assessing the efficiency is achievable by analysing students’

satisfaction. In fact, higher education is evaluated by what is valued by students, how well students are satisfied, and how students perceive the quality of education in EAP classes and how they can be improved. The student evaluation is usually conducted at universities by the administrators.

2.6.2 Application of Data Envelopment Analysis in Measuring Learning and Teaching Performance

Evaluation of the university performance, using DEA, is the product of the development of educational performance and university management. Applying DEA first appeared in the United States to investigate the input and output of education and to illustrate how educational input resources (e.g., teaching performance) is translated into the educational output (students' learning) (Zhang & Shi, 2019). At present, many developed countries formed a series of mature evaluation system in higher education with their own characteristics using DEA. For instance, in the United States, an enormous number of colleges and universities are evaluating in accordance with their training objectives and regions, quality of teaching performance, students' retention and achievements. The participating universities are ranked according to their achieved data. The UK's best-known universities ranking system consider students' admission criteria, teaching quality, teacher-students ratio, average time spent in library by each student, the cost of building and maintaining a school building, research results, graduation rate, and students' satisfaction rate as selection criteria (Zhang & Shi, 2019). All these data processes are analyzed using Data Envelopment Analysis. In all the above-mentioned universities the performance efficiency has been evaluated.

2.6.3 Data Envelopment Analysis

DEA is a non-parametric assessment approach, that has been applied in various fields for performance benchmarking and relative efficiency measurement among homogeneous evaluated units, commonly called decision making units (DMUs) which consumes multiple inputs to produce multiple outputs. The definition of a DMU is generic and flexible. It was initially introduced by Farrell (1957), and improved after several modifications by Charnes, Cooper, and Rhodes (1978) and Banker, Charnes and Cooper (1984). Charnes, et.al (1978) converted Farrell's efficiency measurement concept of multiple inputs and single output to multiple inputs and multiple outputs. They assume that a change in inputs will equally and positively reflect a change in outputs. In fact, the choice between input and output orientation is based on whether the decision maker controls most inputs or the outputs (Charnes et al. 1978). Data envelopment analysis (DEA) is an approach rooted in organizational management and does not account for variation. Instead, it demonstrates how effectively an individual uses their inputs to make outputs, as well as which inputs aren't being used to their full potential.

DEA is originally applied for the performance evaluation in economy, but in recent years it has been applied in many different countries and in many different contexts, such as hospitals, business firms, courts, and universities. The advantages of applying DEA have been pointed out by Cooper, Seiford and Tone (2000). They believe that DEA has been used to supply new insights into activities (and entities) that have previously been evaluated by other methods. It is proven to be useful in uncovering relationships that remain hidden in other methodologies and is capable of handling multiple inputs and outputs, and of being used with any input-output

measurement. By applying DEA, the sources of inefficiency can be analyzed and quantified for every evaluated unit. Moreover, the significant indicators which have impact on the degree of efficiency can be identified by this method. Finally, DEA has evolved over decades of research to cope with a variety of challenges, including the capacity to account for specific weight limits, discrete and non-discrete variables, categorical variables, and many others (Ramanathan, 2003).

2.7 Key Performance Indicators in Teacher Evaluation

There is currently no common definition of performance indicators; however, it is agreed that performance indicators cannot be considered ‘facts’ but are goals, value, and are context laden, that are applied in different ways depending on the performance model being employed. In this section, the focus is on the types that are more related to the criteria of excellence in teaching centers related to teaching performance. The definition used for the teaching quality indicators consider performance indicators as measures that provide information and statistics within the educational context, permitting comparisons between fields, over time and with commonly accepted standards (Cave, Hanney, Henkel & Kogan, 1997). These indicators provide information about the degree to which teaching and learning quality objectives are met within the higher education sector (Bruwer, 1999; Burke & Minassians, 2002; Burke, Minassians & Yang, 2002; Romainville, 1999; Rowe & Lievesley, 2002). Cave, et al (1997) highlight three kinds of performance indicators, (i) simple indicators which are usually expressed in the form of absolute figures to provide a relatively unbiased description of a process or situation, (simple indicator may seem like the more neutral of the two, yet if a value judgment is involved; it may become a performance indicator); (ii) performance indicators that are relative rather than absolute, and therefore are different from the first group in that they differ

from the simple indicators that merely imply a point of reference, for instance an assessment, standards, objectives, or a comparator. The performance indicators always involve judgment that distinguishes it from the first kind. Patrick and Stanley (1998) mention two important sets of performance indicators, established in the United Kingdom, as research quality ratings and teaching quality ratings. Both ratings of quality and, to a lesser extent, teaching quality, have an impact on the level of government funding which is provided to higher education institutions; and (iii) general indicators which are not indicators in a strict sense and are commonly externally driven. They are frequently related to opinions, survey findings, or general statistics.

Another classification of key performance indicator is by Chalmers (2008) who categorizes key performance indicators as quantitative and qualitative. Quantitative indicators are the inputs reflecting human, financial and physical resources included in supporting institutional programs, activities, and services. Outputs are the quantity of outcomes produced in which results are measured immediately along with direct consequences of these results (Burke & Minassians, 2002). In this study, inputs refer to course contents and teaching skills of EAP instructors mentioned in the Students' Course-instructor Evaluation questionnaire completed by the students and outputs refer to students' satisfaction of assignments, exams and grading and the students' final grades which presents students' learning. Qualitative indicators, however, are classified as outcome indicators that measure the quality and impact of complex process of teaching and learning. As outcome indicators are related to objectives of higher education, they are more appropriate for enhancing quality of teaching and learning. Process indicators are the second subcategory of qualitative indicators

which constitute to the means that are applied in delivering educational programs, services, and activities within HE (Burke & Minassians, 2002). In fact, process indicators are items that deal with qualitative information related to teaching and learning, such as practices and policies of teaching and learning performance management and professional development of areas contributing to the qualitative standards of the system. For the staff, the quality of the curriculum, and for the students, evaluation of facilities, services and technology are key factors (Chalmers, 2008). Therefore, process indicators are identified as the most practical, useful, and appropriate measures of teaching and learning quality within higher education (Chalmers, 2008). Due to the limitation of qualitative indicators in enhancing the quality of teaching and learning, there is a need for qualitative measures that allows for a deep and complex understanding of issues regarding higher education (Chalmers, 2008).

2.7.1 Input and Output Indicators

Various inputs are relevant to measure quality in higher education. Input indicators can act on their own or as modifiers (Zhang & Shi, 2019). They can be divided into (i) student input indicators which are the number of students at an institution, their distribution based on their place of birth, ethnicity, gender, disability status, etc. Measures of the average ability of incoming students which can be determined through entering grades, or some sort of standard testing measure that are also included in this category, (ii) institutional indicators which are variety of measures, income from tuition, income from research, income from federal and provincial sources, are all included in this category. The collected data is reported at institutional level; and (iii) the number of instructors which deals with simply

counting the number of full-time and sessional instructors (number of graduate students who act as instructors are also included at this level).

Inputs in educational context, if limited to factors subject to policy manipulation, include characteristics of pupils, teachers' performance, facilities, curriculum, and fiscal and other resources necessary for the maintenance or change of the educational enterprise (Lockheed & Hanushek, 1994).

Outputs in educational context typically refer to changes in student achievement, achieving certification, completion rates, skills, and certain attitudes and values. Output indicators are related to the indicators associated to results or the outcomes. The underlying outcome or objective of EAP is to close the gap between where learners are and where they need to be, and the path which need to be accomplished along this path (Charles, 2015). Learning outcome should be expressed clearly as statement about what the learners will be able to do, rather what they will know. Biggs (1996) describes constructive alignment as one of the powerful concepts for learning objectives to the elements of course design, which harmonize the course content, assessment, and the learning objectives if its principles are applied. In other words, attainment of learning objectives is promoted by teaching and learning activities. Similarly, form of evaluation and attainment should measure attainment of learning objectives (Charles, 2015). Warring (2015) emphasizes on the importance of teaching quality as it influences students' learning outcome. In sum, learning outcome seems to be in direct relation with course content and teacher performance, however, few research has been conducted on the relation between EAP teacher performance evaluation and learner outcome, which is the focus of attention in this study.

Chapter 3

METHODOLOGY

3.1 Introduction

This chapter introduces the overall research design of the study with the framework of research parameter, and describes the context and the participants. It also represents the data collection instruments, and the phases, instruments and research procedures together with statistical application and analysis.

3.2 Research Design

The study adopted a mixed method research, using both quantitative and qualitative methods. The researcher applied the sequential explanatory design among the three designs of mixed method as exploratory, explanatory, and the triangulation designs. As stated in Creswell and Creswell (2017), the aim of sequential explanatory mixed method is to have the qualitative data to help elaborate the initial quantitative results in more details. Therefore, it is essential to connect results of the quantitative phase to the data of qualitative data collection phase.

In this study, first the researcher evaluate the efficiency of EAP teacher performance and second identify the most significant course-instructor indicators which have impact on the efficiency of EAP teacher performance by obtaining quantitative results from the student course-instructor evaluation survey (SCE thereafter) of 10.000 students. Then, the study is following up with the semi-structures interview to ameliorate the results in more depth through a qualitative study analysis. In the first,

quantitative phase of study, the research questions focus on the degree of the efficiency of EAP teacher performance, identify the significant teaching-learning indicator which play a crucial role in the efficiency performance of teacher, and prioritize the teaching-learning indicators. In the second, qualitative phase of study, 15 EAP teachers are interviewed to explore more in-depth the statistical results tests. The researchers' questions addressed the one main question of how to improve efficiency performance of EAP teachers considering the data retrieved from the quantitative research.

3.3 Research Questions

In order to investigate the major indicator, the following questions were put forward:

- 1) What is the efficiency level of EAP teacher performance in the Academic reading-writing classes?
- 2) Which indicators have (the most) significant impact in the efficiency of teaching performance and students' learning in EAP classes?
- 3) Which indicators need to be improved to ameliorate the inefficient EAP classes?
- 4) How can the efficiency of teaching-learning in EAP classes be improved as perceived by instructors?

3.4 Context: The School of Foreign Language

The School of Foreign Languages (SFL thereafter) in the Eastern Mediterranean University provides language services to the university and the community. There is a full range of English Language courses designed for preparatory undergraduate and postgraduate students, as well as other community programs. It is also an accredited training center for Cambridge ESO, and an accredited examination center for a number of international exams, including IELTS (International English Language

Testing System), TOEFL IBT (Test of English as a Foreign Language Internet-based Test), TELC (The European Language Certificates), LCCI (London Chamber of Commerce and Industry) and TOLES (The Test of Legal English Skills). The approach to language teaching is contemporary and it ensures ongoing professional training to its academic staff. The academic staff of SFL has Bachelor's, Master's and Doctorate degrees in language teaching. Over the years the SFL has become an international center for a number of courses approved and moderated by the University of Cambridge, and most of its academic staff had obtained international language teaching qualification certificates and diplomas, such as Cambridge ICALT and DELTA. The courses offered by SFL can be categorized into three different section, i) EPS Courses (for those with minimum level of English); ii) FL Courses (for those who are studying in either English medium faculties, Turkish medium faculties); iii) Postgraduate courses (for Master and Ph.D.). The Modern Language Division is part of the SFL responsible for the delivery of academic courses to students who are studying in English medium faculties, at both undergraduate and postgraduate levels across the university. It also offers a range of elective foreign language courses to students who wish to acquire knowledge of another language.

3.4.1 The Courses Offered by the SFL

One of the primary duties of SFL besides teaching English to those who are getting ready to admit the academic department is to support the students doing academic studies in their fields of studies. Therefore, a range of EAP courses are offered by the SFL. In a very compact way, the courses offered are dependent on the field study of the students. Among these courses, four courses of academic reading-writing classes, known as English Communication I and English Communication II were considered in this study. The courses were offered to freshman students who were

studying in the English medium faculties. The course offers two types of academic genre, cause and effect and opinion essays, which are necessary in the targeted departments. The courses are designed to help students improve Reading and Writing skills in English to high B1 level, as specified in the Common European Framework of Reference for Languages. They aim at connecting critical thinking with language skills and incorporate learning technologies, such as Moodle. The purpose of the courses is to consolidate students' knowledge and awareness of academic discourse, language structures and lexis. The main focus is on the development of productive (writing and speaking) and receptive (reading and listening) skills in academic setting. As the course is offered to all the students studying in English medium faculties, the number of groups varied according to the number of registered students. The number of groups in each course ranged from 10 to 25. The courses offered to these students along with their faculty courses are ENGL181, ENGL 182, ENGL 191, ENGL 192.

- ENGL181 is offered at tertiary level to the freshmen who study in English medium faculties, except for the Faculty of Tourism. Students who pass the proficiency exams with a low grade (40%-50%) take this course. Contact hours are 6 hours per week.
- ENGL182 follows ENGL181 and is offered to the 2nd semester freshman as an academic English language course for English medium faculties, again with the exception of the Faculty of Tourism.
- ENGL 191 is a first semester academic English course to freshman who has passed the proficiency exam with high grades (above 50%). The contact hours are 4 hours per week.

- Students who pass ENGL191 can take ENGL192 the second semester.

Contact hours are 4 hours per week.

3.4.2 Material and Assessments

Students who are taking Academic English are offered two main activities, Booklet and Moodle. The tasks of the booklets are designed by a team of experienced academic staff. The booklet aims at improving Academic Reading and Writing skills and consists of materials and tasks of process writing. Process writing approaches as stated by Hyland (2003), put emphasis on the writer and provide cognitive models of what writers do when they write. Scholars concluded that writing composition is a non-linear, exploratory, generative and recursive process where writers are continuously reformulating their ideas utilizing their linguistic resources to discover ways to express meaning (Hyland, 2016). The tasks of the booklet aims at focusing students on the task itself, brainstorming ideas in the planning stage, collaborative writing, receiving teacher or peer feedback, and increasing students' awareness of good writing strategies. All the steps of the booklet are graded at the end of the semester by the instructors. The Every year, the content of the booklet is revised by the organizer team according to the feedback from the course instructors.

Discussion on Moodle is another activity where students are encouraged to participate. In Moodle tasks, students are presented four topics on which they are expected to make contributions in discussions within the time frame specified by the instructors. At the end of the semester, students' participation is graded by the class instructors. Along with the grades of the class activity, students are evaluated through midterm exams, final exams and end of semester presentations. As a result, the students attain their grades applying the following format: 40% from booklets

and presentation, 10% Moodle discussion, 20% from midterm and 30% from final exam.

3.4.3 Participants: Teachers and Students

In this study, three groups of instructors who are teaching Academic Reading and Writing courses (EAP) with different experience and age groups are selected. Some of the instructors are native-speakers of English, some are non-native of English and majority of the instructors are Turkish native speakers. Fifteen instructors have been agreed to participate in this study. Five instructors with an experienced of above fifteen years who are a member of coordinator and organizer team, five instructors as full time experienced teacher, and five instructors as part time instructors with minimum three years of experience in teaching English. In order to keep the identity of the instructors confidential, each instructor is represented by a letter, as T1, T2,..., T5.

Freshman undergraduate of English medium faculties who were taking academic English courses at tertiary level during the period 2010-2015, both fall and spring semesters participated in this study. 10.000 students, from 110 different nationalities have been considered in this study. Students are required to pass an in-house English proficiency test with a minimum score which is equivalent to CEFR-high or IELTS-5.5 in order to start the departmental studies. The students who cannot pass the proficiency test are required to attend intensive English programs offered at the English Preparatory School (EPS) and to improve their English. The duration of the English course is according to their English level and the obtained grade in proficiency test. After completing General English course in English Preparatory school, student will be eligible to study in their department.

3.5 Data Collection Procedures and Statistical Applications

As mentioned earlier at the research design section, the study is based on sequential mixed method, where different phases are taking place in the process of sampling and application. Thus, data collection procedure involves two stages, collecting quantitative data in the first stage; analyze the data and then using the results to plan the second (interview), qualitative stage. The purpose of this design is to have the qualitative data help explain in more detail the initial quantitative result; thus, it is important to connect the quantitative results to the qualitative data collection.

3.5.1 Sources

The major sources of data in this study are the data of the Students Course-instructor Evaluation survey (SCE), students' final grades and the data from teacher interview.

3.5.1.1 Data on Students' Course-instructor Evaluation Survey (SCE)

The SCE of Eastern Mediterranean University was designed by a group of experts within the parameters of questionnaire design. The SCE was tested and the level of reliability established as 0.84 before it was put into use in 2000, the process took exactly two years. The senate had approved the results in 2002. In 2004 some modification were carried out. The SCE survey is an indispensable part of evaluation aimed at upholding the quality of education at a university in North Cyprus. It has been in use since 2004. The validity and reliability of the aforementioned questionnaire has also been verified by the administrators of the accreditation community, such as ABET (Accreditation Board for Engineering & Technology), AQAS (Agency for Quality Assurance), and City Angels, and many more. The survey is related to the rating of instructors and courses evaluation by students at Eastern Mediterranean University is a bilingual questionnaire in both English and Turkish, comprised three different sections. Section A includes course information,

such as academic year, course code, name, name of the instructor, and the registration number of the student enrolled. Section B covers the students' information, their expected grade, number of hours spent studying for a particular course, and attendance hours. Section C contains the main section focusing on items related to the course and teacher performance, including a 5-Linkert scale questionnaire, ranging from 'strongly agree' to 'strongly disagree'. The questions are categorized into topics: such as the instructors' organization, content knowledge of the related course, presentation skills, rapport with students, clarity, and comments. It is finalized with an extra space for comments, focusing on description, and emphasizing low-inference items. This section allows students to express their views and thoughts with regards to both, the instructors and the course.

3.5.1.2 Data on Students Final Grades

Students' final grade presents the students' achievement and activities in all assignments, presentation, midterm and final exams. The researcher received the data from the Students' Affairs Office of Eastern Mediterranean University, North Cyprus. The data covered four continuous years, i.e., eight semesters for a population of 10.000 participants.

3.5.1.3 Data on Teachers' Interview

Interview design is a vital part in studies which are heavily organized around statistical procedure. It is highly important to a researcher to come to a better and reliable conclusion by means of the application of an interview procedure. Creswell and Creswell (2017) believe that one of the challenges of this type of research design is to plan the results of the quantitative stage sufficiently to follow up on qualitative data in the second stage, 'the key idea is that the qualitative data collection builds directly on the quantitative result' (p.355). As noted by Fraenkel and Wallen (2006),

the purpose of interviewing individuals is to find out, “what is on their mind – what they think or how they feel about something” (p.455). In this study, a semi-structured interview was employed to receive teachers’ opinion on how to improve their performance in EAP classes. The interview was conducted face-to-face and involves open-ended questions and intended to elicit view and opinion from the participants. A relevant series of questions are prepared in light of the finding of the quantitative analysis. The permission has been granted from the interviewees to record the interview.

3.5.2 Procedures (Statistical)

In the data analysis procedure, the Performance Improvement Management Software (PIM-DEA) applied through various phases such as classifying the items, calculating the mean and applying DEA.

3.5.2.1 Phase I

As already stated, the nature of sequential mix method research design requires stages in processing the data. This phase is composed of classification of SCE as course-instructor indicators as input and output indicators, calculating the mean score of EAP courses (ENGL 181, ENGL182, ENGL 191, ENGL 192) establishing the correlation coefficient of indicators related to teacher(T), course (C), grades (G), and evaluation (E).

3.5.2.1.1 Classification of SCE

The student course-instructor evaluation survey (SCE) items were classified into three groups, as follows:

- Items related to the richness of the course content addressed by questions number 1, 7, 14.

- Items corresponding to the teaching skills of the teachers concerned were reflected in questions number 2, 3, 4, 5, 6, 8, 9, 12, 15, 17.
- Items related to positive attitudes toward teaching, addressed by questions number 10, 11, 13, 16, which aimed to identify learners' attitudes toward assignments, exams, and grades.

Table 3.1: Classification of the indicators applied in the study group indicators

Group	Indicators
C (course)	Richness of the course content (three questions in the SET questionnaire)
T(teacher)	Teaching skills of the teacher (nine questions)
E (evaluation)	Attitudes toward teaching, exams, and grades (three questions)
G (grades)	Final grades of students in the EAP course

3.5.2.1.2 Calculating Mean Score of Course-instructor Indicators

At this stage the researcher calculated the mean score for each of the above-mentioned indicators. For example, in each class, there is mean score for teaching indicators, a mean score for course content, a mean score for evaluation. Each mean score is identified with its corresponding letter, as mentioned in the previous section. Thus, each class (ENGL181, ENGL182, ENGL191, ENGL192) contained 3 sets of data. The next stage is to compute the mean score of the students' final grades in each class. The total number of classes (ENGL181, ENGL182, ENGL191, ENGL192) encompassed by this study were 443. Each class's mean score is indicated as letter G. Therefore, at this stage there are 4 sets of data for all 443 scores.

3.5.2.1.3 Correlation of Coefficient

At this stage, the researcher should determine input and output indicators. Considering the total calculation of the previous sections, four sets of data obtained from the analysis of the raw data (data related to teaching indicators, data for course content, data for evaluation, and data for final grades) for each class. Thus, there are four sets of data for 443 classes. Each indicator is illustrated with a latter, as mentioned in the previous section to clarify the data analysis procedure. This stage of data analysis is to calculate the correlation coefficient of the above-mentioned course-instructor indicators to ascertain if they could be selected as the input and the output in the study. The degree of the correlation of course-instructor indicators can be calculated by statistic methods, such as regression analysis and correlation coefficient test. The correlation applied in this study was the Pearson Correlation Coefficient test.

As known, in statistics especially in correlation statistics both negative and positive results of correlation are accepted. If the correlation is zero, it meant that there is no correlation between inputs and outputs which is not accepted. A positive relationship is indicated when a high score on one of the instruments is accompanied by a high score on the other or when a low score on one is accompanied by a low score. A negative relationship, however, is indicated when a high score on one instrument is accompanied by a low score on the other, and vice versa (Fraenkeln, & Wallen, 2009).

In this study, there were four sets of grades available of which the correlation needed to be computed. The correlation coefficient was calculated between groups T and G, T and C, groups T and E. Similarly, the correlation was calculated for group C and

group E, group C and group G, and group E and group G. If the calculated correlation for the above-mentioned groups in this study was zero, it meant that the input and output relation was meaningless, and, they could not be considered inputs or outputs.

3.5.2.2 Phase 2

This phase contains two stages. At stage one, the obtained data (input and output indicators) are applied in Performance Improvement Management software (PIM-DEA) version 3 for three purposes as; i) to evaluate the efficiency performance of EAP teacher performance, ii) to identify the most significant indicator course-instructor that impact the efficiency performance, iii) to prioritize the course-instructor indicators. Two different methods are used for identifying the most significant indicator to ascertain the validity of the results. At the second stage, an interview is conducted with the related course instructors to ameliorate the efficiency of EAP teacher performance. A detailed explanation of the stages is given in the following section.

3.5.2.2.1 Data Envelopment Analysis

Efficiency embodies the ratio of expending the least amount of time, effort or money on the development of an acceptable product or accomplishing a goal. In this study the researcher selected ‘Data Envelopment Analysis’ to measure the efficiency of EAP teacher performance related to the defined criterion improvement based on specified learning aims.

Data Envelopment Analysis (thereafter DEA) is a non-parametric assessment approach, that has been applied in various fields for performance benchmarking and relative efficiencies measurement among homogeneous evaluated units, commonly

called decision making units (DMUs). The definition of a DMU is generic and flexible. DEA is a 'data oriented' approach for evaluating the performance of a set of peer entities called decision making units (DMUs), which consumes multiple inputs to produce multiple outputs. DEA is an attractive tool because it can measure the performance of educational institutions, departments, courses, and students. It was initially introduced by Farrell (1957), and improved after several modifications by Charnes Cooper, and Rhodes (1978) and Banker, Charnes and Cooper (1984). Charnes et al. (1978) converted Farrell's efficiency measurement concept of multiple inputs and single output to multiple inputs and multiple outputs. They assume that a change in inputs will equally and positively reflect a change in outputs. The choice between input and output orientation is based on whether the decision maker controls most inputs or the outputs. This study comprehended the assumption of output orientation, since public universities have greater control over the research produced and of the graduates.

The advantages of applying DEA as pointed out by Cooper et al. (2000), are that it is used to supply new insights into activities (and entities) that have previously been evaluated by other methods. Moreover, it is proven to be useful in uncovering relationships that remain hidden in other methodologies. It is also capable of handling multiple inputs and outputs, and capable of being used with any input-output measurement. In this study, the researcher applied DEA to assess EAP teacher performance for three reasons; firstly, applying DEA can assess.

The efficiency of EAP teacher performance considers all the course-instructor indicators which can have impact on it. Secondly, this analysis method enables the

researcher to identify the most significant indicator and reveal some hidden fact about efficiency performance.

3.5.2.2.2 Interview

The researcher bases the inquiry on the assumption that collecting diverse types of data best provides a more complete understanding of this research than a quantitative data alone. The study starts to generalize results to a population and later in this second stage, focuses on qualitative, open ended interview to collect detailed views from the instructors to help explain the initial quantitative survey. As Dörnyei (2014) emphasizes that the semi-structured interview is appropriate when the researcher develops broad questions beforehand while avoiding ready-made responses. The interview is carried out for 15 instructors individually. The interview aimed at eliciting information from the instructors to first, interpret the retrieved data, second EAP instructors have personally expressed their experiences to find solution for the improvement of EAP instructors' performance regarding the efficiency.

3.6 Ethical Considerations

The researcher needed to go through a set of carefully designed stages to consider the ethical issues. For this purpose, permission to analyse the SCE data and the interview of teachers was first obtained from the School of Foreign Languages (where they were to be appraised) and then officially approved by the Rectorate's body in charge of supervising research of the related issues. Formal letters outlining the interview questions were sent to full-time and part-time teachers, both novice and experienced. If a given teacher agreed to participate, then the surveys were deployed in the teachers' workplace. Furthermore, a consent form and permission for the recording are signed by the teacher before the interview.

3.7 Summary

To sum up, in the present chapter the major methodological procedures and the related phases were addressed. By adopting an explanatory design of mixed method, this study collected both quantitative as well as qualitative data about students' course-instructor evaluation survey, namely SCE and conducted interviews from the EAP instructors to ameliorate efficiency of teacher performance, respectively.

Chapter 4

RESULTS

4.1 Introduction

The following chapter describes the findings of the present study in accordance with the research design and application; thus the following stages were applied: (i) Classifying the items of the survey, (ii) Calculating the mean for the items in the survey and the final grades of students, (iii) Computing the Correlation of Coefficient to select appropriate indexes (inputs and outputs) to be used in the software, (iv) Applying the Performance Improvement Management software (PIM-DEA) version 3 to assess the efficiency of EAP classes, (v) Weight analysis to identify the significant indicators (vi) Sensitivity analysis to confirm the results obtained from the previous phase (weight analysis), and (vii) Interview. The analysis of two sets of data students' final grades and the data of the SCE survey is presented in the above-mentioned steps to answer the following research questions:

- 1) What is the efficiency level of teacher performance in Academic reading-writing classes?
- 2) Which indicators have the most significant impact in the efficiency of teaching performance and students' learning in EAP classes?
- 3) Which indicators should be improved to ameliorate the inefficient EAP classes?
- 4) How can the efficiency of teaching-learning in EAP classes be improved as perceived by instructors?

4.2 Classifying the Items of the Survey

Two sets of raw data, students' final grades and the data of the Student Course-instructor Evaluation (SCE) survey were in Excel format which is required to be arranged and classified according to the aim of the research. The researcher had access to the final grades of the students which in fact, reflect the academic achievement of the students in the course.

Besides, as was already stated, the SCE survey data items can be classified into three groups as, i) items related to the richness of the course content addressed by questions [1,7,14] of the survey named as group C ii) items corresponding to teaching skills of the teacher performance reflected in questions [2,3,4,5,6,8,9,12,15, and 17] in SCE survey named as T, and iii) items related to the positive attitudes towards assignments, exams, and grades reflected in [10,11,13,16] of the survey, as group E, and the final grades named as G. Table 4.1 illustrates the classification of the items in the study.

Table 4.1: Classification of the items of student course- instructor evaluation

Group	Indicators
Course [C]	Richness of the course content (three questions in SCE)
Teacher [T]	Teaching skills and performance (nine questions)
Evaluation [E]	Attitudes towards exams, assignments, and grades (three questions)
Grades [G]	Final grades of students in EAP course

4.3 Calculating the Mean Score for Students' Final Grades

The final grades of the participants in EAP course were based on the standard of letter grading system at Eastern Mediterranean University (EMU). Table 4.2 cont. illustrate the letter grades and the grades range from 100 to 45.

Table 4.2: EMU Letter grading standard

Grades	100-85	84-80	79-75	74-70	69-66	65-63
Letter	A	A-	B+	B	B-	C+

Table 4.2: EMU Letter grading standard (cont.)

Grades	62-60	59-57	56-54	53-50	49-45	0-44
Letter	C	C-	D+	D	D-	F

The data was arranged based on course, years, and groups. Each course contains different groups according to the number of the registered students in the related semesters that can vary from 1 to 50 groups. The total number of the groups in four years, eight semesters, and four courses of academic reading-writing is altogether 577 classes. The number of the students in each group varied from 21 to 28 students.

Table 4.4 presents the groups in each course and semester.

Table 4.4: Number of groups in each course and year

Year	Semester	ENGL 181	ENGL 182	ENGL 191	ENGL 192	Total
2010-11	Fall	5	1	24	22	52
2010-11	Spring	3	3	18	24	48
2011-12	Fall	5	2	18	15	40
2011-12	Spring	6	3	11	21	41
2012-13	Fall	7	2	29	23	61
2012-13	Spring	10	6	30	29	75
2013-14	Fall	5	5	45	22	77
2013-14	Spring	4	5	17	41	67
2014-15	Fall	5	4	47	32	88
2014-15	Spring	1	5	1	21	28

The researcher converted letter grades to grades ranged from 0-4 in order to calculate the average for each class. The following quantity based on the grading standard of the university is illustrated in Table 4.5.

Table 4.5: Grades between 0-4 representing letter grades

Letter grades	A	A -	B +	B	B-	C+	C	C-	D+	D	D-	F
Quantity	4	3.7	3.3	3	2.7	2.3	2	1.7	1.3	1	0.7	0

The next step was to calculate the mean for each class. Considering the number of the classes in eight semesters and four years, a total of 577 mean grades were obtained at this stage. For instance in spring 2011-12 there were 5 groups for ENGL 181. Table 4.6 illustrates the mean score for five classes (ENGL 181), spring semester, 2011-12. A complete list of grades received from the registers' office is illustrated in Appendix B.

Table 4.6: Mean score for ENGL181, spring 2011-12

Academic Year	ENGL 181	Semester	No.	G(mean)
2011-12	Group 1	Spring	25	3.14
2011-12	Group 2	Spring	23	3.25
2011-12	Group 3	Spring	28	3.1
2011-12	Group 4	Spring	19	3.38
2011-12	Group 5	Spring	26	3.82

4.4 Data on Students' Evaluation of Teaching (SCE) Survey

To access the required information, there is a need to analyze the data of the students' course-instructor evaluation of teaching (SCE) survey completed by the students at the end of semester. Raw data received from the Rectors' Office (Academic Affairs) was in Excel format. As mentioned above, the survey consisted of three different sections regarding students' ideas about teacher's teaching skills, course syllabuses, testing and the assignments. To retrieve the data, firstly, they were arranged as by course, year, semester, and the groups of each course. Groups which contain less than 10 responses were not considered in this study. Therefore out of

577 classes, the information of 445 classes was applied in this study since 100 groups did not have sufficient number of responses to the survey. The analysis of this section was conducted in two phases:

1. The first phase was to classify the items of survey into three sections related to teaching performance, course syllabus and curriculum, and students' satisfaction of assignments; exams and grading system (see Table 4.1). To accelerate the analysis, items related to each group were highlighted with different color. For example, students' satisfaction of testing, assessment and assignments were highlighted in yellow, items about course syllabuses, curriculum as blue, items related to the teaching skills and performance were highlighted in green. As the data were presented in letters, we needed to convert letters to numbers to be able to compute the average for the above-mentioned groups. The researcher applied the previously mentioned values of Table 4.3 for the calculation. To avoid the probable error, all the mean scores related to the students' final grades were illustrated by letter G. The results consisted of 445 classes for all four courses which contained 3 types of data. The value achieved was from 0 to 4. As it has been mentioned before, the data was for 557 groups; however, the researcher used only 445. About 100 classes did not meet the acceptable number of participants who had completed the SCE (students' course-instructor evaluation) survey.
2. The second stage was to calculate the average for all three types of data of the SCE survey (items related to course content, items related to teaching performance and items related to assignments, evaluations and grading system) as mentioned earlier. Thus, there were three sets of grades which represented the average of all items related to course curriculum, teaching

skills and performance, and students' satisfaction of exams and assignments for each class. To accelerate the analysis procedure, each group is illustrated by a letter. This this reason, the letter T presents all the mean scores related to teacher skills and performance, the letter C illustrates all the mean scores of related courses syllabuses and the letter E presents all mean scores of the items of students' satisfaction of assignments, exams and grading system. Consequently, four sets of numbers were obtained from the analysis of both data sources for all the classes in each group, namely group G, group T, group C, and group E.

As it is shown in Table 4.5, there were 9 groups in fall and spring semester of academic year 2010-11; whereas, only the data of 6 groups can be accepted due to the low number of the participants.

- In the academic year 2011-12, there were 6 groups of freshman students in ENGL181, who took the academic reading writing course, all the 6 groups were included in the analysis.
- In the academic year 2012-13, the number of groups in both fall and spring semesters increased. Out of 18 groups in this year, only one group was excluded due to the low number of the participants.
- In academic year 2013-14, the number of groups increased in both fall and spring semester whilst 9 groups could be included in the analysis.
- In academic year of 2014-15, there were 22 groups of the classes in ENGL 181 in both groups, the researcher, however, could only include 6 groups in the analysis. 16 groups were not considered due to a low number of the

students who had filled in the survey. The total number of groups and the number of accepted groups for ENGL 181 illustrated in Table 4.7.

Table 4.7: Number of accepted groups for ENGL 181

Fall-Spring	Total	Accepted no.
2010-11	9	6
2011-12	6	6
2012-13	18	17
2013-14	21	15
2014-15	22	6

- There was a slight decrease in the number of the groups in ENGL 182. Considering ENGL 182 in 2010-11, there was only one group of students in fall semester.
- In the spring semester of the previously mentioned year, the number of the groups is 3. All 3 groups were included in the analysis.
- In 2011-12, there were not many groups in fall semester. There were only 2 groups for ENGL 182 both groups' data could be included because of the sufficient number of the participants.
- The spring semester of the same academic year, there was a slight increase in the number of the groups; all 3 groups' data were used in the analysis.
- In 2012-13, there was an increase of the groups in the ENGL 182 due to the increasing number of the enrollment at the undergraduate level in spring. There were a total of 6 groups in ENGL 182. All the data from the groups was included in the analysis.
- In 2013-14, there were 5 groups in both spring and fall semester. Considering the number of the students who have completed the survey at the end of the semester, all data could be used for the analysis.

- Groups of the academic year 2014-15 were 13 groups; however, only 9 groups were considered since sufficient number of participants did not complete the survey. Table 4.8 presented total number of group and the number of accepted groups for ENGL 182.

Table 4.8: Number of accepted groups for ENGL 182

Fall-Spring	Total	Accepted no.
2010-11	4	4
2011-12	5	5
2012-13	5	5
2013-14	8	8
2014-15	13	9

- For ENGL 191, the number of the groups was noticeably large in 2010-2012 academic years. In both, fall and spring semesters of 2010-12, there were a total numbers of 46 groups in the above-mentioned course. Each group contained 25-28 students. For these semesters, only one group was not considered due to a low number of participation in SCE survey
- In the year after, there were a total of 21 and 16 groups for the ENGL 191 of fall and spring semesters, respectively. The data of 4 groups were not considered in the analysis because of lacking sufficient number of participants.
- In 2012-13 academic years, the number of the groups in ENGL increased due to the high number of the registration at the university. There were a total of 66 groups in both fall and spring semesters. The data of 53 groups were included in the analysis. 13 groups out of 66 groups in ENGL 191 did not contain sufficient number of participants.

- Increasing the groups and students in ENGL 191 maintained in 2013-14 for both fall and spring semesters. The number of the groups increased to 44 groups in fall semester. Similarly, in spring semester, there were 42 groups in ENGL 191, however; 26 groups of fall semester and 29 groups of spring semester could be included in the analysis, according to the afore-mentioned reasons.
- In 2014-15, the number of the groups was noticeably high, whereas, there was a decrease in the number of the participants. Only 10 groups have been included for fall semester. In spring semester, the number of the participants was very low. Only the data of two groups could be included in the study out of 31 groups. Table 4.9 presents the total and accepted number of the groups for ENGL 191.

Table 4.9: Number of accepted groups for ENGL 191

Fall-Spring	Total	Accepted no.
2010-11	46	45
2011-12	37	33
2012-13	66	53
2013-14	82	55
2014-15	31	12

- There was a similar situation in ENGL192, massive groups and large number of the learners who participated in the study. Therefore, the total number of groups applied for the analysis were 37 for 2010-11 for ENGL 192.
- There were a total of 21 groups of students in the ENGL192, only 13 groups were included in 2011-12.
- In 2012-13, number of the groups were consistent, 22 groups for fall semester and 28 for spring semester. The excluded groups were not as many as the

other groups. 18 groups for the first semester and 25 groups for the second semester were considered in the analysis.

- In 2013-14 the number of the groups remained the approximate number of the previous semesters. However, only 19 groups have be included in the analysis for fall semester. In spring, there were plenty of participants for SCE survey, therefore the number of groups applied in the analysis has been increased up to 28 groups.
- In 2014-15, there is a decline in the number of the groups included in the analysis due to the lack of sufficient number of the participants. 14 groups out 34 groups in fall semester. In the preceding semester, spring, only 14 groups out of 46 have been be considered in the analysis. Table 4.10 illustrates the total and accepted number for ENGL 192.

Table 4.10: Number of accepted groups for ENGL 192

Fall-Spring	Total	Accepted no.
2010-11	37	37
2011-12	21	13
2012-13	50	43
2013-14	65	47
2014-15	80	28

4.4.1 Summary

In this section, according to the principles of sequential mixed method approach applied in this study, firstly raw data was arranged regarding the group number in each course during 2010-2015. Secondly, the items of SCE survey is classified into three groups as items related to *teaching performance*, items for *course contents*, and items for students' satisfaction of *assignments, exams, and grading system*. Later, the average value for the above mentioned groups were computed. The total number of

participants included in four courses of ENGL 181, ENGL 182, ENGL 191, and ENGL 192 was 10,000 students. Table 4.11 presents a sample of calculation for items of the survey and the grades. A complete calculation for all the groups was presented in Appendix B since it contained a huge data.

Table 4.11: List of the Groups in ENGL 181 in 2011-12

Academic Year	ENGL 181	Semester	Course [C]	Teacher [T]	Exams [E]
2011-12	Group 1	Fall	3.35	3.64	3.6
2011-12	Group 1	Spring	2.87	3.14	2.77
2011-12	Group 2	Spring	3.21	3.25	3.09
2011-12	Group 3	Spring	3.33	3.1	3
2011-12	Group 4	Spring	3.44	3.38	3.33
2011-12	Group 5	Spring	3.79	3.82	3.71

4.5 Selecting Accurate Inputs and Outputs

Calculating the mean of the final scores and the three items of the SCE as mentioned earlier, four sets of grades were obtained and were assigned as four groups with a specific letter (as presented in Table: 4.11).

At this stage the researcher assigned each group of numbers as either input or output. The selection of inputs and outputs are the most important phase. As Martin (2016) points out, the reliability and acceptability of the results depend a great extent on the accurate selection of inputs and outputs. To make an accurate selection of inputs and outputs, there was a need to calculate the correlation of the above- mentioned four indicators. The inputs and outputs required for the study were assigned regarding the degree of correlation between them. The degree of the correlation of the input items and output items in the units of DEA has been calculated by statistic methods such as

regression analysis and correlation coefficient tests. The correlation used in this study was the Pearson correlation coefficient test.

A correlation coefficient is symbolized by the letter r , which indicates the degree of relationship that exists between the scores obtained from the analysis of two instruments.

To calculate the correlation, the researcher needed to calculate the mean score of the items of students' evaluation (SCE) survey. Items related to teaching skills and teacher performance is arranged in one group, items related to curriculum and syllabuses are considered as another group. The correlation coefficient was calculated between group T and group G, group T and group C, group T and E. Similarly, the correlation is calculated for group C and group E, group C and group G, and group E and group G.

As indicated in chapter 3, if the calculated correlation for the above-mentioned groups in Table 4.11, becomes zero, it means that the input and output relation is meaningless; that is to say that, they cannot be considered as inputs or outputs. However, in our study as seen in Table 4.12, the correlation coefficient among four indicators (indicators of course content [C], teaching performance [T], evaluation [E], and grading [G]) are not zero. Therefore, the inputs and outputs in this study were assigned based on the relevant degree of the correlation as stated in Table 4.12.

Table 4.12: Correlation of coefficient of inputs and outputs

Correlation	Group E	Group G
Group C	-0.1287	-0.00855
Group T	0.419883	0.339705

In this study, as stated in Table 4.13, group C (items related to course syllabus and content) is assigned as input 1, group T (items related to the teaching skills and performance) as input 2, group E (items related to the assignments and exam and grading) as output 1, and group G (the participants' final grades) as output 2. Table 4.13 illustrates the selected items for input 1, input 2, output 1, and output 2. In summary as shown in Table 4.13, the selection of input and output were based on the data of SCE and the students' final grades.

Table 4.13: Selected inputs and outputs

Input 1(Course content)	Output1(Evaluation and assignments)
1. The course increased my knowledge (1)	1. The assignments were effective learning tools (10)
2. The course challenged me intellectually (7)	2. The exams were effective learning tools (11)
3. The course materials were relevant (14)	3. My grades reflected my performance in the course (13)
Input 2 (Teaching Skills)	Output 2 (Grades)
1. The instructor clearly stated the course objectives (2)	1. Students' Final Grades
2. Instructor was well- prepared (3)	2. Quizzes
3. Instructor communicated the subject matter in the target lg. (4)	3. Midterms exam
4. The instructors' presentation of the content was clear (5)	4. Class activities
5. The instructor developed a good rapport with students (6)	5. Final exam
6. The instructor stimulated my interest in the subject (8)	
7. The instructor provided feedback on my work (9)	
8. The instructor was available during specialized office hours (12)	
9. The instructor was punctual (15)	
10. The instructor treated all students fairly (17)	

4.6 Analysis of the Results Applying PIM-DEA

The software applied in this study is the latest updated version of Performance Improvement Management software of Data Envelopment Analysis (PIM-DEA) by

Emrouznejad, A. & Thanassoulis, E. (2005). The analysis of the results, developed in four stages to provide answers to the first research question of this study which was:

1. What is the efficiency level of EAP teacher performance in the Academic reading-writing classes?

To initiate the analysis, the results of retrieved data (selected inputs and outputs Table 4.13) were imported in the software. Each class considered as one DMU and contained four types of data for input 1 [C] (course content), input 2 [T] (teacher performance), output 1[E] (evaluation), and output 2 [G] (final grades) for four courses of ENGL 181, ENGL 182, ENGL 191, ENGL 192.

4.6.1 Efficiency Value of DMUs

The performance of one decision making unit (DMU), as stated in Ramanathan, (2003) is evaluated in DEA by applying the concept of efficiency, the ratio of total outputs to total inputs. The efficiencies estimated by this method are relative, that is, relative to the best performing DMU, (p.26). The best-performing DMU is assigned as an efficiency score of unity or 100 percent, and the performance of other DMUs vary, between 0 and 100 percent relative to this best performance, (Ramanathan, 2003, p.27). In this study, by the application of the PIM-DEA software, out of 445 DMU (EAP classes) illustrates 100% efficiency value for, only 19 DMUs for the period of academic year 2010-2015. In other words, 4.30 % of the above-mentioned 445 DMUs have 100% efficiency. Table 4.14 illustrates the efficiency value of the research for 19 DMUs with the efficiency value of 100 along with the related inputs and outputs.

Table 4.14: Inputs and outputs for the DMUS with efficiency value of 99-98

DMU	Index 1	Index 2	Index 3	Index 4	Efficiency	No.
DMU 82	4	3.949	4	1.742	100	1
DMU 84	3.128205	3.415385	3.519231	1.916	100	2
DMU 91	3.717949	3.784615	3.596154	3.64	100	3
DMU 82	4	3.949	4	1.742	100	4
DMU 150	2	2.84375	2.625	2.078	100	5
DMU 197	3.5555	3.51111	3.41666	3.49	100	6
DMU 251	3.71	3.73	3.85	2.487	100	7
DMU 267	3.69697	3.74545	3.704545	3.336	100	8
DMU 275	3.76667	3.96	3.95	2.196	100	9
DMU 338	3.125	3.0625	3.34375	1.729	100	10
DMU 339	2.125	2.0625	2.09375	2.869	100	11
DMU 349	3.04444	3.213333	3	3.495	100	12
DMU 350	3.19047	3.342857	3.35714	3.265	100	13
DMU 372	2.875	3.3125	3.2187	3.276	100	14
DMU 380	3.61905	3.871429	3.85714	2.83	100	15
DMU 407	3.8	3.73	3.85	2.92	100	16
DMU 432	3.42857	3.28571	3.47619	3.003	100	17
DMU 435	3.16667	3.875	3.5625	3.265	100	18
DMU 439	2.20833	2.15	2.21875	2.815	100	19

Having calculated the DMU's, the research finding reflects the fact that a very little amount of DMU's showed the efficiency level of instructors' performance. This means the rest of the DMU's do not fulfill the value of efficiency as it has been questioned. Therefore, the findings of research question are not answered with the only 4.3 percent of all the DMUs very clearly. To simplify the illustration of the analysis, only the highest and the lowest inefficient DMUs were presented. The overall calculation is illustrated in Appendix B. Table 4.15 displays the first highest DMUs of inefficient DMUs with inefficiency value between 99-98. As it can be seen there were 28 DMUs whose efficiency ranged from 99-98%. The inefficient DMUs in this classification were 6.5% of total inefficient DMUs.

Table 4.15: Inputs and outputs for the DMUS with efficiency value of 99-98

DMU	Index1	Index2	Index3	Index4	Efficiency	Total
DMU311	2.78	2.9	3.04	1.64	99.62	1
DMU181	3.22	3.58	3.55	2.51	99.55	2
DMU248	3.53	3.78	3.75	2.86	99.48	3
DMU252	3.86	3.8	3.75	3.26	99.48	4
DMU196	3.38	3.77	3.67	2.64	99.47	5
DMU270	3.875	3.9125	3.78	3.28	99.46	6
DMU279	2.85	3.17	3.10	3.17	99.35	7
DMU160	3.21	3.43	3.45	2.74	99.31	8
DMU241	3.19	3.35	3.42	2.53	99.29	9
DMU87	3.11	3.41	3.36	3.07	99.21	10
DMU127	3.8	3.9	3.9	2.47	99.21	11
DMU434	2.86	2.5	2.625	2.3	99.05	12
DMU171	3.87	3.85	3.75	3.2	98.95	13
DMU185	3	3.5	3.375	2.4	98.89	14
DMU282	3.61	3.8	3.78	2.7	98.88	15
DMU266	3.66	3.51	3.47	3.2	98.71	16
DMU256	2.94	3.20	2.25	3.3	98.55	17
DMU236	3.29	3.562	3.21	3.4	98.5	18
DMU237	3.66	3.75	3.59	3.38	98.39	19
DMU382	3.51	3.57	3.63	2.46	98.38	20
DMU393	3.40	3.57	3.43	3.3	98.31	21
DMU314	3.30	3.36	3.47	2.07	98.24	22
DMU151	3.92	3.86	3.86	2.59	98.23	23
DMU161	3.83	3.73	3.78	2.16	98.08	24
DMU109	3.23	3.57	3.50	2.43	98.07	25
DMU199	3.15	3.34	3.20	3.2	98.03	26
DMU14	3.35	3.64	3.6	1.86	98.02	27
DMU138	3.43	3.35	3.4	3	98	28

Only 5% of the inefficient DMUs had got the value of 83.95% to 72%. This was the lowest group of inefficient DMUs. Table 4.16 presents the number of DMUs and their computed value.

Table 4.16: Inputs and outputs for the DMUS with efficiency value of 83.95-72

DMU	Index1	Index2	Index3	Index4	Efficiency	Total
DMU203	3.33	3.24	2.91	1.87	83.95	1
DMU427	3.33	3.34	2.89	2.51	83.57	2
DMU49	3	3.52	2.85	1.85	83.47	3
DMU2	3.121	3.46	2.93	1.71	83.38	4
DMU90	3.48	3.56	3.08	1.78	83.32	5
DMU163	3.1	3.33	2.85	1.91	83.27	6
DMU157	3.15	3.31	2.84	2.11	83.16	7
DMU94	3	3.26	2.71	2.5	83.09	8
DMU101	3.375	3.36	2.93	1.82	82.6	9
DMU400	3.07	3.05	2.61	2.23	81.6	10
DMU102	3.22	3.44	2.88	1.05	81.11	11
DMU48	3.125	3.26	2.781	1.17	80.8	12
DMU146	3.11	3.23	2.764	1.47	80.73	13
DMU320	3.147	3.47	2.82	1.96	80.68	14
DMU124	3.09	3.23	2.75	1.09	80.63	15
DMU273	2.83	3.087	2.5	2.30	80.62	16
DMU395	2.64	2.88	2.38	1.60	80.28	17
DMU76	2.94	2.9	2.5	1.14	79.75	18
DMU300	3.333	3.45	2.84	1.29	79.03	19
DMU67	3.16	3.42	2.79	1.49	78.96	20
DMU297	2.151	2.37	1.77	1.207	75.3	21
DMU290	3.17	3.41	2.55	0.97	72.39	22

To illustrate the condense of the inefficient DMUs; values are presented in the diagram format. Diagram 4.1. illustrates the efficiency value for 445 DMUs. As it shows the highest number of the efficiency belong to the efficiency value of 93.99-91:00. The second high value is located between 96.99-94.99. The lowest value of efficiency is for DMUs whose efficiency value is less than 79. Only 3 DMUs have the efficiency value of less than 79:00.

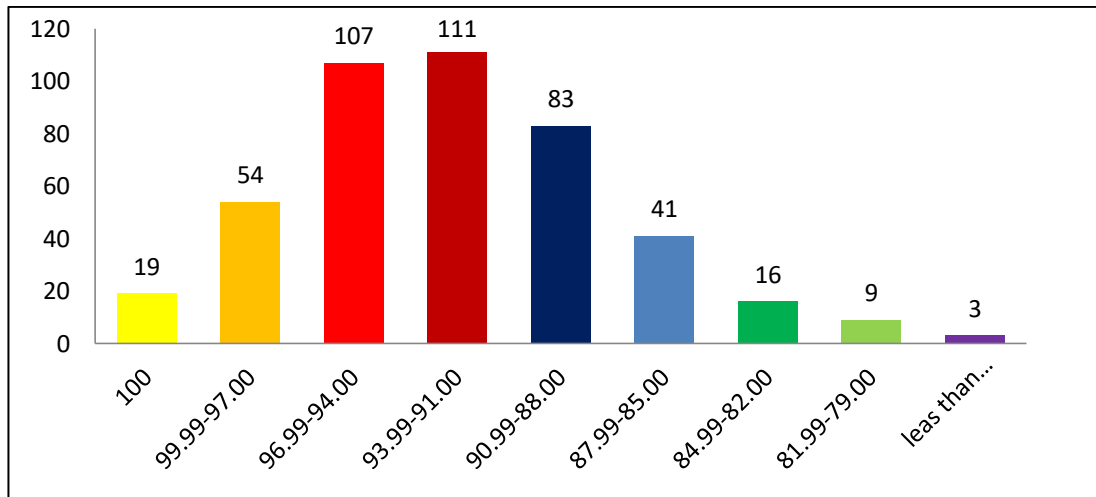


Figure 4.1: The efficiency value for 445 DMUs

In the light of the analysis of the efficiency of the DMUs in this study, it can be concluded that, there is no sharp fail of efficiency among DMUs which may severely affect the quality of education. However, considering the first research question, it is necessary to note that the level of the inefficiency is fairly low. In other words, on the basis of percentile, it can be said that only 4.26 percent of the DMUs are efficient and the rest 95.74% are inefficient. As a result of this, the administrators are required to evaluate the existing facts and figures. The only possible point is that there is no sharp decrease in the values of efficiency. However, still it is necessary to tackle the values and percentiles of the efficiency values.

4.6.2 Weight Analysis

PIM-DEA software can provide more information about the indicators which play role in the efficiency evaluation, for instance, weight analysis. Calculating the weights for indicators (inputs and outputs) answers the second research question. ‘Which indicators have the most significant impact in the efficiency of teaching and learning in EAP classes’?

Weights of each inputs and outputs for all 445 DMUs in this study are computed by the software to identify the significant indicators influenced the degree of performance efficiency. To clarify the concept of weight, consider Table 4.17 as a sample.

Table 4.17: Sample weights of the inputs and outputs

Name	Efficiency	Input1	Input2	Output1	Output2
DMU161	98.08	0	0.18	0.26	0
DMU162	94.72	0.11	0.09	0.28	0
DMU163	83.27	0.15	0.18	0.33	0.03
DMU164	96.33	0.07	0.13	0.23	0.07
DMU165	90.41	0.1	0.15	0.29	0.02
DMU166	93.74	0.09	0.14	0.29	0
DMU167	96.03	0.11	0.09	0.27	0
DMU168	95.65	0.12	0.18	0.28	0.03
DMU169	94.74	0.12	0.14	0.28	0.03
DMU170	94.35	0.16	0.09	0.27	0.03

Table 4.17 illustrates efficiency analysis and weight analysis for 10 DMUs (EAP courses). The first column represents each class, column two illustrates the degree of the efficiency value, column three displays the degree of input one's impact (weight) on the efficiency value of the DMU 161, column four, column five, column six highlight the degree of the impact of input 2, output1, and output 2 respectively. In other words the highest value of weight interpreted as having more effect on the degree of the efficiency. Appendix B represents the data of the efficiency assessment and weight analysis for 443 DMUs (EAP classes).

The average of the weights can be a clear explanation for the general importance of each inputs and outputs indicated in the efficiency of all DMUs. When the findings of weight analysis were considered, the value of 0.2818 of input I (assignments, exams and grading system) has been found to be of significant finding means that

output I which is students' feedback to the assignments, exams and grading system are very important for the students. This in turn reflects the efficiency level of the teacher performance. So, Output 1 has a bidirectional effect. Table 4.18 illustrates the average of the weight analysis of inputs and outputs for 443 DMUs.

Considering the attained value in Table 4.18, it is clear that output 1 with the value of (0.2818) is the most significant, input 2 with (0.1429), input 1 (0.1053), and output 2 (0.030) the least important respectively. Therefore, it can be interpreted that the students' satisfaction of the class assessment and the assignments play a significant role in the degree of efficiency of a teacher in class, the second important is the teacher's performance, later the course while the students' final grade will be the least important factor. Table 4.18 illustrates weight calculation of inputs and outputs.

Table 4.18: Weights of the inputs and outputs for 443 DMUs

Indexes	Output 1	Input2	Input 1	Output 2
Weights	0.2818	0.1429	0.1053	0.0304

As shown in the above table, the second most significant indicator is input 2, related to the teaching skills; with value of (0.1429) is the second significant indicator. Input 1 (course content) with a value of (0.1053) and output 2 (students' final grades) with the value of (0.030) are the least important, respectively.

4.6.3 Sensitivity Analysis

In order to support the findings of weight analysis for the second research question, and to raise the degree of reliability, the researcher conducted sensitivity analysis. By applying sensitivity analysis the efficiency of each DMU was recalculated by deleting each input and output in four stages. For instance, at stage one the efficiency was calculated by removing input 1 (items related to the course content), stage two

the efficiency was calculated by removing input 2 (items related to teaching skills), at stage 3 the efficiency was calculated by removing output 1 (items related to students' satisfaction of exam, assignments and grading) and at the final stage the efficiency was calculated by removing output 2 (students' final grades). Later the obtained averages of the above-mentioned efficiency values were compared. The significant change of the efficiency value implied the noticeable indicator, which might be input 1, input 2, output 1, or output 2. Table 4.18 illustrates a sample calculation for a limited number of DMUs. As presented in the Table 4.19, R. I. 1 stands for remove input 1, R.I.2 stands for removing input 2, R.O.1 stands for removing output 1, and R.O.2 stands for removing output 2.

Table 4.19: Applying sensitivity analysis for 15 DMUs

Eff. after removing indicators					
Class	Eff.	Eff-R.I.1	Eff-R.I.2	Eff-R.O.1	Eff-R.O.2
1	88.97	84.23	88.75	50.81	88.97
2	83.38	80.39	83.13	48.7	83.38
3	89.39	87.55	88.79	44.26	89.39
4	93.22	92.17	89.96	71.88	92.19
5	89.39	87.52	88.83	36.66	89.39
6	92.19	91.93	89.96	35.24	92.19
7	95.94	95.6	93.1	27.63	95.94
8	86.97	86.12	85.78	33.31	86.97
9	95.16	95.16	93.46	41.61	95.16
10	92.89	92.24	91.74	44.99	92.89
11	90.19	89.54	89.19	43.55	90.19
12	91.58	91.18	90.46	53.3	91.58
13	90.01	87.61	89.72	57.71	90
14	98.02	95.19	97.78	52.24	98.02
15	85.5	81.58	83.27	49.39	85.32

The calculation for all of the 445 DMUs are presented in Appendix D. The analysis illustrated that deleting the most significant indicator, Output1 in this study, had more impact on the degree of change of efficiency; that is, the elimination of Output1 (items related to the students' satisfaction of assignments, exams and grading) made

the significant declining (descending) change in the efficiency value of all DMUs. Similarly, Input 2 (items related to teaching skills), Input 1 (items related to course content), and Output 2 (students' final grades) had the declining change on the efficiency values. Table 4.20 illustrates the above-mentioned statements in the order of their importance.

Table 4.20: Sensitivity analysis for 443 DMUs

Index	Output 1	Input 2	Input 1	Output 2
Ave. Eff	62.984	89.919	90.9418	91.326

Note: Eliminating output 1 results in major decrease in the amount of efficiency

In light of the sensitivity analysis result, shown in Table 4.19, Output 1 (items related to the students' satisfaction of assignments, exams and grades) can be found to be the most significant indicator in efficiency of teacher performance. In all of the following calculation, the order of importance of each index (2 inputs, 2 outputs) remains unchanged. As it has been mentioned earlier, the students' satisfaction of assignments, exams and grade is the most significant, and then Input 2, teachers' performance and punctuality in class, then Input 1, the indicators related to the course content, and finally Output 2, the students' overall grades are the least significant indicator in the degree of contribution to the efficiency of a teacher in class.

4.6.4 Summary of the Data Analysis

Thus, in this data analysis, the instructors of EAP classes were evaluated in terms of the degree of the efficiency value. For this purpose, three course-instructor indicators from SCE questionnaire and the students' final grades have been considered as 2 Inputs, and 2 Outputs, correspondingly. The major aim was to find out the number of EAP classes which are considered as efficient. According to the results, only 4% of

the EAP instructors could be considered as efficient. In the second stage, the researcher identified the most significant indicator which has the highest impact on the degree of its efficiency in EAP course. The analysis illustrated that indicators related to the students' satisfaction of assignments, exams and grades play a major role in the efficiency of EAP teacher performance.

4.7 Interview

As pointed in chapter 3, the research design was based on sequential mix method approach. Therefore, the research findings of Output 1 (indicators related to the students' satisfaction of assignments, exams, and grades) have been the source of the interview questions. This means the research questions would crosscheck the statistical answers findings. The interview consisted of a set of pre-prepared questions in open-ended format. The aim was to encourage the interviewee to elaborate the issues raised in the analysis. The interview consisted of three groups in accordance with the results of the analysis. In reference to the data retrieved from the analysis of the data, the indicators of Output 1 had a significant impact on the degree of the teachers' efficiency. The rate of the efficiency degree in EAP classes revealed the fact that the students were not satisfied and also they have not been aware of the grading system, therefore; the questions of the interview covered all the items concerning Output1. Referring to the SCE survey, Output 1 comprises of items related to students' degree of satisfaction of grades, assignments and exams, thus, the first set of questions were guided by the factors on how to improve the assignment and exams, and on how much students have been aware of the grading procedures and the systems.

In the second part of the interview, the researcher asked the instructors' opinion on how efficient class could be developed. The factors, which they believed, could impact on teachers' performance in EAP class regarding the appropriate management of time and course outlines. The research questions were fully stated in Appendix E.

4.7.1 Assignments as Effective Learning Tool

In the interview, the researcher sought to investigate the following questions (i) how effective were assignments to the students' learning, (ii) how often they gave feedback to the students? (iii) if they thought the assignments met the students' needs in academic reading-writing course? And (iv) if the assignments covered the course outlines, and how the assignments could have been improved. [T1], [T2], [T3], [T4] and [T5] had no roles in preparing assignments. They received the booklet from the department and used in classes. [T1] and [T2] believed the assignments given were sufficient and there was no need for alteration. [T3] believed in more comprehensive assignments and tasks. He thought tasks of the assignments need to dominate the exams and quizzes. [T4] and [T5] believed in having more group work in completing the assignments. They believed the group works needed to be graded. [T7] believed that assignments were compatible with the need of the learners, as they were all prepared by the need analysis of the learners' departments. She also emphasized that, "all teachers should cooperate in the material development, since it gives teachers a sense of belonging to the system and improve their performance in class". [T11] suggested having some online activities in the classroom to strengthen their motivation. [T8] and [T7] agreed on having some speaking activities in the assignments and class. [T14] believed that assignments should be done in class, homework will be appropriate only for the completion of the task. Majority of the instructors believed in having plagiarism check for assignments as many essays are

copied from the other sources. Almost one third of the instructors thought that the assignments should be handed as a full pack to the students at the beginning of the semesters, emphasizing that the aims of the assignments need to be clarified to the students. According to [T13] and [T14] who were also members in organization team, assignments would be meaningful if they were compatible with the course outline and the learners' need. Having good rapport between teachers and the learners were recommended by all of the interviewees. Students got written feedback therefore they were considered as a learning tools. Three of the instructors believed that topics selected for assignments were not appropriate. [T2] thought that more current issues for topics should be introduced in class. [T7], [T10] and [T12] thought of adding some grammar sections for the language, however; others believed that they were not teaching grammar in this course, they were teaching language skills. Therefore, teachers recommended grammatical source as supplementary material for the students to improve their knowledge of language if it was required.

4.7.2 Exams as Effective Learning Tools

Bearing in mind the second most significant indicator, item number 11 of the SCE survey, which is about the students' satisfaction of exams, was included in the second part of the interview. Regarding the exam formats and their rules and regulations, questions of this part were designed to seek information about instructors' opinion about the format and if they could be considered as a learning tools. Majority of the instructors agreed on the format of the midterm and the final questions. Minority of the instructors believed in adding the writing section for the midterm exam, too. T1 stated that "you found out the mistakes of your students while correcting their essays in the final exam, which is too late and there is no chance of improving". One third of the instructors think of taking the papers to the class for the

feedback, according to T7, “Students learn from their mistakes”. Almost all of the instructors believed that students didn’t learn ‘from’ their exams but they learn ‘for’ the exams. T15 stated that, “we teach various techniques of reading for academic texts, such as skimming, scanning and critical thinking, therefore; they don’t learn ‘from’ exams, they learn ‘for’ the exams”. T7 emphasized that, although; students are already aware of the exam formats, she received many complains from the students for the grades. She also added that the lack of having questions for essay writing in midterm exam, was a disadvantage, but considering a high work load of teacher they had more time to practice academic writing than to rush toward it to prepare students for the midterm exam writing sections. She believed the teacher should have more time to work with their students.

T8, T9, and T19 thought the exams were not learning tools, they were a measuring tool. They presented how much the students have learned during the semester. In their opinion, exams could be learning tool if they were in the format of progress test. T11 also believed that exams could not be learning tool if the papers were not analyzed after the exams, “students make mistakes but we never talk about their mistakes”, he said. In his view, assignments could be considered as learning tools not the exams.

T13 considered exams as learning tools because students learnt for the exams, “they see the exam specimen and then study for it” she believed. The instructors believe that students learn the techniques they can use in the exams while doing some exam specimen.

4.7.3 Grades Reflect the Performance of the Learners

The third question of the interview was related to the grading system as follows; (i) how exams are graded, (ii) if rubrics are explained to the students, (iii) how many students complain about the exam results, (iv) if they believe exam results and presenting rubrics have any impact on the teacher performance or students' learning; (v) how teacher performance can be improved.

[T1], [T2] and [T3] did not explain the rubrics to the students, unless they were asked. Others clarify the criteria of essays at the beginning of the semester. Thus, the criteria were clearly elaborated to the students in EAP classes by the majority of the instructors. [T12], [T6] and [T13], who were more experienced, practice grading process in class with the students in group. They believed that learners had to be aware of the grading process and the teachers' expectation in the course. In their view, acknowledging students about the grading process enabled them to have a clear understanding of the assignments and exams. Consequently they would have better performance in the class. "There should be a mutual understanding in grading between students and the teachers", [T14] explained. She also added "If the learners know about the grading process they can accomplish the course objectives better". [T6] emphasized that, "learners are required to be aware of the course expectations to avoid any probable misconceptions or discriminations from the teacher toward students". [T13] mentioned that students attendance was a crucial factor in class performance, "I explained ones the criteria in class, those who attended were aware, those who were absent would miss" she added. She also believed that clarifying the criteria to the learners had an indirect impact on the teachers' performance. Since the teacher focused on the lesson based on the criteria, [T15] not only gave the criteria to

the students, but also analyzed it with the students and gave references from the course book. “Students’ awareness of the criteria saves me”, she added.

The last question of the interview which is the last question of this research reflects the teachers’ performance in class regarding the efficiency. The researcher tried to seek recommendations from the teachers both new and experienced in having more efficient class. Out of 15 instructors, only four teachers believed in having the lesson plan despite of more than fifteen years of experience. Others believed that lesson plans are for the early stages, the only alteration of the teacher is the way of presenting the material. “I always have my lesson plan before I attend class, it helps me to have more organized performance in the classroom”, mentioned [T14]. [T8] thought all the teachers should be involved in preparing the materials for assignments and courses, which affect the teacher performance. She also believed in having annual meeting with different English medium departments to both adopt more materials considering the needs of the learners and to have a clear course objective. This will enable the coordinators and organizers of the course to prepare the materials and assignments related to the writing styles based on the needs of the learners. Acknowledging the learners’ with the grading will motivate them for doing the assignments and class activities, moreover, it gives a clear direction in teachers’ performance. Need analysis of the class should be done for every single stage as the students belong to different background and profile. There are both weak and strong students in terms of language command in classes.

4.8 Summary

As pointed out several times throughout the chapters, the nature of the research design in this study was sequential mix method. Therefore, accordingly in this

chapter the data arrangement and preparation for different calculation and the transforming them to other phases of the research were clearly stated. In this respect, the classification of the survey items, the calculation of the students, groups, preparation of the ENGL groups, the selection of acceptable inputs and outputs, application of performance analysis, calculator of the relevant decision making units, calculation of efficiency performance of teachers and output I is as well as others, crosschecking the efficiency on the basis of weight and sensitivity analyses and forming the teachers' interviews were carried out.

Chapter 5

DISCUSSION AND CONCLUSION

5.1 Introduction

This chapter summarizes the research and focuses on the major findings of the research, followed by a discussion in light of the pertinent research to date. Finally, the chapter offers points regarding pedagogical implications, limitation and delimitation of the study and concludes with suggestions for further research.

5.2 Discussion of Findings

Regarding the teacher performance evaluation from significant value of efficiency, the study aimed at discussing the findings of the following questions:

1. What is the efficiency level of EAP teacher performance in the Academic reading-writing classes?
2. Which indicators have (the most) significant impact in the efficiency of teaching performance and students' learning in EAP classes?
3. Which indicators need to be improved to ameliorate the inefficient EAP classes?
4. How can the efficiency of teaching-learning in EAP classes be improved as perceived by instructors?

The findings in relation to each specific research question are presented in the data analysis chapter, according to the order of questions as formulated above. This section presents the discussion of findings and conclusion in the same order.

5.2.1 Efficiency Level of Teacher Performance

The notion of quality in language education is increasingly common as in other areas of human activity (Crabbe, 2003). The notion of quality can be sought in two ways: either in product, the achievement of specific objectives or in the process, the teaching performance, availability and use of learning opportunity (Cave, et al, 1997). Considering efficiency as one of the main elements in quality evaluation in higher education, it is crucial to assess it in the process which is, the teaching performance. Referring the quality in class and measuring efficiency performance of EAP teachers as the indispensable factor of quality, the analysis of the study revealed some important facts.

As mentioned in the previous chapters, efficiency in education occurs at a time when outputs (students' learning) can be test results or value added and are produced at the minimum level or resources in a restricted time (Johns, Portela & Thanassoulis, 2017). That is, the target in efficiency is to achieve maximum result (output) utilizing minimum effort (inputs) at a restricted time. This study considered course content and teacher performance skills as the input and students' satisfaction of assignments, exams, grading system and their final grades as outputs to evaluate the efficiency performance of EAP teachers. According to the attained data in Diagram 4.1, only 19% of the EAP teachers were considered as fully efficient. In other word, only 19% of EAP teachers used their allocated time and available course content and material in their performance and achieved the best results, students' learning. Majority of academic reading-writing classes in Eastern Mediterranean University had the efficiency value between 99%- 74% (Diagram 4.1). That is 81% of the EAP teachers were not considered fully efficient in their class performances. This means the

quality of instruction is to be reconsidered. The course-instructor indicators which had an impact on the efficiency performance of EAP teachers were identified and discussed in the following sections.

5.2.2 The Most Significant Indicators: Exam Satisfaction, Assignments, and Grading

In order to improve the efficiency value in EAP classes, the most significant indicator was detected. Two separate analyses have been utilized at this stage to ascertain the accuracy of the findings, calculating weight and sensitivity analysis. Notably, the analysis in both methods resulted in a similar way. According to the findings in Table 4.17 and Table 4.19 students' satisfaction of the exams, assignments, and grading system highly affected the efficiency of teacher performance. Therefore, these indicators were considered as the most significant in the EAP teacher performance. That is, students' satisfaction of assignment, exams, and grading system enabled teachers to have better performance with the highest students' achievement. Our findings, in this study, have been in variance with Montoneri et al., (2012) that highlight the priority of the richness of course content regarding the degree of efficiency value. According to the findings of their study, the richness of the course content will improve teacher performance and enable the teachers to have more efficient performance. However, referring to the weight analysis of the items in SCE survey in data analysis (chapter 4), students' satisfaction of assignments, exams, and grades could improve teacher performance from the efficiency value in EAP courses. Importantly, the analysis illustrates that majority of the learners consider assignments and exams and the grading system as effective learning tools in academic reading-writing courses.

5.2.3 Interview

Referring to the last research question (how can the efficiency of teacher performance be improved) and in the light of data gathered in the interview from the instructors', the following suggestions have been made. The items are related to the most significant items of the SCE questionnaire which have impact on the efficiency of teacher performance.

5.2.3.1 Assignments as Effective Learning Tools

According to the results of the interview, teachers usually clarify course objectives in the first session but they hardly ever explain the 'aims' and 'objectives' of each assignment. Clarifying objectives and aims of assignments and criteria and rubric of both, assignments and exams to the students make them more meaningful; therefore, students consider them as learning tools. In other words, students are clear on what they will be expected to achieve in the course and the output which in fact meant learning. According to the instructors, in academic reading-writing classes, process writing seems more important rather than the final exams which can be practiced in group work. As highlighted by the instructors, group work in assignments is highly recommended in the above-mentioned classes. The majority of instructors, whom were interviewed, believe that there is a big gap in feeling responsibility in group work among learners, which needs to be improved.

Need analysis is recommended to be focused when preparing the assignments and the topics of the academic writing that make students more motivated and interested in accomplishing the given task. It is believed that involving both, instructors and learners in preparing the materials gives a sense of belonging to the course in academic reading writing classes. Moreover, it might enable a good rapport between

the instructors and learners. Furthermore, considering the restricted hours of English instruction at the university's curriculum, online tasks and assignments are recommended to involve learners in practicing more English. Moreover, the rubric of grading as a single pack of booklet is recommended by the teachers. In light of the points raised by the EAP teachers, the suggestions can be summarized as the following:

- Criteria for marking assignment must be clear and handed to the students beforehand.
- Assignments must be expanded; there must be more assignments than the exam.
- Topics selected for the process writing (assignments) are better to be selected by the students related to their major at the department.
- Students will take assignments seriously if they are aligned with the needs of their departments.
- Some assignments can be done as a group, so that students can learn to participate in team work. Students should be graded based on their degree of participation in the team. There is a big gap in team working in terms of assignments.
- There should be a good teacher-student rapport and trust; this gives them a sense of belonging and responsibility in class.
- Academic skills for all four skills must be reflected in preparing the assignments.
- There must be some speaking activities for completing the assignments. More activities for speaking and listening skills can be included in assignments.

- There must be more technology-based assignments using students' smart phones in classes.
- Need analysis must be taken into account while preparing the assignments.
- The booklet must cover all the materials for outline, process writing, rubrics for writing and presentation skills.

All of the above-mentioned suggestions can improve the assignments and teacher performance in EAP courses.

5.2.3.2 Exams as Effective Learning Tools

Considering exams as the second item of the most significant indicator in efficiency performance of EAP teachers, 60% (9 out of 15) of instructors believed that students did not learn from their exams but they learned for the exams. Practicing the exam specimen was highly recommended as students could learn the techniques which could improve their performance in exams and were highly in line with quality and effective learning. Almost all of the instructors believe in giving feedback to the students. As stated in Brown and Campione (1994), feedbacks needed to be detailed, comprehensive, meaningful to the individual, fair, challenging and supportive for the students' learning. Teachers must consider using the whole range of means available to them to make it possible, including computer-aided assessment and strategies for giving feedback efficiently such as assignment return sheets, assignment reports, in class collective feedback and other means (Brown & Campione, 1994). The following points were recommended by the instructors about the midterm and final exams for the betterment of the results:

- The exam papers should be allowed to be discussed in classes, people learn from their mistakes

- Activities of critical thinking and analyzing texts must be emphasized in the exams.
- There should be some writing tasks in the midterm exams, too. Students need to get feedback on their exams, furthermore; writing essay in midterm can enable the instructor to detect the weakness and the strength of their learners in academic reading and writing.
- Exam formats must be clear and to the point.

5.2.3.3 Grades Reflecting Learner Performance

Only 40% of the instructors explained and clarified the rubrics for the assignments and exams to the students in the class. Students' comprehension of the grading process enables them to have a clear understanding of the assignments and exams, as mentioned by instructors. Consequently, students can perform better and achieve more in class. There should be a mutual understanding in grading between students and teachers. If learners know about the grading process, they can accomplish the course objectives better. The majority of instructors reported that the grading process could affect their teaching performance.

Instructors can practice grading in the class with students in groups. Learners must be aware of the grading process and the expectation of the course delivered by the teachers. Teachers can use self-assessment, peer-assessment and group assessment and to explain the rubrics. However, as emphasized in Brown (2005), none of these activities should be regarded as a 'quick fix', because they take considerable briefing, training and rehearsal if they are to be effective. Instructors in the research believed that when properly managed, it could save some time for the instructors and

they were extremely valuable in helping students interpret criteria and the rubrics for grading the assignments and exams.

5.3 Summary

Regarding the efficiency as a major factor of quality, it is crucial to consider the quality concept in teacher education. Evaluating teacher performance, especially from the efficiency aspect, has not received adequate attention in researches to date. Therefore, the present study attempted to explore the degree of the efficiency value of teachers in EAP courses. It was a longitudinal survey involving a questionnaire and an interview. The survey was conducted with 10.000 undergraduate students studying in English medium faculties in Eastern Mediterranean University, North Cyprus during 2010-2015. As one of the most important finding of the research, only 19% of EAP instructors acquired a full efficiency value – 100% (see Diagram 4.1). The majority of EAP instructors acquired the efficiency value of 99-88 %, importantly that the degree of efficiency is in direct relation with the students' satisfaction of assignments, exams, and grading system. Having approximately 28 multinational students in EAP course, the degree of efficiency seemed quite reasonable.

Another important finding was in relation to prioritizing the indicators which had an effect on the degree of efficiency in teachers' performance. According to the quantitative analysis, students' satisfaction with exams and assignments was the most significant indicator. Teachers' performance and punctuality constituted the second most important indicator. Student satisfaction with course content and final grades took the third and fourth level of importance, respectively. Moreover, it was found

that the higher the students' satisfaction with exams, assignments and the grading system, the more efficient the EAP instructors were deemed to be.

The analysis was followed by an interview aims at eliciting information from the instructors in order to interpret the retrieved data. It also aimed to improve the degree of efficiency in teachers' performance. According to the data elicited from the interview, in order to have an efficient class, EAP instructors should draw up a need analysis at the beginning of the course, clarify the course objectives to the students, explain the aims of the assignments and communicate the allocated time clearly along with informing the students about the grading system.

The significance of the present study is to evaluate the efficiency of instructors on the micro level. It is a contribution to the field of teacher evaluation since the efficiency of universities in general, and departmental performance in particular, has not been widely investigated. Furthermore, this study was conducted to fill a gap in the relevant literature and to study the efficiency of teachers' performance in class rather than the types of effectiveness which have traditionally been discussed in research. Conducting an interview with the instructors provided some techniques for improving the degree of efficiency value in the teachers' performance. Annual meeting with different English medium departments are recommended to have clear course objectives. This will enable the coordinators and organizers of the course to prepare the materials and assignments related to writing styles based on the needs of the learners. Both experienced and new teachers should focus on having a clear cut lesson plan reflecting the aims and course objectives of each lesson. All teachers need to be involved in material preparation. Needs analysis of the class should be

done for every single student due to their different background and profile. There are both weak and strong students in terms of language command in classes.

5.4 Conclusion

The current study aimed at evaluating teacher performance from the efficiency perspective and identified and prioritized the most significant indicators which affect the efficiency of teacher performance. Data analysis has been conducted through PIM-DEA software. Later, through an interview, the researchers try to find some solutions to improve the teacher performance efficiency. Teachers who are considered as efficient seem to set the goals and plan their class performance based on the course objectives. They know how to handle with students' problems, and have a good rapport with them. When the objectives are clear, the students can actively participate in the learning process. They are more engaged and motivated to learn. These methods encourage students' metacognition (that is, a means of learning about their own learning), they are also very effective in encouraging deep rather than surface learning, as stated in Brown (2005). Any assignments, assessment strategy and grading systems need to be efficient in terms of staff time, and should ensure that learners find the tasks they are set manageable, relevant and developmental, that is the objectives must be clearly stated in class. We cannot simply expect our students or ourselves to just keep working harder and harder; we must make best use of the available technologies and strategies, where possible, to make assessment more efficient and meaningful (Brown & Campione 1994). The assessment tasks need to be integral to the learning process, rather than a subsequent bolt-on and, to ensure this, tutors should be able to concentrate equally strongly on giving feedback and on making evaluative decisions about performance. Timing of assignments, assessment and grading practices are also key issues, since the

responses given to the assessed work, need to allow opportunities for amendment and remediation of errors.

5.5 Pedagogical Implications

In light of the findings of the present study, some implications for teacher education and training can be suggested, especially for those concerned with EAP courses. Language teachers and instructors can consider introducing the criteria and grading system with emphasis on the relation with aims and objectives of the course. Moreover, EAP teachers can be recommended to practice the grading procedure with the students to enable them to develop their critical thinking skills. Since learners become aware of the evaluation and grading system, and practice critical thinking skills, they will be more autonomous learners and be able to reflect on their writing. Furthermore, students are suggested to have more group work in EAP classes and give reflection on each other's writing. This will save teachers' time and improve their monitoring skills.

5.6 Suggestions for Further Research

Prospective research can incorporate evaluating the efficiency of EAP while distinguishing the learners' level of proficiency. Moreover, it can also be conducted with specific teachers to examine more teaching performance in classes. Further research can undertake investigation of the relationship of teacher efficiency with the washback effect. Considering Eastern Mediterranean University as a multicultural university, learner identity can also be taken into account for evaluating efficiency.

5.7 Final Remarks

Applying a different method (DEA in this study) in data analysis can give a distinct viewpoint toward teaching. The overall findings of this study illustrate the pervasive influence of grading system on teachers' efficiency. Acknowledging learners' with

grading procedures and relating it with the aims of the course can motivate them for completing assignments and cooperating in class activities, moreover, it gives a clear direction in teachers' performance, subsequently improving the quality of teachers in EAP courses.

5.8 Limitations and Delimitations of the Study

As it occurs in every research, the study had also some limitations. Undergraduate freshman students who were taking academic English courses were considered in this study; however, the questionnaire for some classes could not be considered in this study as it was filled with an insufficient number of participants in a class. Therefore, some classes were forced to be deleted from the study. Regarding the acceptable number of participants, it should be mentioned that an average of below 50% responses were not considered in this study. The EAP instructors in questionnaire was unanimous, therefore the researchers were unable to identify the efficient instructors in the interview. Gender differences were not taken into consideration; both male and female students were participants in the research and were not spilled. Age was also considered a constant variable. In order to use the DEA for analysis data, some conditions were required as the number of decision making units, and general English courses in this study, must have been three times greater than the summation of inputs and outputs, and the inputs and outputs were required to be selected according to the aims of the study.

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APPENDICES

Appendix A: Students' Course- instructor Evaluation Survey (SCE)

Questionnaire

EMU Student Ratings of Instructor / Course DAÜ Öğrenci - Öğretim Elemanı / Ders Dereceleme Ölçeği

A- COURSE INFORMATION (DERS)	
Academic Year/Term	2011-12/2
Course Code/Group	
Course Name	Writing
Instructor Name	
# of Students Enrolled	15

B- STUDENT INFORMATION (ÖĞRENCİ)									
I) The grade I expect to receive in this course: / Bu dersten almayı öngördüğüm not:					II) The approximate number of hours spent each week studying for this course: / Bu ders için haftada ortalama çalışma süresi:			III) I visited hours: / Öğretmen ziyaret ettim:	
A	0	C+	0	D-	0	None/Hiç	0	None/Hiç	
A-	0	C	0	F	0	1-3 hours/1-3 saat	3	1-3 times/1-3 kez	
B+	2	C-	0	NG	0	4-6 hours/4-6 saat	0	4-6 times/4-6 kez	
B	0	D+	0	Empty	8	7-10 hours/7-10 saat	4	7-10 times/7-10 kez	
B-	0	D	0			More than 10 hours/10 saatten fazla	3	More than 10 times/10 kezden fazla	
						Empty/Boş cevap	0	Empty/Boş cevap	
Average/Ortalama					3,3	Average/Ortalama		2,7	Average/Ortalama

C- INSTRUCTOR / COURSE RATING SCALE ÖĞRETİM ELEMANI / DERS DERECELEME ÖLÇEĞİ		Scale / Ölçek						
Items / Maddeler		AVERAGE ORTALAMA	AGREE STRONGLY KESİNLİKE KATILIRIM	AGREE KATILIRIM	NEUTRAL FİKRİM YOK	DISAGREE KATILMA	DISAGREE STRONGLY HİÇ KATILMA	TOTAL TOPLAM
1	The course increase my knowledge of the subject. Ders bu konudaki bilgimi artırdı.	3,7	7	3	0	0	0	10
2	The instructor clearly stated the course objectives. Öğretim elemanı dersin hedeflerini açıkça belirtti.	3,6	6	4	0	0	0	10
3	The instructor was well-prepared. Öğretim elemanı derse hazırlıklı geliyordu.	3,7	7	3	0	0	0	10
4	The instructor communicated the subject matter in the target language. Öğretim elemanı konuyu öngörülen öğretim dilinde aktardı.	3,78	7	2	0	0	0	10
5	The instructor's presentation of the content was clear. Öğretim elemanı ders içeriğini anlaşılır bir biçimde	3,6	6	4	0	0	0	10

	sundu.							
6	The instructor developed a good rapport with students. Öğretim elemanı öğrencilerle iyi bir iletişim kurdu.	3,3	4	5	1	0	0	10
7	The course challenged me intellectually. Ders düşünsel anlamda ufkumu genişletti.	3,6	6	4	0	0	0	10
8	The instructor stimulated my interest in the subject. Öğretim elemanı derse olan ilgimi artırdı.	3,5	5	5	0	0	0	10
9	The instructor provided feedback on my work. Öğretim elemanı çalışmalarımı ilgili geribildirimde bulundu.	3,5	6	3	1	0	0	10
10	The assignments were effective learning tools. Verilen ödevler etkin öğrenme araçlarıydı.	3,5	6	3	1	0	0	10
11	The exams were effective learning tools. Sınavlar etkin öğrenme araçlarıydı.	3,6	6	4	0	0	0	10
12	The instructor was available during specified office hours. Öğretim elemanı belirlenen ofis saatlerinde yerindeydi.	3,6	6	4	0	0	0	10
13	My grades reflected my performance in the course. Sınav sonuçları derste ki performansımı yansıtıyordu.	3,6	6	4	0	0	0	10
14	The course materials were relevant. Kullanılan materyaller ders ile ilgiliydi.	3,4	5	4	1	0	0	10
15	The instructor was punctual. Öğretim elemanı ders saatleri konusunda duyarlıydı.	3,6	6	4	0	0	0	10
16	The audio-visual aids (e.g. videos, slides, charts, etc.) used were effective Görsel-işitsel malzemeler(video, slayt, tablo, vb.) öğrenimde etki	3,5	5	5	0	0	0	10
17	The instructor treated all students fairly. Öğretim elemanı tüm öğrencilere adilce davrandı.	3,5	5	5	0	0	0	10

Appendix B: Inputs and Outputs Values and Classes Efficiency Scores

#	IENG181	Course	Teacher	Attitude	Grade	Eff.	#	IENG182	Course	Teacher	Attitude	Grade	Eff.
1	2010-11-1	3.0277	3.4477	3.0625	1.77	88.97	50	2010-11-1	3.666667	3.744444	3.611111	1.9235	94.08
2	2010-11-1	3.1214	3.46144	2.9311	1.71	83.38	51	2010-11-2	3.375	3.375	3.375	2.2863	95.1
3	2010-11-1	3.2857	3.5214	3.2321	1.57	89.39	52	2010-11-2	3.145833	3.43125	3.03125	2.2941	87.56
4	2010-11-1	3.5	3.53	3.4	2.57	93.22	53	2010-11-2	3.857143	3.95	3.714286	2.1937	93.76
5	2010-11-2	3.28	3.52	3.23	1.3	89.39	54	2011-12-1	3.148148	3.288889	2.944444	1.5076	85.03
6	2010-11-2	3.5	3.53	3.4	1.26	92.19	55	2011-12-1	3.185185	3.511111	3.055556	2.033	86.28
7	2010-11-2	3.3939	3.4182	3.4545	0.98	95.94	56	2011-12-2	3.422222	3.686667	3.316583	2.1733	89.13
8	2010-11-2	3.4583	3.5817	3.2187	1.194	86.97	57	2011-12-2	3.2	3.6	3.5	2.047	97.95
9	2011-12-1	3.73	3.74	3.67	1.51	95.16	58	2011-12-2	3.714286	3.671429	3.714286	1.75	97.6
10	2011-12-1	3.638571	3.728	3.55	1.63	92.89	59	2012-13-1	3.491228	3.526316	3.342105	2.266	91.2
11	2011-12-1	3.663333	3.759	3.465	1.58	90.19	60	2012-13-1	3.545455	3.609091	3.568182	1.8285	95.39
12	2011-12-1	3.755556	3.82	3.566667	1.94	91.58	61	2012-13-2	3.407407	3.533333	3.444444	1.795	94.07
13	2011-12-1	3.31	3.59	3.28	2.05	90.01	62	2012-13-2	3.194444	3.333333	3.229167	1.844	92.44
14	2011-12-2	3.35	3.64	3.6	1.86	98.02	63	2012-13-2	3.609195	3.734483	3.577586	2.59	94.33
15	2011-12-2	2.877273	3.144818	2.772727	1.67	85.5	64	2012-13-2	3.69697	3.754545	3.704545	1.965	96.14
16	2011-12-2	3.212121	3.254545	3.090909	1.24	89.2	65	2012-13-2	3.166667	3.521429	3.321429	2.004	93.6
17	2011-12-2	3.333333	3.1	3	0.92	88.96	66	2012-13-2	3	3.3	2.96875	2.192	88.76
18	2011-12-2	3.444444	3.388889	3.333333	1.27	92.82	67	2013-14-1	3.166667	3.425	2.791667	1.49	78.96
19	2011-12-2	3.791667	3.825	3.71875	1.19	95.23	68	2013-14-1	3.259259	3.211111	3.138889	1.452	90.81
20	2012-13-1	3.539683	3.47619	3.214286	1.788	87.88	69	2013-14-1	3.611111	3.508333	3.479167	2.05	94.49
21	2012-13-1	3.583333	3.80625	3.671875	1.61	95.95	70	2013-14-1	3.428571	3.528571	3.464286	1.257	94.51
22	2012-13-1	3.566667	3.52	3.55	1.0038	96.19	71	2013-14-1	3.761905	3.771429	3.75	1.063	96.71
23	2012-13-1	2.923077	3.2	2.884615	2.13	88.56	72	2013-14-2	3.636364	3.672727	3.386364	1.1727	89.13
24	2012-13-1	2.846154	2.776923	2.692308	1.3041	89.99	73	2013-14-2	3.166667	3.5375	3.375	2.03	95.09
25	2012-13-1	3.685185	3.7	3.583333	1.7794	93.63	74	2013-14-2	3.458333	3.7125	3.625	2.103	96.8
26	2012-13-1	3.433333	3.54	3.375	1.6	91.89	75	2013-14-2	3.296296	3.266667	3.055556	1.825	87.63
27	2012-13-1	3.315789	3.378947	2.986842	1.8894	84.32	76	2013-14-2	2.944444	2.9	2.5	1.142	79.75
28	2012-13-2	3.814815	3.877778	3.416667	1.2473	86.94	77	2014-15-1	3.952381	3.928571	3.785714	2.156	95.2
29	2012-13-2	3.577778	3.793333	3.683333	1.5107	96.41	78	2014-15-1	3.138205	3.425385	3.517231	1.716	98.96
30	2012-13-2	3.074074	3.044444	2.958333	0.9714	89.5	79	2014-15-1	3.291667	3.5	3.28125	2.244	91.75
31	2012-13-2	3.727273	3.563636	3.386364	1.625	90.94	80	2014-15-1	3.619048	3.657143	3.571429	1.978	94.32
32	2012-13-2	3.366667	3.51	3.375	1.3913	92.78	81	2014-15-2	3.666667	3.528571	3.464286	2.637	93.96
33	2012-13-2	3.333333	3.566667	3.416667	0.76	93.62	82	2014-15-2	4	3.949	4	1.742	100
34	2012-13-2	4	3.966667	3.888889	1.5047	97.22	#	IENG191	Course	Teacher	Attitude	Grade	Eff.
35	2013-14-1	2.733333	3.593333	3.05	1.5228	94.89	83	2010-11-1	3.377778	3.686667	3.383333	2.123	91.62
36	2013-14-1	3.472222	3.5	3.395833	1.2541	92.66	84	2010-11-1	3.128205	3.415385	3.519231	1.916	100
37	2013-14-1	3.6	3.68	3.375	1.38	89.03	85	2010-11-1	3.518519	3.733333	3.25	1.506	86.04
38	2013-14-1	2.925926	3.4	2.944444	0.9666	87.59	86	2010-11-1	3.435897	3.730769	3.269231	1.87	87.59
39	2013-14-1	3.47619	3.571429	3.214286	1.57	86.84	87	2010-11-1	3.111111	3.411111	3.361111	3.07	99.21
40	2013-14-2	3.62963	3.688889	3.527778	1.766	92.71	88	2010-11-1	3.666667	3.76	3.566667	1.765	92.8
41	2013-14-2	2.388889	2.85	2.625	1.359	93	89	2010-11-1	3.588235	3.782353	3.382353	2.26	88.59
42	2013-14-2	3.766667	3.82	3.775	1.2111	96.87	90	2010-11-1	3.481481	3.566667	3.083333	1.788	83.32
43	2013-14-2	3.777778	3.733333	3.5	1.1823	90.86	91	2010-11-1	3.717949	3.784615	3.596154	3.64	100
44	2014-15-1	3.388889	3.566667	3.458333	1.58	94.21	92	2010-11-1	3.176471	3.247059	3.102941	1.255	89.93
45	2014-15-1	3.238095	3.628571	3.4285	1.537	95.26	93	2010-11-1	3.060606	3.227273	3.045455	1.54	89.84
46	2014-15-1	2.47619	2.714286	2.5	1.5541	90.38	94	2010-11-1	3	3.2625	2.71875	2.5	83.09
47	2014-15-1	3.033333	2.777778	2.75	0.776	91.89	95	2010-11-1	3.428571	3.421429	3.25	2.072	90.27
48	2014-15-1	3.125	3.2625	2.78125	1.172	80.8	96	2010-11-1	2.894737	3.110526	2.736842	1.968	85.45
49	2014-15-2	3	3.528571	2.857143	1.8529	83.47	97	2010-11-1	3.0909	3.4181	2.9318	1.3741	84

#	IENG191	Course	Teacher	Attitude	Grade	Eff.	#	IENG191	Course	Teacher	Attitude	Grade	Eff.
98	2010-11-1	3.1041	3.631	3.3125	1.714	94.46	146	2011-12-2	3.11747	3.235294	2.764706	1.475	80.73
99	2010-11-1	3.7777	3.5866	3.5	2.232	93.55	147	2011-12-2	3.79167	3.74375	3.671875	2.759	95.26
100	2010-11-1	2.8787	2.9636	2.5909	2.21	84.44	148	2011-12-2	3.36363	3.4	3.09090	2.356	87.45
101	2010-11-1	3.375	3.3625	2.9375	1.826	82.6	149	2011-12-2	3.28888	3.413333	3.06666	2.525	87.88
102	2010-11-1	3.2222	3.4444	2.8888	1.055	81.11	150	2011-12-2	2	2.84375	2.625	2.078	100
103	2010-11-1	3.2222	3.4111	3.2777	1.652	92.45	151	2011-12-2	3.92307	3.861538	3.86538	2.596	98.23
104	2010-11-1	3.0370	3.4444	2.9722	1.672	86.17	152	2011-12-2	3.15384	3.469231	3.057692	2.945	90.05
105	2010-11-1	3	3.58	3.35	1.5	97.83	153	2011-12-2	3.42857	3.428571	3.42857	2.49	95.72
106	2010-11-1	2.625	3.1375	2.875	1.347	92.47	154	2011-12-2	3.07407	3.094444	2.98611	2.706	93.13
107	2010-11-2	3.5	3.7333	3.395833	2.131	90.12	155	2011-12-2	3.70175	3.542105	3.34210	2.478	90.31
108	2010-11-2	3.7222	3.8222	3.652778	2.561	94.25	156	2011-12-2	2.70833	2.8875	2.71878	1.553	90.37
109	2010-11-2	3.2352	3.5764	3.509804	2.432	98.07	157	2011-12-2	3.15151	3.318182	2.84090	2.111	83.16
110	2010-11-2	3.4912	3.5684	3.381579	2.213	91.59	158	2011-12-2	3.30769	3.423077	3.32692	2.867	95.37
111	2010-11-2	3.4877	3.4769	3.346154	1.693	91.48	159	2012-13-1	3.71428	3.814286	3.71428	2.277	95.73
112	2010-11-2	3.2222	3.625	3.458333	2.172	96.36	160	2012-13-1	3.21212	3.436364	3.45454	2.741	99.31
113	2010-11-2	3.4769	3.4928	3.303571	1.496	90.2	161	2012-13-1	3.83333	3.7375	3.7812	2.162	98.08
114	2010-11-2	3.0666	3.09	2.875	2.031	87.94	162	2012-13-1	3.55555	3.766667	3.6	2.285	94.72
115	2010-11-2	3.7666	3.82	3.65	2.21	93.67	163	2012-13-1	3.1	3.33	2.85	1.917	83.27
116	2010-11-2	3.3333	3.445455	3.5	1.809	97.33	164	2012-13-1	3.43133	3.458824	3.38235	3.083	96.33
117	2010-11-2	3.4074	3.477778	3.472222	1.868	95.54	165	2012-13-1	3.48148	3.477778	3.27777	2.368	90.41
118	2010-11-2	3.4	3.58	3.425	0.966	93.08	166	2012-13-1	3.41666	3.485	3.4125	1.975	93.74
119	2010-11-2	3.5952	3.607143	3.535714	1.479	94.17	167	2012-13-1	3.63888	3.783333	3.6875	2.266	96.03
120	2010-11-2	3.3333	3.61	3.15	1.625	86.05	168	2012-13-1	3.27083	3.21875	3.23437	2.72	95.65
121	2010-11-2	3.1282	3.315385	3.173077	1.334	91.45	169	2012-13-1	3.10256	3.423077	3.26923	2.375	94.74
122	2010-11-2	3.1666	3.5875	3.34375	1.933	94.16	170	2012-13-1	3.29166	3.65	3.40625	2.585	94.35
123	2010-11-2	3.1794	3.238462	3.153846	1.369	91.49	171	2012-13-1	3.875	3.85	3.75	3.287	98.95
124	2010-11-2	3.0909	3.236364	2.75	1.095	80.63	172	2012-13-1	3.5625	3.675	3.375	2.84	91.46
125	2011-12-1	3.1481	3.088889	2.972222	2.37	90.9	173	2012-13-1	2.21428	2.414286	2.19642	2.65	94.21
126	2011-12-1	3.1481	3.555556	3.166667	2.262	89.96	174	2012-13-1	2.27451	2.435294	2.25	2.107	91.42
127	2011-12-1	3.8	3.9	3.9	2.475	99.21	175	2012-13-1	3.19047	3.75	3.375	2.008	94.46
128	2011-12-1	3.4242	3.436364	3.295455	2.43	92.01	176	2012-13-1	3.0625	3.275	3.14062	3.196	97.18
129	2011-12-1	3.4523	3.542857	3.517857	2.68	96.81	177	2012-13-1	2.6	2.74	2.45	2.2	87.3
130	2011-12-1	3.6666	3.715789	3.447368	2.718	91.26	178	2012-13-1	3.52381	3.642857	3.5	2.083	93.36
131	2011-12-1	3.0666	3.44	3.225	2.556	94.32	179	2012-13-1	3.04761	3.028571	2.92857	1.841	90.08
132	2011-12-1	3.5641	3.584615	3.519231	2.11	94.24	180	2012-13-1	3.71428	3.742857	3.60714	1.521	93.55
133	2011-12-1	3.4242	3.545455	3.431818	2.651	94.81	181	2012-13-2	3.22222	3.588889	3.55555	2.513	99.55
134	2011-12-1	3.2121	3.536364	3.295455	2.24	92.6	182	2012-13-2	2.44444	2.566667	2.36111	2.062	89.37
135	2011-12-1	3.8333	3.833333	3.8125	2.708	97.5	183	2012-13-2	3.60606	3.681818	3.56818	2.156	94.06
136	2011-12-1	3.4102	3.507692	3.326923	3.12	94.92	184	2012-13-2	3.85185	3.877778	3.63889	1.922	92.39
137	2011-12-1	2.9090	3.181818	3.022727	2.467	93.86	185	2012-13-2	3	3.5	3.375	2.481	98.89
138	2011-12-1	3.4333	3.35	3.425	3	98	186	2012-13-2	3.28571	3.385714	3.39285	2.226	96.13
139	2011-12-1	3.4814	3.488889	3.472222	1.677	94.82	187	2012-13-2	3.45833	3.4875	3.2812	1.812	89.79
140	2011-12-1	3.0909	3.172727	2.840909	1.831	84.88	188	2012-13-2	3.42424	3.572727	3.29545	1.773	89.4
141	2011-12-1	3.1666	3.3875	3.21875	1.34	91.52	189	2012-13-2	3.42222	3.446667	3.35	2.212	92.92
142	2011-12-2	3.7407	3.766667	3.611111	2.508	93.51	190	2012-13-2	3.54902	3.617647	3.48529	2.288	93.29
143	2011-12-2	3.4583	3.5375	3.5	2.396	95.7	191	2012-13-2	3.28205	3.230769	3.34615	1.779	96.39
144	2011-12-2	3.5667	3.61	3.6	1.917	96.06	192	2012-13-2	3.31111	3.573333	3.31666	2.764	93.02
145	2011-12-2	3.1778	3.38	3.183333	2.117	91.41	193	2012-13-2	2.7857	2.84285	2.57142	2.164	86.79

#	IENG191	Course	Teacher	Attitude	Grade	Eff.	#	IENG191	Course	Teacher	Attitude	Grade	Eff.
194	2012-13-2	3.5277	3.59166	3.375	3.123	94.38	242	2013-14-1	2.84848	3.21818	2.977273	2.412	92.68
195	2012-13-2	3.5833	3.6	3.52083	2.97	96.04	243	2013-14-1	2.80952	2.78571	2.678571	2.02	90.32
196	2012-13-2	3.3809	3.77143	3.67857	2.64	99.47	244	2013-14-1	3.91667	3.85	3.84375	2.52	97.84
197	2012-13-2	3.5555	3.51111	3.41666	3.49	100	245	2013-14-1	3.57143	3.52857	3.5	2.459	94.95
198	2012-13-2	2.8	2.62	2.3	2.55	85.53	246	2013-14-2	3.85	3.84	3.74	2.704	95.51
199	2012-13-2	3.1515	3.34545	3.20454	3.29	98.03	247	2013-14-2	3.38	3.64	3.58	1.8	97
200	2012-13-2	3.375	3.175	3.21875	2.795	95.8	248	2013-14-2	3.53	3.78	3.75	2.864	99.48
201	2012-13-2	3.370	3.56667	3.02777	3.326	93.29	249	2013-14-2	3.66	3.64	3.62	2.826	96.55
202	2012-13-2	2.1481	2.48889	2.16666	1.905	88.88	250	2013-14-2	3.46	3.78	3.3	1.895	88
203	2012-13-2	3.3333	3.24444	2.91666	1.875	83.95	251	2013-14-2	3.71	3.73	3.85	2.487	100
204	2012-13-2	2.6944	2.84167	2.79166	2.147	94.88	252	2013-14-2	3.86	3.8	3.75	3.266	99.48
205	2012-13-2	3.5833	3.65833	3.58333	2.605	95.64	253	2013-14-2	3.77	3.86	3.24	2.618	84.18
206	2012-13-2	3.6666	3.6	3.4375	2.228	91.63	254	2013-14-2	2.98	3.09	2.83	2.141	87.98
207	2012-13-2	3.5333	3.64667	3.5	2.253	93.39	255	2013-14-2	3.77	3.83	3.57	1.517	91.5
208	2013-14-1	3.59	3.709	3.53	2.709	93.88	256	2013-14-2	2.94872	3.20769	2.25	3.38	98.55
209	2013-14-1	3.36	3.603	3.337	2.147	91.07	257	2013-14-2	3.72222	3.8	3.6875	2.25	95.08
210	2013-14-1	3.82	3.754	3.71	2.27	95.95	258	2013-14-2	3.23809	3.71428	3.285714	2.92	92.4
211	2013-14-1	3.62	3.75	3.62	3.111	97.36	259	2013-14-2	3.51852	3.82222	3.444444	2.88	92.41
212	2013-14-1	3.61	3.64	3.4	2.246	90.26	260	2013-14-2	3.08333	3.05	3	2.56	93.71
213	2013-14-1	3.45	3.64	3.4	2.194	91.55	261	2013-14-2	3.48718	3.74615	3.615385	2.117	96
214	2013-14-1	3.66	3.65	3.45	2.966	93.45	262	2013-14-2	3.92592	3.92222	3.777778	2.576	95.31
215	2013-14-1	3.76	3.68	3.72	1.761	97.58	263	2013-14-2	3.33333	3.61428	3.571429	2.161	97.56
216	2013-14-1	3.54	3.5	3.43	2.342	93.55	264	2013-14-2	3.47619	3.7	3.5	3.026	95.84
217	2013-14-1	3.84	3.56	3.55	2.953	96.62	265	2013-14-2	3.12121	3.08181	2.909091	2.81	91.46
218	2013-14-1	3.6333	3.7	3.35	2.404	88.45	266	2013-14-2	3.66667	3.51111	3.472222	3.27	98.71
219	2013-14-1	3.4872	3.51538	3.23076	2.038	88.04	267	2013-14-2	3.69697	3.74545	3.704545	3.336	100
220	2013-14-1	3.2222	3.41333	3.1	2.261	88.72	268	2013-14-2	3.75	3.76388	3.59375	2.348	92.85
221	2013-14-1	3.7	3.73	3.45	2.157	89.7	269	2013-14-2	3.69697	3.85454	3.704545	2.384	95.35
222	2013-14-1	2.8333	2.79167	2.5	1.978	84.26	270	2013-14-2	3.875	3.9125	3.78125	3.284	99.46
223	2013-14-1	3.8571	3.88571	3.75	2.544	95.27	271	2013-14-2	3.33333	3.375	3.15625	2.073	89.16
224	2013-14-1	3.2916	3.2625	3.09375	2.548	90.44	272	2013-14-2	3.625	3.6375	3.625	1.588	95.93
225	2013-14-1	3.5833	3.6875	3.375	2.755	90.75	273	2013-14-2	2.83333	3.0875	2.5	2.308	80.62
226	2013-14-1	3.2	3.48	3.36666	2.539	96.02	274	2013-14-2	3.48148	3.62222	3.555556	2.696	96.57
227	2013-14-1	3.3	3.38	3.275	2.338	93.15	275	2014-15-1	3.76667	3.96	3.95	2.196	100
228	2013-14-1	3.4848	3.53636	3.27272	2.31	89.42	276	2014-15-1	3.5	3.5375	3.21875	2.936	90.41
229	2013-14-1	3.6666	3.68888	3.59722	2.47	94.58	277	2014-15-1	3.53333	3.5	3.4	2.688	93.53
230	2013-14-1	3.5833	3.6625	3.6875	2.31	97.6	278	2014-15-1	3.83333	3.84	3.8	2.946	97.68
231	2013-14-1	3.0833	3.38333	3.02083	2.2	88.21	279	2014-15-1	2.85714	3.17143	3.107143	3.174	99.35
232	2013-14-1	3.5833	3.725	3.28125	2.233	86.54	280	2014-15-1	2.85714	3.05714	3	2.581	96.38
233	2013-14-1	3.125	3.362	2.9375	2.962	89.02	281	2014-15-1	3.66667	3.77143	3.214286	2.711	85.61
234	2013-14-1	3.4545	3.67273	3.5	2.32	93.94	282	2014-15-1	3.61905	3.8	3.785714	2.721	98.88
235	2013-14-1	3.5151	3.52727	3.34090	3.391	97.4	283	2014-15-1	3.66667	3.57143	3.392857	3.058	94.21
236	2013-14-1	3.2916	3.562	3.21875	3.471	98.5	284	2014-15-1	3.61905	3.52857	3.285714	1.508	88.87
237	2013-14-1	3.6666	3.7562	3.59375	3.38	98.39	285	2014-15-2	3.16667	3.05	3.125	2.91	97.52
238	2013-14-1	3.0208	3.1187	2.59375	3.083	89.53	286	2014-15-2	3.4375	3.45625	2.953125	2.88	85.97
239	2013-14-1	3.5714	3.67857	3.42857	2.285	90.95	#	IENG192	Course	Teacher	Attitude	Grade	Eff.
240	2013-14-1	3.3636	3.62727	3.47727	3.128	97.59	287	2010-11-1	3.70370	3.8	3.527778	2.163	91.13
241	2013-14-1	3.19047	3.35714	3.428571	2.53	99.29	288	2010-11-1	2.95833	3.0125	3.09375	1.352	95.95

#	IENG192	Course	Teacher	Attitude	Grade	Eff.	#	IENG192	Course	Teacher	Attitude	Grade	Eff.
289	2010-11-1	2.21428	2.36428	2.21428	2.071	93.07	337	2012-13-1	2.73333	2.74	2.8	2.561	97.95
290	2010-11-1	3.17647	3.41764	2.55882	0.97	72.39	338	2012-13-1	3.125	3.0625	3.34375	1.729	100
291	2010-11-1	3.41667	3.558333	3.35416	1.778	91.23	339	2012-13-1	2.125	2.0625	2.09375	2.869	100
292	2010-11-1	3.83333	3.9	3.825	1.66	97.01	340	2012-13-1	3.38095	3.528571	3.39285	2.395	93.78
293	2010-11-1	3.47222	3.85	3.41666	1.811	90.85	341	2012-13-1	3.37778	3.44	3.21667	2.572	90.74
294	2010-11-1	2.98148	3.3	3.06944	2.446	92.45	342	2012-13-1	3.69047	3.778571	3.660714	2.469	94.93
295	2010-11-1	3	3.17	3	1.653	90.12	343	2012-13-1	3.70370	3.777778	3.66667	2.134	94.9
296	2010-11-1	3.23809	3.38571	3.35714	1.857	94.9	344	2012-13-1	3.57143	3.557143	3.357143	2.504	90.99
297	2010-11-1	2.15151	2.37272	1.77272	1.207	75.3	345	2012-13-1	2.83333	3.01	2.825	2.8	93.12
298	2010-11-1	3.3125	3.45	3.25	2.471	91.9	346	2012-13-1	3.71111	3.893333	3.53333	2.475	90.72
299	2010-11-1	3.29166	3.475	3.09375	1.05	85.99	347	2012-13-1	3.63333	3.62	3.4	2.938	92.67
300	2010-11-1	3.33333	3.45	2.84375	1.295	79.03	348	2012-13-1	2.54166	2.7	2.46875	1.67	88.55
301	2010-11-1	3.53333	3.51	3.2	1.66	86.88	349	2012-13-1	3.04444	3.213333	3	3.495	100
302	2010-11-2	3.44444	3.56111	3.30555	2.286	90.29	350	2012-13-1	3.19047	3.342857	3.35714	3.265	100
303	2010-11-2	3.63888	3.65833	3.375	1.926	88.98	351	2012-13-1	3.46667	3.59	3.4	2.272	92.14
304	2010-11-2	3.17948	3.29231	3.13461	3.167	95.9	352	2012-13-1	3.41667	3.525	3.33333	1.577	91.07
305	2010-11-2	3.5	3.51666	3.16666	1.761	86.02	353	2012-13-1	3.04167	3.3	2.95312	2.161	87.76
306	2010-11-2	3.5	3.66666	3.5	1.031	93.39	354	2012-13-1	3.59259	3.611111	3.38889	2	90.23
307	2010-11-2	3.40740	3.43333	3.27777	2.14	91.16	355	2012-13-2	3.26667	3.3	3.15	2.62	91.92
308	2010-11-2	3.19444	3.525	3.1875	0.987	89.37	356	2012-13-2	3.23333	3.4	3	2.29	86.18
309	2011-12-1	3.66666	3.6	3.375	2.063	89.97	357	2012-13-2	3.83333	3.85	3.825	2.85	97.84
310	2011-12-1	3.703704	3.62222	3.61111	2.0607	95.83	358	2012-13-2	3.09524	3.028571	2.82143	2.154	87.51
311	2011-12-1	2.78788	2.9	3.04545	1.642	99.62	359	2012-13-2	3.45833	3.725	3.46875	1.738	92.58
312	2011-12-1	3.33333	3.19	3.175	2.496	93.4	360	2012-13-2	3.63636	3.581818	3.27272	1.944	87.56
313	2011-12-1	3.56863	3.71176	3.45588	1.846	91.2	361	2012-13-2	3.72727	3.736364	3.63636	2.357	94.34
314	2011-12-1	3.30555	3.36666	3.47916	2.075	98.24	362	2012-13-2	3.5	3.591667	3.27083	2.911	90.81
315	2011-12-1	3	3.23125	2.9375	1.984	88.3	363	2012-13-2	3.51852	3.644444	3.55556	2.18	94.89
316	2011-12-1	3.56863	3.77059	3.42647	2.281	90.02	364	2012-13-2	2.77778	2.822222	2.72222	2.392	92.72
317	2011-12-1	2.64102	2.62307	2.48077	1.618	89.21	365	2012-13-2	3.24242	3.481818	3.40909	2.676	97.02
318	2011-12-1	3.24242	3.33636	3.25	1.48	92.47	366	2012-13-2	3.37037	3.466667	3.33333	2.869	94.39
319	2011-12-1	3.03030	3.04545	2.81818	2.104	87.69	367	2012-13-2	3.52778	3.558333	3.35416	2.391	91.05
320	2011-12-1	3.14286	3.47143	2.82143	1.968	80.68	368	2012-13-2	3.4	3.46	3.3	3.085	94.76
321	2011-12-1	3.54545	3.72727	3.36363	1.685	88.85	369	2012-13-2	3.21212	3.290909	3.09091	3.007	93.08
322	2011-12-2	3.09523	3.11428	2.78571	1.981	84.58	370	2012-13-2	3.02564	3.2	2.92307	2.704	90.13
323	2011-12-2	3.38095	3.47143	3.25	2.4	90.75	371	2012-13-2	3.14285	3.257143	2.96428	2.65	88.9
324	2011-12-2	3.625	3.65	3.5	2.057	92.47	372	2012-13-2	2.875	3.3125	3.2187	3.276	100
325	2011-12-2	3.16667	3.3375	3.1875	2.531	93.3	373	2012-13-2	2.82051	3.284615	2.76923	2.3	85.88
326	2011-12-2	2.74359	2.76923	2.69231	2.732	94.46	374	2012-13-2	3.14285	3.021429	2.94643	1.621	89.55
327	2011-12-2	3.52778	3.55	3.41666	2.18	92.36	375	2012-13-2	3.51852	3.644444	3.47222	1.617	92.66
328	2011-12-2	3.07692	3.09230	3.01923	2.191	92.39	376	2012-13-2	2.76667	2.94	2.7125	2.518	90.85
329	2011-12-2	3.27778	3.74167	3.27083	1.924	90.11	377	2012-13-2	3.53333	3.56	3.55	2.495	96.22
330	2011-12-2	3.33333	3.5	3.30555	2.272	92.02	378	2012-13-2	3.69230	3.807692	3.75	2.69	97.2
331	2011-12-2	3.57575	3.78181	3.65909	1.133	95.89	379	2013-14-1	3.4762	3.628571	3.57143	2.528	96.54
332	2011-12-2	3.8	3.72	3.6	2.348	93.69	380	2013-14-1	3.61905	3.871429	3.85714	2.83	100
333	2011-12-2	3.4	3.33	3.4	2.411	96.41	381	2013-14-1	3.24242	3.209091	3.09091	2.121	90.49
334	2011-12-2	3.79167	3.8375	3.75	2.268	95.95	382	2013-14-1	3.51515	3.572727	3.63636	2.463	98.38
335	2011-12-2	3.3125	3.43125	3.17187	2.903	91.51	383	2013-14-1	3.54166	3.6625	3.3125	2.133	88.15
336	2011-12-2	3.30303	3.4	3.13636	1.614	87.99	384	2013-14-1	2.58333	2.5375	2.4687	1.857	91.8

#	IENG192	Course	Teacher	Attitude	Grade	Eff.	#	IENG192	Course	Teacher	Attitude	Grade	Eff.
385	2013-14-1	3.7	3.73	3.525	2.04	91.65	416	2014-15-1	3.56667	3.56	3.125	3.392	94.67
386	2013-14-1	3.52778	3.56667	3.29167	2.6	89.83	417	2014-15-1	3.36667	3.35	3.225	3.023	94.43
387	2013-14-1	3.72222	3.76667	3.6875	2.609	95.7	418	2014-15-1	3.63333	3.71	3.525	2.3	92.5
388	2013-14-1	2.375	2.7375	2.3125	2.248	86.09	419	2014-15-1	3.5	3.74	3.4	3.124	93.85
389	2013-14-1	3.55556	3.66667	3.39583	2.67	91.29	420	2014-15-1	3.58333	3.6375	3.4375	2.515	92.02
390	2013-14-1	3.28205	3.469231	3.23077	2.731	92.2	421	2014-15-1	3	3.12857	3.14285	2.15	96.06
391	2013-14-1	3.70833	3.5375	3.59375	2.234	97.02	422	2014-15-1	3.04762	3.62857	3.03571	2.12	87.67
392	2013-14-1	2.97222	2.991667	2.91667	1.925	91.52	423	2014-15-1	3.47222	3.525	3.47916	2.908	96.51
393	2013-14-1	3.40740	3.572222	3.43055	3.335	98.31	424	2014-15-1	3.28571	3.5	3.28571	2.051	91.42
394	2013-14-1	3.57575	3.581818	3.43182	2.804	93.38	425	2014-15-1	3.06667	3.47	3.3	2.75	96.6
395	2013-14-2	2.64102	2.884615	2.38461	1.603	80.28	426	2014-15-1	3.125	2.9625	2.84375	2.12	89.64
396	2013-14-2	3.45833	3.575	3.34375	1.694	90.43	427	2014-15-1	3.33333	3.34286	2.89285	2.511	83.57
397	2013-14-2	3.54167	3.45	3.34375	2.797	92.96	428	2014-15-1	3.83333	3.65	3.6	2.12	95
398	2013-14-2	3.39394	3.236364	3.22727	2.766	94.17	429	2014-15-1	3.47619	3.41429	3.46428	2.875	97.23
399	2013-14-2	3.70833	3.675	3.34375	2.65	88.62	430	2014-15-1	3.55556	3.53333	3.41667	2.944	94.5
400	2013-14-2	3.07407	3.055556	2.61111	2.238	81.6	431	2014-15-1	3.14286	3.24285	2.85714	2.825	87.53
401	2013-14-2	3.05556	3.183333	3.04167	2.326	92.16	432	2014-15-1	3.42857	3.28571	3.47619	3.003	100
402	2013-14-2	3.8	3.87	3.825	2.281	97.52	433	2014-15-1	3.52381	3.41429	3.07143	1.992	85.07
403	2013-14-2	3.53846	3.530769	3.5	2.989	96.78	434	2014-15-1	2.86667	2.5	2.625	2.341	99.05
404	2013-14-2	3.91667	3.925	3.875	2.87	97.95	435	2014-15-1	3.16667	3.875	3.5625	3.265	100
405	2013-14-2	2.75757	2.881818	2.65909	2.952	93.25	436	2014-15-1	3.09524	3.54288	2.82143	3.125	90.19
406	2013-14-2	3.66667	3.6	3.5	3.143	96.63	437	2014-15-1	3.83333	3.79	3.7	2.122	95.09
407	2013-14-2	3.8	3.73	3.85	2.92	100	438	2014-15-1	2.6	3	2.5	2.387	85.06
408	2013-14-2	3.62963	3.611111	3.41667	2.487	91.33	439	2014-15-1	2.20833	2.15	2.21875	2.815	100
409	2013-14-2	3.52381	3.671429	3.35714	2.893	91.7	440	2014-15-1	3.55556	3.55	3.5	2.432	94.75
410	2013-14-2	3.33333	3.425	3.09375	2.566	88.13	441	2014-15-1	3.28571	3.50714	3.01786	2.307	85.02
411	2013-14-2	3.76190	3.842857	3.57143	2.838	92.72	442	2014-15-1	3.79167	3.7125	3.6875	2.032	96.11
412	2013-14-2	3.23333	3.39	3.025	3.4	96.16	443	2014-15-1	3.94444	3.90741	3.95833	3.045	100
413	2013-14-2	3.66667	3.85	3.71875	2.42	96.05	444	2014-15-1	3.66667	3.75	3.66667	1.997	95.48
414	2013-14-2	3.33333	3.422222	3.27778	2.304	92.29	445	2014-15-1	3.44444	3.71667	3.375	2.817	92.01
415	2013-14-2	3.47222	3.616667	3.14583	3.048	89.25	Average of original efficiency						92.45

Appendix C: Weights of Inputs and Outputs Values for Each Class

#	IENG181	Course(v1)	Teacher (v2)	Attitude (u1)	Grade(u2)	#	IENG182	Course(v1)	Teacher (v2)	Attitude (u1)	Grade(u2)
1	2010-11-1	0.25	0.01	0.33	0	50	2010-11-1	0.11	0.09	0.28	0
2	2010-11-1	0.27	0.01	0.34	0	51	2010-11-2	0.1	0.15	0.28	0.02
3	2010-11-1	0.12	0.11	0.31	0	52	2010-11-2	0.13	0.15	0.31	0.03
4	2010-11-1	0.11	0.14	0.28	0.02	53	2010-11-2	0.04	0	0.27	0.01
5	2010-11-2	0.12	0.11	0.31	0	54	2011-12-1	0.1	0.17	0.34	0
6	2010-11-2	0.09	0.15	0.29	0	55	2011-12-1	0.17	0.1	0.31	0.03
7	2010-11-2	0.09	0.14	0.29	0	56	2011-12-2	0.12	0.1	0.3	0
8	2010-11-2	0.09	0.15	0.31	0	57	2011-12-2	0.19	0.01	0.29	0
9	2011-12-1	0	0.19	0.27	0	58	2011-12-2	0	0.2	0.27	0
10	2011-12-1	0.11	0.1	0.28	0	59	2012-13-1	0.1	0.15	0.29	0.02
11	2011-12-1	0.11	0.1	0.29	0	60	2012-13-1	0.08	0.14	0.28	0
12	2011-12-1	0.07	0.11	0.28	0	61	2012-13-2	0.09	0.14	0.29	0
13	2011-12-1	0.16	0.09	0.29	0.03	62	2012-13-2	0.1	0.16	0.3	0.02
14	2011-12-2	0.18	0.01	0.28	0	63	2012-13-2	0.1	0.13	0.26	0.02
15	2011-12-2	0.17	0.18	0.34	0.03	64	2012-13-2	0.1	0.09	0.27	0
16	2011-12-2	0.1	0.16	0.32	0	65	2012-13-2	0.2	0.01	0.3	0
17	2011-12-2	0	0.25	0.33	0	66	2012-13-2	0.16	0.17	0.32	0.03
18	2011-12-2	0	0.23	0.3	0	67	2013-14-1	0.11	0.18	0.36	0
19	2011-12-2	0.06	0.1	0.27	0	68	2013-14-1	0	0.24	0.32	0
20	2012-13-1	0	0.24	0.31	0	69	2013-14-1	0	0.22	0.29	0
21	2012-13-1	0.14	0.05	0.27	0	70	2013-14-1	0.09	0.14	0.29	0
22	2012-13-1	0	0.21	0.28	0	71	2013-14-1	0.06	0.1	0.27	0
23	2012-13-1	0.17	0.18	0.33	0.03	72	2013-14-2	0.09	0.15	0.3	0
24	2012-13-1	0	0.46	0.37	0	73	2013-14-2	0.19	0.01	0.3	0
25	2012-13-1	0	0.21	0.28	0	74	2013-14-2	0.14	0.05	0.28	0
26	2012-13-1	0.09	0.15	0.3	0	75	2013-14-2	0.11	0.17	0.31	0.02
27	2012-13-1	0.11	0.17	0.32	0.02	76	2013-14-2	0.2	0.29	0.4	0
28	2012-13-2	0.07	0.11	0.29	0	77	2014-15-1	0.06	0.1	0.26	0
29	2012-13-2	0.1	0.09	0.27	0	78	2014-15-1	0.14	0.13	0.27	0
30	2012-13-2	0.17	0.25	0.34	0	79	2014-15-1	0.12	0.14	0.28	0.03
31	2012-13-2	0	0.22	0.3	0	80	2014-15-1	0.08	0.14	0.28	0
32	2012-13-2	0.09	0.15	0.3	0	81	2014-15-2	0	0.23	0.28	0.01
33	2012-13-2	0.11	0.1	0.29	0	82	2014-15-2	0	0	0.25	0
34	2012-13-2	0	0	0.26	0	#	IENG191	Course	Teacher	Attitude	Grade
35	2013-14-1	0.26	0	0.33	0	83	2010-11-1	0.19	0.01	0.3	0
36	2013-14-1	0.09	0.15	0.29	0	84	2010-11-1	0.15	0.14	0.28	0
37	2013-14-1	0.11	0.1	0.3	0	85	2010-11-1	0.12	0.1	0.31	0
38	2013-14-1	0.26	0.01	0.34	0	86	2010-11-1	0.2	0.01	0.31	0
39	2013-14-1	0.09	0.15	0.31	0	87	2010-11-1	0.12	0.13	0.27	0.03
40	2013-14-2	0.11	0.1	0.28	0	88	2010-11-1	0.11	0.1	0.28	0
41	2013-14-2	0.19	0.28	0.38	0	89	2010-11-1	0.12	0.1	0.29	0
42	2013-14-2	0.06	0.1	0.26	0	90	2010-11-1	0.1	0.16	0.32	0
43	2013-14-2	0	0.2	0.29	0	91	2010-11-1	0	0	0	0.27
44	2014-15-1	0.11	0.1	0.29	0	92	2010-11-1	0.1	0.16	0.32	0
45	2014-15-1	0.19	0.01	0.29	0	93	2010-11-1	0.18	0.16	0.33	0
46	2014-15-1	0.2	0.29	0.4	0	94	2010-11-1	0.15	0.22	0.33	0.04
47	2014-15-1	0	0.45	0.36	0	95	2010-11-1	0.1	0.16	0.29	0.02
48	2014-15-1	0.2	0.18	0.36	0	96	2010-11-1	0.17	0.21	0.34	0.03
49	2014-15-2	0.27	0.01	0.35	0	97	2010-11-1	0.27	0.01	0.34	0

#	IENG191	Course(v1)	Teacher (v2)	Attitude (u1)	Grade(u2)	#	IENG191	Course(v1)	Teacher (v2)	Attitude (u1)	Grade(u2)
98	2010-11-1	0.23	0.01	0.3	0	146	2011-12-2	0.18	0.19	0.35	0.03
99	2010-11-1	0	0.22	0.29	0	147	2011-12-2	0.08	0.11	0.26	0.02
100	2010-11-1	0.15	0.23	0.35	0.04	148	2011-12-2	0.13	0.14	0.3	0.03
101	2010-11-1	0.11	0.17	0.33	0.02	149	2011-12-2	0.13	0.14	0.3	0.03
102	2010-11-1	0.1	0.17	0.35	0	150	2011-12-2	0.31	0	0.38	0
103	2010-11-1	0.09	0.15	0.31	0	151	2011-12-2	0	0.16	0.26	0
104	2010-11-1	0.26	0.01	0.34	0	152	2011-12-2	0.1	0.1	0.25	0.08
105	2010-11-1	0.23	0.01	0.3	0	153	2011-12-2	0.1	0.15	0.28	0.02
106	2010-11-1	0.19	0.17	0.35	0	154	2011-12-2	0.13	0.2	0.3	0.03
107	2010-11-2	0.12	0.1	0.29	0	155	2011-12-2	0	0.24	0.29	0.01
108	2010-11-2	0.08	0.09	0.27	0.01	156	2011-12-2	0.18	0.27	0.37	0
109	2010-11-2	0.15	0.08	0.27	0.02	157	2011-12-2	0.15	0.18	0.33	0.03
110	2010-11-2	0.1	0.15	0.28	0.02	158	2011-12-2	0.12	0.13	0.28	0.03
111	2010-11-2	0.09	0.15	0.3	0	159	2012-13-1	0.11	0.09	0.27	0
112	2010-11-2	0.19	0.01	0.29	0	160	2012-13-1	0.12	0.13	0.27	0.03
113	2010-11-2	0.09	0.15	0.3	0	161	2012-13-1	0	0.18	0.26	0
114	2010-11-2	0.14	0.21	0.32	0.04	162	2012-13-1	0.11	0.09	0.28	0
115	2010-11-2	0.06	0.1	0.27	0	163	2012-13-1	0.15	0.18	0.33	0.03
116	2010-11-2	0.09	0.14	0.29	0	164	2012-13-1	0.07	0.13	0.23	0.07
117	2010-11-2	0.09	0.14	0.29	0	165	2012-13-1	0.1	0.15	0.29	0.02
118	2010-11-2	0.11	0.1	0.29	0	166	2012-13-1	0.09	0.14	0.29	0
119	2010-11-2	0.09	0.14	0.28	0	167	2012-13-1	0.11	0.09	0.27	0
120	2010-11-2	0.21	0.01	0.32	0	168	2012-13-1	0.12	0.18	0.28	0.03
121	2010-11-2	0.09	0.16	0.32	0	169	2012-13-1	0.12	0.14	0.28	0.03
122	2010-11-2	0.19	0.01	0.3	0	170	2012-13-1	0.16	0.09	0.27	0.03
123	2010-11-2	0.1	0.16	0.32	0	171	2012-13-1	0	0.14	0.19	0.09
124	2010-11-2	0.2	0.18	0.36	0	172	2012-13-1	0.1	0.11	0.25	0.06
125	2011-12-1	0.14	0.2	0.31	0.04	173	2012-13-1	0.42	0	0.21	0.21
126	2011-12-1	0.17	0.09	0.3	0.03	174	2012-13-1	0.22	0.33	0.44	0
127	2011-12-1	0.07	0.08	0.25	0.01	175	2012-13-1	0.19	0.01	0.3	0
128	2011-12-1	0.11	0.14	0.28	0.03	176	2012-13-1	0.06	0.17	0.18	0.14
129	2011-12-1	0.12	0.13	0.26	0.03	177	2012-13-1	0.18	0.23	0.37	0.04
130	2011-12-1	0.1	0.11	0.25	0.05	178	2012-13-1	0.11	0.1	0.29	0
131	2011-12-1	0.16	0.09	0.29	0.03	179	2012-13-1	0.14	0.21	0.32	0.04
132	2011-12-1	0.09	0.14	0.28	0	180	2012-13-1	0.06	0.1	0.28	0
133	2011-12-1	0.12	0.13	0.27	0.03	181	2012-13-2	0.15	0.08	0.26	0.02
134	2011-12-1	0.16	0.09	0.29	0.03	182	2012-13-2	0.21	0.31	0.42	0
135	2011-12-1	0.08	0.08	0.26	0.01	183	2012-13-2	0.11	0.1	0.28	0
136	2011-12-1	0.04	0.15	0.21	0.1	184	2012-13-2	0.06	0.1	0.27	0
137	2011-12-1	0.15	0.19	0.31	0.03	185	2012-13-2	0.18	0.08	0.28	0.02
138	2011-12-1	0.07	0.13	0.23	0.07	186	2012-13-2	0.1	0.15	0.28	0.02
139	2011-12-1	0.09	0.14	0.29	0	187	2012-13-2	0.09	0.15	0.3	0
140	2011-12-1	0.15	0.18	0.33	0.03	188	2012-13-2	0.09	0.15	0.3	0
141	2011-12-1	0.09	0.15	0.31	0	189	2012-13-2	0.1	0.15	0.28	0.02
142	2011-12-2	0.08	0.11	0.27	0.02	190	2012-13-2	0.1	0.15	0.27	0.02
143	2011-12-2	0.11	0.13	0.27	0.02	191	2012-13-2	0	0.23	0.3	0
144	2011-12-2	0.08	0.14	0.28	0	192	2012-13-2	0.12	0.13	0.28	0.03
145	2011-12-2	0.13	0.14	0.29	0.03	193	2012-13-2	0.16	0.23	0.35	0.04

#	IENG191	Course(v1)	Teacher (v2)	Attitude (u1)	Grade(u2)	#	IENG191	Course(v1)	Teacher (v2)	Attitude (u1)	Grade(u2)
194	2012-13-2	0.03	0.15	0.21	0.1	242	2013-14-1	0.16	0.17	0.31	0.03
195	2012-13-2	0.08	0.12	0.23	0.06	243	2013-14-1	0.15	0.22	0.34	0.04
196	2012-13-2	0.18	0.01	0.27	0	244	2013-14-1	0	0.16	0.26	0
197	2012-13-2	0	0.21	0.17	0.12	245	2013-14-1	0.1	0.14	0.27	0.02
198	2012-13-2	0	0.3	0.25	0.17	246	2013-14-2	0.08	0.08	0.26	0.01
199	2012-13-2	0.05	0.15	0.17	0.14	247	2013-14-2	0.15	0.05	0.28	0
200	2012-13-2	0	0.32	0.29	0.03	248	2013-14-2	0.11	0.12	0.25	0.03
201	2012-13-2	0.06	0	0	0.3	249	2013-14-2	0.1	0.12	0.25	0.04
202	2012-13-2	0.23	0.34	0.46	0	250	2013-14-2	0.2	0.01	0.3	0
203	2012-13-2	0	0.28	0.33	0.01	251	2013-14-2	0.09	0.13	0.25	0.02
204	2012-13-2	0.16	0.21	0.33	0.03	252	2013-14-2	0	0.14	0.19	0.09
205	2012-13-2	0.1	0.13	0.26	0.02	253	2013-14-2	0.1	0.1	0.25	0.08
206	2012-13-2	0	0.22	0.29	0	254	2013-14-2	0.14	0.21	0.32	0.04
207	2012-13-2	0.1	0.13	0.27	0.02	255	2013-14-2	0.07	0.11	0.28	0
208	2013-14-1	0.1	0.12	0.25	0.04	256	2013-14-2	0.2	0	0	0.3
209	2013-14-1	0.11	0.14	0.28	0.03	257	2013-14-2	0.1	0.09	0.27	0
210	2013-14-1	0	0.18	0.27	0	258	2013-14-2	0.11	0.1	0.25	0.06
211	2013-14-1	0.09	0.09	0.22	0.07	259	2013-14-2	0.1	0.09	0.24	0.06
212	2013-14-1	0.1	0.15	0.28	0.02	260	2013-14-2	0.13	0.2	0.3	0.04
213	2013-14-1	0.11	0.14	0.28	0.02	261	2013-14-2	0.14	0.05	0.28	0
214	2013-14-1	0.06	0.13	0.23	0.07	262	2013-14-2	0.06	0.1	0.26	0
215	2013-14-1	0	0.2	0.27	0	263	2013-14-2	0.18	0.01	0.28	0
216	2013-14-1	0.1	0.15	0.28	0.02	264	2013-14-2	0.09	0.09	0.23	0.07
217	2013-14-1	0	0.17	0.21	0.09	265	2013-14-2	0.01	0.24	0.21	0.14
218	2013-14-1	0.11	0.14	0.28	0.02	266	2013-14-2	0	0.18	0.19	0.11
219	2013-14-1	0.1	0.16	0.3	0.02	267	2013-14-2	0.06	0.12	0.21	0.07
220	2013-14-1	0.13	0.14	0.3	0.03	268	2013-14-2	0.06	0.1	0.28	0
221	2013-14-1	0.11	0.1	0.29	0	269	2013-14-2	0.11	0.09	0.27	0
222	2013-14-1	0.16	0.24	0.37	0.04	270	2013-14-2	0	0	0.17	0.11
223	2013-14-1	0.06	0.1	0.26	0	271	2013-14-2	0.11	0.16	0.3	0.02
224	2013-14-1	0.13	0.16	0.3	0.03	272	2013-14-2	0.08	0.14	0.28	0
225	2013-14-1	0.1	0.11	0.25	0.05	273	2013-14-2	0.18	0.23	0.37	0.04
226	2013-14-1	0.12	0.13	0.28	0.03	274	2013-14-2	0.11	0.12	0.26	0.03
227	2013-14-1	0.12	0.14	0.28	0.03	275	2014-15-1	0.16	0	0.25	0
228	2013-14-1	0.11	0.14	0.29	0.03	276	2014-15-1	0.04	0.16	0.22	0.1
229	2013-14-1	0.1	0.13	0.26	0.02	277	2014-15-1	0.11	0.14	0.27	0.02
230	2013-14-1	0.1	0.13	0.26	0.02	278	2014-15-1	0.09	0.1	0.23	0.05
231	2013-14-1	0.13	0.15	0.31	0.03	279	2014-15-1	0.09	0.19	0.25	0.07
232	2013-14-1	0.11	0.14	0.29	0.02	280	2014-15-1	0.15	0.19	0.31	0.03
233	2013-14-1	0.06	0.16	0.18	0.16	281	2014-15-1	0.1	0.1	0.25	0.08
234	2013-14-1	0.1	0.13	0.27	0.02	282	2014-15-1	0.1	0.12	0.25	0.02
235	2013-14-1	0.04	0.16	0.16	0.14	283	2014-15-1	0	0.17	0.21	0.1
236	2013-14-1	0.13	0	0.1	0.2	284	2014-15-1	0	0.23	0.3	0
237	2013-14-1	0.08	0.08	0.2	0.09	285	2014-15-2	0.05	0.21	0.23	0.1
238	2013-14-1	0	0.18	0	0.32	286	2014-15-2	0.02	0.2	0.22	0.12
239	2013-14-1	0.11	0.14	0.28	0.02	#	IENG192	Course(v1)	Teacher (v2)	Attitude (u1)	Grade(u2)
240	2013-14-1	0.09	0.09	0.23	0.07	287	2010-11-1	0.11	0.09	0.28	0
241	2013-14-1	0.12	0.13	0.27	0.03	288	2010-11-1	0.16	0.24	0.32	0

#	IENG192	Course(v1)	Teacher (v2)	Attitude (u1)	Grade(u2)	#	IENG192	Course(v1)	Teacher (v2)	Attitude (u1)	Grade(u2)
289	2010-11-1	0.22	0.33	0.45	0	337	2012-13-1	0.14	0.21	0.32	0.04
290	2010-11-1	0.12	0.19	0.39	0	338	2012-13-1	0	0.23	0.3	0
291	2010-11-1	0.09	0.15	0.3	0	339	2012-13-1	0	0.19	0	0.35
292	2010-11-1	0.06	0.1	0.26	0	340	2012-13-1	0.12	0.13	0.27	0.03
293	2010-11-1	0.19	0.01	0.29	0	341	2012-13-1	0.13	0.14	0.29	0.03
294	2010-11-1	0.15	0.16	0.3	0.03	342	2012-13-1	0.08	0.09	0.27	0.01
295	2010-11-1	0.18	0.16	0.33	0	343	2012-13-1	0.1	0.09	0.27	0
296	2010-11-1	0.09	0.15	0.3	0	344	2012-13-1	0.11	0.14	0.28	0.02
297	2010-11-1	0.28	0.41	0.56	0	345	2012-13-1	0.14	0.21	0.32	0.04
298	2010-11-1	0.12	0.14	0.29	0.03	346	2012-13-1	0.08	0.09	0.28	0.01
299	2010-11-1	0.1	0.16	0.32	0	347	2012-13-1	0.07	0.13	0.23	0.07
300	2010-11-1	0.11	0.17	0.35	0	348	2012-13-1	0.2	0.3	0.41	0
301	2010-11-1	0	0.24	0.31	0	349	2012-13-1	0.19	0	0	0.29
302	2010-11-2	0.11	0.14	0.28	0.03	350	2012-13-1	0.01	0.21	0.18	0.12
303	2010-11-2	0.09	0.15	0.3	0	351	2012-13-1	0.11	0.14	0.28	0.02
304	2010-11-2	0.03	0.19	0.17	0.14	352	2012-13-1	0.09	0.15	0.3	0
305	2010-11-2	0.1	0.16	0.32	0	353	2012-13-1	0.14	0.17	0.32	0.03
306	2010-11-2	0.11	0.1	0.29	0	354	2012-13-1	0.09	0.15	0.3	0
307	2010-11-2	0.1	0.16	0.29	0.02	355	2012-13-2	0.13	0.16	0.29	0.03
308	2010-11-2	0.2	0.01	0.31	0	356	2012-13-2	0.14	0.15	0.31	0.03
309	2011-12-1	0	0.22	0.3	0	357	2012-13-2	0.08	0.1	0.25	0.02
310	2011-12-1	0	0.21	0.28	0	358	2012-13-2	0.14	0.21	0.33	0.04
311	2011-12-1	0.16	0.24	0.33	0	359	2012-13-2	0.19	0.01	0.29	0
312	2011-12-1	0	0.33	0.29	0.03	360	2012-13-2	0	0.23	0.31	0
313	2011-12-1	0.11	0.1	0.29	0	361	2012-13-2	0	0.19	0.27	0
314	2011-12-1	0.1	0.15	0.28	0.02	362	2012-13-2	0.09	0.1	0.24	0.07
315	2011-12-1	0.16	0.17	0.32	0.03	363	2012-13-2	0.11	0.09	0.28	0
316	2011-12-1	0.12	0.09	0.29	0	364	2012-13-2	0.15	0.22	0.33	0.04
317	2011-12-1	0.2	0.3	0.4	0	365	2012-13-2	0.12	0.13	0.27	0.03
318	2011-12-1	0.09	0.15	0.31	0	366	2012-13-2	0.11	0.12	0.26	0.04
319	2011-12-1	0.14	0.21	0.33	0.04	367	2012-13-2	0.11	0.14	0.28	0.02
320	2011-12-1	0.19	0.11	0.33	0.03	368	2012-13-2	0.04	0.16	0.21	0.1
321	2011-12-1	0.11	0.1	0.3	0	369	2012-13-2	0.01	0.23	0.2	0.13
322	2011-12-2	0.15	0.22	0.33	0.04	370	2012-13-2	0.14	0.2	0.31	0.04
323	2011-12-2	0.12	0.14	0.29	0.03	371	2012-13-2	0.13	0.2	0.31	0.04
324	2011-12-2	0.09	0.14	0.29	0	372	2012-13-2	0.18	0.08	0.29	0.02
325	2011-12-2	0.13	0.14	0.29	0.03	373	2012-13-2	0.22	0.09	0.34	0.03
326	2011-12-2	0.15	0.22	0.33	0.04	374	2012-13-2	0	0.36	0.32	0.03
327	2011-12-2	0.1	0.15	0.28	0.02	375	2012-13-2	0.11	0.1	0.29	0
328	2011-12-2	0.13	0.2	0.31	0.04	376	2012-13-2	0.15	0.22	0.33	0.04
329	2011-12-2	0.2	0.01	0.31	0	377	2012-13-2	0.09	0.14	0.27	0.02
330	2011-12-2	0.12	0.13	0.28	0.03	378	2012-13-2	0.08	0.1	0.25	0.02
331	2011-12-2	0.11	0.09	0.27	0	379	2013-14-1	0.1	0.13	0.26	0.02
332	2011-12-2	0	0.21	0.28	0	380	2013-14-1	0.17	0.01	0.26	0
333	2011-12-2	0.1	0.15	0.28	0.02	381	2013-14-1	0.13	0.17	0.3	0.03
334	2011-12-2	0.06	0.1	0.26	0	382	2013-14-1	0.09	0.14	0.26	0.02
335	2011-12-2	0.1	0.13	0.26	0.06	383	2013-14-1	0.11	0.14	0.29	0.02
336	2011-12-2	0.1	0.16	0.32	0	384	2013-14-1	0.2	0.3	0.41	0

#	IENG192	Course(v1)	Teacher (v2)	Attitude (u1)	Grade(u2)	#	IENG192	Course(v1)	Teacher (v2)	Attitude (u1)	Grade(u2)
385	2013-14-1	0.11	0.1	0.28	0	416	2014-15-1	0.11	0.1	0.28	0
386	2013-14-1	0.11	0.14	0.28	0.03	417	2014-15-1	0.11	0.14	0.28	0.03
387	2013-14-1	0.08	0.1	0.26	0.02	418	2014-15-1	0.08	0.1	0.26	0.02
388	2013-14-1	0.19	0.24	0.39	0.04	419	2014-15-1	0.19	0.24	0.39	0.04
389	2013-14-1	0.11	0.12	0.26	0.04	420	2014-15-1	0.11	0.12	0.26	0.04
390	2013-14-1	0.12	0.14	0.28	0.03	421	2014-15-1	0.12	0.14	0.28	0.03
391	2013-14-1	0	0.21	0.28	0	422	2014-15-1	0	0.21	0.28	0
392	2013-14-1	0.16	0.2	0.32	0.03	423	2014-15-1	0.16	0.2	0.32	0.03
393	2013-14-1	0.08	0.09	0.2	0.09	424	2014-15-1	0.08	0.09	0.2	0.09
394	2013-14-1	0.1	0.12	0.25	0.05	425	2014-15-1	0.1	0.12	0.25	0.05
395	2013-14-2	0.19	0.24	0.39	0.04	426	2014-15-1	0.19	0.24	0.39	0.04
396	2013-14-2	0.09	0.15	0.3	0	427	2014-15-1	0.09	0.15	0.3	0
397	2013-14-2	0.09	0.12	0.25	0.06	428	2014-15-1	0.09	0.12	0.25	0.06
398	2013-14-2	0	0.32	0.29	0.03	429	2014-15-1	0	0.32	0.29	0.03
399	2013-14-2	0.09	0.13	0.25	0.06	430	2014-15-1	0.09	0.13	0.25	0.06
400	2013-14-2	0.15	0.23	0.35	0.04	431	2014-15-1	0.15	0.23	0.35	0.04
401	2013-14-2	0.13	0.2	0.3	0.03	432	2014-15-1	0.13	0.2	0.3	0.03
402	2013-14-2	0.05	0.1	0.26	0	433	2014-15-1	0.05	0.1	0.26	0
403	2013-14-2	0.08	0.12	0.24	0.06	434	2014-15-1	0.08	0.12	0.24	0.06
404	2013-14-2	0.09	0	0.25	0.02	435	2014-15-1	0.09	0	0.25	0.02
405	2013-14-2	0.06	0.19	0.2	0.16	436	2014-15-1	0.06	0.19	0.2	0.16
406	2013-14-2	0	0.17	0.2	0.09	437	2014-15-1	0	0.17	0.2	0.09
407	2013-14-2	0	0.21	0.25	0.01	438	2014-15-1	0	0.21	0.25	0.01
408	2013-14-2	0.1	0.15	0.28	0.02	439	2014-15-1	0.1	0.15	0.28	0.02
409	2013-14-2	0.09	0.1	0.24	0.07	440	2014-15-1	0.09	0.1	0.24	0.07
410	2013-14-2	0.13	0.14	0.3	0.03	441	2014-15-1	0.13	0.14	0.3	0.03
411	2013-14-2	0.1	0.09	0.24	0.06	442	2014-15-1	0.1	0.09	0.24	0.06
412	2013-14-2	0.06	0	0	0.29	443	2014-15-1	0.06	0	0	0.29
413	2013-14-2	0.11	0.09	0.27	0	444	2014-15-1	0.11	0.09	0.27	0
414	2013-14-2	0.11	0.14	0.29	0.03	445	2014-15-1	0.11	0.14	0.29	0.03
415	2013-14-2	0.08	0.1	0.22	0.1	Weight's Average		0.28	0.14	0.10	0.03

Appendix D: Original Efficiency Scores and Efficiency Scores after Removing the Indicators (one by one) for Each Class (Efficiency sensitivity analysis)

		Eff. after removing indicators						Eff. after removing indicators						Eff. after removing indicators						Eff. after removing indicators			
Class	Eff.	Eff-I1	Eff-I2	Eff-O1	Eff-O2	Class	Eff.	Eff-I1	Eff-I2	Eff-O1	Eff-O2	Class	Eff.	Eff-I1	Eff-I2	Eff-O1	Eff-O2	Class	Eff.	Eff-I1	Eff-I2	Eff-O1	Eff-O2
1	88.97	84.23	88.75	50.81	88.97	49	83.47	77.28	83.33	53.48	83.47	97	84	81.13	83.73	39.2	84	145	91.41	88.9	89.18	60.08	90.52
2	83.38	80.39	83.13	48.7	83.38	50	94.08	93.55	92.9	53	94.08	98	94.46	87.75	94.31	48.86	94.46	146	80.73	79.56	78.47	42.14	80.73
3	89.39	87.55	88.79	44.26	89.39	51	95.1	94.4	91.26	64.66	94.44	99	93.55	93.55	88.97	62.18	93.55	147	95.26	95.16	93.88	76.01	95.14
4	93.22	92.17	89.96	71.88	92.19	52	87.56	83.99	85.49	65.23	85.84	100	84.44	82.4	77.78	65.79	82.28	148	87.45	86.27	83.75	66.51	86.28
5	89.39	87.52	88.83	36.66	89.39	53	93.76	93.31	93.76	60.27	93.62	101	82.6	82.25	79.43	51.69	82.34	149	87.88	85.55	84.2	71.21	85.98
6	92.19	91.93	89.96	35.24	92.19	54	85.03	83.76	83	42.9	85.03	102	81.11	79.51	80.28	29.86	81.11	150	100	86.47	100	100	100
7	95.94	95.6	93.1	27.63	95.94	55	86.28	82.94	85.48	57.67	85.83	103	92.45	90.84	91.08	46.76	92.45	151	98.23	98.23	97.5	71.32	98.1
8	86.97	86.12	85.78	33.31	86.97	56	89.13	86.89	88.94	60.77	89.12	104	86.17	81.8	85.94	47.91	86.17	152	90.05	88.27	88.55	83.7	86.42
9	95.16	95.16	93.46	41.61	95.16	57	97.95	93.3	97.65	58.01	97.95	105	97.83	89.66	97.71	43.29	97.83	153	95.72	94.94	91.84	70.15	94.81
10	92.89	92.24	91.74	44.99	92.89	58	97.6	97.6	94.82	48.46	97.6	106	92.47	84.54	91.93	41.97	92.47	154	93.13	91.44	85.61	78.88	89.62
11	90.19	89.54	89.19	43.55	90.19	59	91.2	90.44	88.56	63.39	90.73	107	90.12	88.15	89.85	59.31	90.07	155	90.31	90.31	86.07	69.25	90.14
12	91.58	91.18	90.46	53.3	91.58	60	95.39	94.94	93.67	50.86	95.39	108	94.25	93.44	93.67	70.36	94	156	90.37	86.92	85.12	47.55	90.37
13	90.01	87.61	89.72	57.71	90	61	94.07	93.07	92.61	50.24	94.07	109	98.07	94.01	97.3	68.78	97.62	157	83.16	80.72	80.02	60	81.68
14	98.02	95.19	97.78	52.24	98.02	62	92.44	90.98	90.19	52.31	92.3	110	91.59	90.72	89.6	61.73	91.29	158	95.37	93.47	91.13	80.8	93.01
15	85.5	81.58	83.27	49.39	85.32	63	94.33	92.85	92.91	71.61	93.83	111	91.48	91.47	88.73	47.53	91.48	159	95.73	95.05	94.82	62.57	95.72
16	89.2	88.58	86.05	35.37	89.2	64	96.14	95.8	94.84	54.1	96.14	112	96.36	91.72	96.1	61.47	96.36	160	99.31	95.76	96.17	77.62	97.18
17	88.96	88.96	81.72	26.8	88.96	65	93.6	89.97	93.23	56.91	93.6	113	90.2	90.01	87.77	41.95	90.2	161	98.08	98.08	95.5	59.59	98.08
18	92.82	92.82	89.05	35.88	92.82	66	88.76	84.69	86.59	63.27	87.5	114	87.94	86.66	82.56	59.25	86.45	162	94.72	92.9	94.34	63.38	94.66
19	95.23	94.99	94.02	32.69	95.23	67	78.96	77.15	78.36	42.31	78.96	115	93.67	93.31	92.69	60.71	93.66	163	83.27	80.52	81.22	54.66	82.33
20	87.88	87.88	84.47	50.2	87.88	68	90.81	90.81	86.64	41.56	90.81	116	97.33	96.31	95.34	50.9	97.33	164	96.33	95.99	92.96	86.67	93.13
21	95.95	94.1	95.77	44.59	95.95	69	94.49	94.49	90.32	57.42	94.49	117	95.54	94.9	93.36	52.44	95.54	165	90.41	89.76	87	66.48	89.64
22	96.19	96.19	92.86	28.1	96.19	70	94.51	93.7	92.8	35.16	94.51	118	93.08	91.67	92.21	27.05	93.08	166	93.74	93.13	91.6	55.42	93.74
23	88.56	84.25	85.68	62.42	87.37	71	96.71	96.69	95.01	29.23	96.71	119	94.17	94.11	92.04	41.14	94.17	167	96.03	94.88	95.29	62.55	96.01
24	89.99	89.99	81.46	40.03	89.99	72	89.13	88.96	87.55	32.47	89.13	120	86.05	83.8	85.81	45.68	86.05	168	95.65	94.76	89.09	77.79	93.42
25	93.63	93.63	91.91	49.17	93.63	73	95.09	91.12	94.74	57.65	95.09	121	91.45	89.75	89.85	37.97	91.45	169	94.74	90.64	93.11	67.71	93.42
26	91.89	91.07	90.33	44.72	91.89	74	96.8	94.48	96.6	58.68	96.8	122	94.16	89.36	93.86	54.89	94.16	170	94.35	89.99	93.48	72.85	93.71
27	84.32	83.34	81.62	53.42	83.95	75	87.63	87.34	83.78	52.02	87.39	123	91.49	90.7	88.32	39.1	91.49	171	98.95	98.95	98.95	90.3	95.37
28	86.94	86.47	86.27	34.27	86.94	76	79.75	79.53	73.88	34.35	79.75	124	80.63	79.12	78.54	31.28	80.63	172	91.46	90.45	89.78	78.75	89.41
29	96.41	94.61	96.16	41.85	96.41	77	95.2	95.1	95.14	59.23	95.09	125	90.9	90.33	83.78	69.15	88.36	173	94.21	89.48	94.21	90.45	90.92
30	89.5	89.07	84.81	28.54	89.5	78	98.96	97.43	90.05	63.24	90.89	126	89.96	85.22	89.26	64.31	89.51	174	91.42	87.53	82.74	70.92	91.42
31	90.94	90.94	86.27	45.34	90.94	79	91.75	89.28	92.59	54.83	94.32	127	99.21	98.48	98.93	67.99	99.11	175	94.46	87.35	94.33	56.94	94.46
32	92.78	91.63	91.39	39.03	92.78	80	94.32	94.12	89.83	73.76	93.7	128	92.01	91.14	88.34	68.42	91.07	176	97.18	96.52	95.17	91.34	91.98
33	93.62	91.69	93.07	21.37	93.62	81	93.96	93.96	100	47.86	100	129	96.81	95.12	93.84	74.89	95.6	177	87.3	84.47	79.55	68.91	86.07
34	97.22	97.22	97.22	41.34	97.22	82	100	100	91.44	59.52	91.62	130	91.26	90.34	89.83	75.03	90.04	178	93.36	92.5	92.22	57.89	93.36
35	94.89	81.41	94.89	46.38	94.89	83	91.62	88.64	99.65	54.54	100	131	94.32	89.32	92.62	73.03	92.88	179	90.08	89.42	84.47	54.23	89.27
36	92.66	92.39	90.28	35.15	92.66	84	100	97.45	85.71	41.87	86.04	132	94.24	94.1	92.09	58.79	94.24	180	93.55	93.48	92.09	41.91	93.55
37	89.03	88.53	87.78	38.19	89.03	85	86.04	84.37	87.46	52.25	87.59	133	94.81	92.78	92	74.12	93.44	181	99.55	94.99	98.8	71.12	99.11
38	87.59	81.8	87.4	28.31	87.59	86	87.59	84.9	95.58	87.48	95.87	134	92.6	88.99	91.74	63.44	92.09	182	89.37	86.59	79.71	66.81	89.37
39	86.84	86.18	85.39	43.78	86.84	87	99.21	96.27	91.76	48.64	92.8	135	97.5	97.36	96.88	74.4	97.32	183	94.06	93.57	92.71	59.66	94.06
40	92.71	92.38	91.3	48.84	92.71	88	92.8	92.15	88.15	62.57	88.52	136	94.92	94.49	92.37	87.4	91.15	184	92.39	92.1	91.74	52.8	92.39
41	93	85.18	89.36	44.58	93	89	88.59	87.04	81.84	49.88	83.32	137	93.86	89.38	90.08	72.5	92.01	185	98.89	92.02	98.44	71.61	98.63
42	96.87	96.51	95.57	33.27	96.87	90	83.32	82.75	100	100	92.88	138	98	97.84	93.03	84.99	96.16	186	96.13	94.59	93.21	62.9	95.52
43	90.86	90.86	88.55	32.6	90.86	91	100	100	86.94	35.82	89.93	139	94.82	94.68	92.16	47.04	94.82	187	89.79	89.5	87.44	50.83	89.79
44	94.21	92.81	93.29	44.27	94.21	92	89.93	89.07	87.58	44.02	89.84	140	84.88	83.17	81.13	52.72	84.06	188	89.4	88.33	88.34	49.57	89.4
45	95.26	90.87	95	43.46	95.26	93	89.84	87.8	79.65	72.16	80.57	141	91.52	89.65	90.35	38.05	91.52	189	92.92	92.16	89.84	62.24	92.46
46	90.38	85.78	83.12	50	90.38	94	83.09	80.48	87.06	58.4	89.96	142	93.51	93.19	92.41	68.99	93.29	190	93.29	92.58	91.44	63.6	93.04
47	91.89	91.89	79.59	23.82	91.89	95	90.27	89.88	81.84	58	84.41	143	95.7	94.49	93.27	66.98	95.13	191	96.39	96.39	91.99	50.84	96.39
48	80.8	79.57	78.81	33.41	80.8	96	85.45	82.05	83.33	53.48	83.47	144	96.06	95.77	94.17	53.31	96.06	192	93.02	90.12	90.7	77.81	91.04

Class	Eff.	Eff. after removing indicators				Class	Eff.	Eff. after removing indicators				Class	Eff.	Eff. after removing indicators				Class	Eff.	Eff. after removing indicators			
		Eff-I1	Eff-I2	Eff-O1	Eff-O2			Eff-I1	Eff-I2	Eff-O1	Eff-O2			Eff-I1	Eff-I2	Eff-O1	Eff-O2			Eff-I1	Eff-I2	Eff-O1	Eff-O2
193	86.79	94.14	92.53	86.97	85.31	241	99.29	96.53	95.82	71.74	97.7	289	93.07	89.18	83.33	70.69	93.07	337	97.95	96.67	87.96	79.1	96.14
194	94.38	95.56	93.58	82.66	90.56	242	92.68	87.01	90.03	71.75	91.04	290	72.39	70.82	71.7	27.53	72.39	338	100	100	94.75	50.66	100
195	96.04	94.87	99.37	74	93.95	243	90.32	89.74	81.78	61.92	89.77	291	91.23	90.17	90.04	49.73	91.23	339	100	100	100	100	100
196	99.47	100	97.5	97.74	99.47	244	97.84	97.84	96.95	69.23	97.75	292	97.01	96.43	96.49	45.6	97.01	340	93.78	91.82	91.65	67.13	92.92
197	100	85.53	77.84	80.38	92.74	245	94.95	94.7	91.48	68.78	94.67	293	90.85	86.89	90.83	50.49	90.85	341	90.74	89.11	86.94	72.4	89.19
198	85.53	97.34	96.56	93.52	82.2	246	95.51	95.43	94.98	74.29	95.31	294	92.45	87.77	89.92	70.85	90.74	342	94.93	94.27	93.98	67.94	94.86
199	98.03	95.8	87.65	80.45	91.78	247	97	94.67	96.72	50.46	97	295	90.12	87.58	87.5	47.71	90.12	343	94.9	94.44	93.77	58.68	94.9
200	95.8	92.78	93.29	93.29	93.87	248	99.48	96.68	98.71	79.57	98.83	296	94.9	93.54	93.02	52.51	94.9	344	90.99	90.43	87.74	69.9	90.27
201	93.29	82.18	81.32	66.04	82.64	249	96.55	95.97	94.26	78.43	95.72	297	75.3	71.1	64.54	41.81	75.3	345	93.12	91.19	88.13	83.55	89.41
202	88.88	83.95	79.45	53.53	88.88	250	88	84.96	87.92	52.87	88	298	91.9	89.69	88.86	69.55	90.48	346	90.72	89.38	90.69	68.02	90.46
203	83.95	91.85	87.7	65.93	83.77	251	100	100	98.49	68.59	100	299	85.99	84.61	84.9	29.59	85.99	347	92.67	92.58	90.67	81.65	90.27
204	94.88	94.41	93.46	72.2	94.06	252	99.48	99.48	98.73	89.73	96.2	300	79.03	78.18	77.46	36.43	79.03	348	88.55	85.22	80.67	52.97	88.55
205	95.64	91.63	88.43	62.01	94.89	253	84.18	83.48	83.97	71.92	82.8	301	86.88	86.88	84.18	46.49	86.88	349	100	100	100	100	88.91
206	91.63	92.43	92.07	62.58	91.63	254	87.98	85.67	82.93	62.46	86.32	302	90.29	88.81	88.3	63.83	89.67	350	100	99.82	97.32	92.59	95.86
207	93.39	92.2	92.35	74.99	93.24	255	91.5	91.11	90.36	41.68	91.5	303	88.98	88.92	87.22	53.38	88.98	351	92.14	90.82	90.48	63.36	91.71
208	93.88	88.9	90.47	60.26	92.98	256	98.55	96.79	98.55	98.55	67.78	304	95.9	95.69	93.13	90.1	90.24	352	91.07	90.22	89.48	44.12	91.07
209	91.07	95.95	93.85	62.5	90.87	257	95.08	94.6	94.03	61.81	95.08	305	86.02	85.86	83.78	49.3	86.02	353	87.76	84.22	85.3	61.86	86.46
210	95.95	96.41	96.47	85.97	95.95	258	92.4	88.81	91.09	82.56	91.2	306	93.39	92.06	92.6	28.69	93.39	354	90.23	90.13	88.25	55.62	90.23
211	97.36	89.91	88.28	62.33	94.71	259	92.41	90.05	91.9	80.07	90.89	307	91.16	90.42	88.13	60.27	90.74	355	91.92	90.2	86.83	74.5	89.9
212	90.26	89.91	90.74	61.25	90.06	260	93.71	92.76	85.82	75.16	90.53	308	89.37	86.28	89.02	27.98	89.37	356	86.18	83.73	83.2	64.77	84.67
213	91.55	93.36	91.69	82.26	91.41	261	96	93.64	95.87	58.96	96	309	89.97	89.97	86.83	57.41	89.97	357	97.84	97.47	97.41	78.3	97.48
214	93.45	97.58	94.28	48.73	91.05	262	95.31	95.18	95.31	70.77	95.09	310	95.83	95.83	92.35	57.26	95.83	358	87.51	87.17	80.49	63.46	85.45
215	97.58	93.32	90.13	65.64	97.58	263	97.56	94.93	97.29	60.75	97.56	311	99.62	96.88	93.47	49.45	99.62	359	92.58	90.19	92.44	48.49	92.58
216	93.55	96.62	92.28	82.42	93.32	264	95.84	94.11	94.41	84.34	93.34	312	93.4	93.4	86.49	71.68	92.28	360	87.56	87.56	84.61	54.17	87.56
217	96.62	87.53	86.66	66.44	95.4	265	91.46	91.41	84.75	82.08	86.81	313	91.2	90.09	90.37	51.17	91.2	361	94.34	94.34	92.9	64.97	94.34
218	88.45	87.62	85.67	57.06	87.92	266	98.71	98.71	94.75	91.58	94.25	314	98.24	97.33	95.24	58.72	98.05	362	90.81	90.19	88.82	81.06	87.96
219	88.04	86.15	86.14	63.99	87.87	267	100	100	99.53	91.9	96.22	315	88.3	84.93	85.68	57.26	87.45	363	94.89	93.94	93.77	60.6	94.88
220	88.72	89.61	88.28	59.48	87.41	268	92.85	92.78	91.66	64.6	92.81	316	90.02	88.36	89.6	63.22	89.95	364	92.72	91.02	83.76	72.88	90.89
221	89.7	83.86	75.88	60.57	89.7	269	95.35	94.22	94.87	65.58	95.3	317	89.21	88.54	79	50.98	89.21	365	97.02	93.51	94.39	75.64	95.07
222	84.26	94.95	94.92	69.89	83.33	270	99.46	99.46	99.46	90.22	95.55	318	92.47	91.51	89.98	41.97	92.47	366	94.39	92.95	90.69	80.61	92.14
223	95.27	89.33	84.9	72.64	95.11	271	89.16	88.21	85.98	58.63	88.63	319	87.69	86.47	81.62	61.82	85.82	367	91.05	90.21	88.32	66.74	90.4
224	90.44	89.56	89.14	76.29	88.57	272	95.93	95.9	93.89	44.08	95.93	320	80.68	77.29	79.63	55.97	79.9	368	94.76	94.43	91.6	86.72	91.08
225	90.75	92.27	93.93	71.96	89.12	273	80.62	77.08	76.6	68.87	78.18	321	88.85	87.41	88.3	46.77	88.85	369	93.08	92.96	89.37	85.56	88.74
226	96.02	91.64	89.74	66.1	94.35	274	96.57	94.49	94.37	75.12	95.44	322	84.58	83.36	79.48	57.57	83.08	370	90.13	87.94	85.2	77.65	87.06
227	93.15	88.42	86.82	64.58	92.16	275	100	99.13	100	60.33	100	323	90.75	89.18	87.79	67.41	89.7	371	88.9	86.92	83.66	75.58	86.04
228	89.42	94.2	92.61	68.31	88.78	276	90.41	90.19	88.04	82.07	87.19	324	92.47	92.36	90.65	57.05	92.47	372	100	98.12	100	96.93	96.97
229	94.58	97.07	96.18	64.01	94.25	277	93.53	92.91	89.84	75.34	92.5	325	93.3	90.35	89.47	71.88	91.27	373	85.88	79.58	84.32	68.81	84.53
230	97.6	84.51	86.42	62.8	97.6	278	97.68	97.22	97.16	80.93	96.93	326	94.46	92.97	87.12	83.97	91.6	374	89.55	89.55	83.15	47.81	89.47
231	88.21	85.31	85.59	61.84	86.83	279	99.35	97.86	97.26	94.25	95.55	327	92.36	92.01	89.97	60.89	92.19	375	92.66	91.73	91.58	44.95	92.66
232	86.54	88.25	87.79	84.33	86.36	280	96.38	92.6	90.53	76.64	93.88	328	92.39	91.09	86.5	63.89	90.6	376	90.85	87.51	84.74	76.17	88.18
233	89.02	91.95	93.33	64.74	84.13	281	85.61	84.9	84.92	74.7	83.54	329	90.11	84.78	89.98	54.27	90.11	377	96.22	95.4	93.39	69.63	95.62
234	93.94	97.27	95.41	94.86	93.78	282	98.88	97.2	98.15	75.19	98.62	330	92.02	89.95	90.04	63.87	91.24	378	97.2	96.16	96.51	74.01	96.91
235	97.4	96.86	98.5	97.82	90.51	283	94.21	94.21	91.37	85.28	90.97	331	95.89	94.17	95.56	31.39	95.89	379	96.54	94.66	94.88	70.46	95.86
236	98.5	98.11	98.03	93.14	88.65	284	88.87	88.87	85.19	42.18	88.87	332	93.69	93.69	91.42	64.8	93.69	380	100	97.95	100	78.2	100
237	98.39	89.53	88.62	89.53	93.53	285	97.52	97.51	88.55	85.43	93.89	333	96.41	96.21	91.53	68.4	95.87	381	90.49	89.87	85.58	60.73	89.55
238	89.53	89.97	89.61	63.32	78.25	286	85.97	85.84	83.1	80.97	81.3	334	95.95	95.58	95.02	62.31	95.92	382	98.38	97.47	95.96	68.68	97.92
239	90.95	95.63	95.67	87.77	90.72	287	91.13	90.5	90.22	59.47	91.12	335	91.51	90.58	88.04	81.77	88.54	383	88.15	87.2	87.02	59.22	88.04
240	97.59	94.14	92.53	86.97	94.49	288	95.95	94.26	91.12	39.93	95.95	336	87.99	87.13	85.9	45.56	87.99	384	91.8	91.55	79.8	59.38	91.8

Class	Eff.	Eff. after removing indicators				Class	Eff.	Eff. after removing indicators				Class	Eff.	Eff. after removing indicators				Class	Eff-I1	Eff. after removing indicators			
		Eff-I1	Eff-I2	Eff-O1	Eff-O2			Eff-I1	Eff-I2	Eff-O1	Eff-O2			Eff-I1	Eff-I2	Eff-O1	Eff-O2			Eff-I2	Eff-O1	Eff-O2	Eff-I1
385	91.65	91.56	90.2	59.38	91.65	401	92.16	89.49	87.57	66.86	90.38	417	94.43	94.37	89.81	85.64	90.62	433	85.07	85.07	80.93	56.18	85.07
386	89.83	88.65	87.01	56.26	88.62	402	97.52	96.99	96.8	62.66	97.48	418	92.5	91.92	91.18	63.52	92.43	434	99.05	99.05	79.05	75.35	99.05
387	95.7	95.16	94.59	72.53	95.37	403	96.78	96.38	93.66	83.6	94.62	419	93.85	92.41	93.2	86.94	90.15	435	100	95.49	100	92.72	100
388	86.09	80.3	83.35	71.77	84.61	404	97.95	97.81	97.95	78.85	97.57	420	92.02	90.95	89.66	69.81	91.27	436	90.19	87.32	90.19	89.13	80.67
389	91.29	89.71	89.46	73.97	90.1	405	93.25	92.74	90.98	89.46	87.79	421	96.06	93.4	91.67	62.34	95	437	95.09	95.09	93.45	58.3	95.09
390	92.2	89.62	88.81	74.06	89.94	406	96.63	96.63	94.16	87.47	93.3	422	87.67	80.46	87.56	60.65	87.67	438	85.06	79.69	82.42	74.77	82.57
391	97.02	97.02	91.83	77.01	97.02	407	100	100	98.46	80.53	100	423	96.51	95.35	93.26	81.36	94.62	439	100	100	98.07	96.52	100
392	91.52	90.38	85.63	62.45	90.69	408	91.33	90.9	88.47	69.16	90.87	424	91.42	89.39	90.27	57.82	91.05	440	94.75	94.25	91.72	67.92	94.25
393	98.31	97.55	96.72	57.05	93.22	409	91.7	90.6	90.16	80.4	89.32	425	96.6	91.19	94.77	78.58	95.02	441	85.02	82.25	82.91	65.04	83.57
394	93.38	92.64	90.72	93.34	91.85	410	88.13	86.11	84.27	72.31	86.28	426	89.64	89.64	80.58	63.12	88.3	442	96.11	96.11	93.25	56.11	96.11
395	80.28	76.66	75.94	78.14	80.21	411	92.72	91.87	92.29	77.97	91.47	427	83.57	82.53	79.11	71.18	81.6	443	100	100	100	83.65	99.67
396	90.43	89.59	89.11	49.78	90.43	412	96.16	96.05	96.16	96.16	85.49	428	95	95	90.96	58.79	95	444	95.48	94.9	94.33	55.03	95.48
397	92.96	92.79	89.01	47.26	91.92	413	96.05	94.65	95.67	66.69	95.99	429	97.23	96.65	92.72	81.08	95.95	445	92.01	89.67	90.71	78.66	90.31
398	94.17	94.17	87.54	78.68	92.85	414	92.29	90.81	89.29	64.94	91.45	430	94.5	94.27	91.55	82.32	92.32	Average	92.45	90.94	89.92	62.98	91.3263
399	88.62	88.33	86.83	79.01	87.8	415	89.25	88.65	87.82	84.97	84.57	431	87.53	87.41	84.18	80.66	83.1						
400	81.6	80.62	74.86	73.36	78.82	416	94.67	94.67	94.03	94.67	83.98	432	100	100	94.07	85.47	98.95						