THE ALIGNMENT BETWEEN INTERNATIONAL AND NATIONAL ACADEMIC ACCREDITATIONS -AN APPLICATION IN INFORMATION SYSTEMS BACHELOR PROGRAM AT KINGDOM OF SAUDI ARABIA

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ABSTRACT

This study proposes a method for consolidating various program accreditations into a unified accreditation process for a single academic program. The primary challenge lies in harmonizing the diverse requirements of multiple accreditations. In the context of academic technology programs in Saudi Arabia, this research focuses on the integration of NCAAA and ABET accreditations, with a specific application to the Information Systems at King Abdulaziz university. The core methodology employed in this study involves applying Bloom's taxonomy of learning to identify the synergies between the accreditation criteria of ABET and NCAAA. To ascertain the alignment of learning outcome measurement based on both accreditations, a questionnaire was administered to faculty members within the College of Computer Science and Information Technology at renowned universities in the Kingdom of Saudi Arabia. This article is intended for researchers specializing in the quality of education in computing and engineering, as well as professionals, developers, and officials with an interest in academic accreditations. Furthermore, this research seeks to establish a foundation for the seamless dissemination of educational content through websites and digital applications, adhering to the standards and principles of academic accreditation.

KEYWORDS

Academic Accreditations, Academic program, Computer Science, Kingdom of Saudi Arabia, NCAAA, Website development

1. INTRODUCTION

The academic program seeks accreditation to enhance the position of the university and to increase the confidence prospective students perceive in the offered program, which increases student enrollment and attracts quality faculty. Multiple accrediting agencies exist but achieving more than one accreditation for a given program can be a major challenge, taking significant time and resources to accomplish. Hence, it is optimal to condense the information to be gathered and unify the measures of academic quality that each accrediting body is looking to obtain. This study proposes a unifying and mutually satisfactory solution by matching the accreditation requirements of ABET[1] and NCAAA[2]. The Information Systems Program, of King Abdulaziz University, Rabigh Branch, was used as a sample to illustrate a proposed methodology for unifying this effort of simultaneously satisfying the requirements of these two accrediting agencies. The level 5 implementation course 492: Web Design & Development has been used as an example illustration, using data that covers the period 2022-2023. The NCAAA asks for

evaluation data on 33 separate requirements that must be measured and reported during the entire year. This study will concentrate on two important requirements: course specification and program learning outcomes. While this program has previously obtained ABETaccreditation, the administrators of the program now seek to obtain NCAAA while still retaining the ABET accreditation. A questionnaire was distributed to computer science faculty members and Quality deanship members in most of Saudi Arabia Universities since the national

NCAAA is requested from the Ministry of education of Saudi Arabia [3]. The questionnaire was distributed electronically by WhatsApp tools toward faculty members working in Saudi Universities. The first set of questions was asked about support for obtaining two academic accreditations at the same time. The second set of questions was asked about the validity of the proposed relationship between the educational outcomes of ABET and the classification of educational domains of the NCAAA. The third set of questions was to check the reliability of the answers. The result predicted support for obtaining local and international accreditation, which increases the quality of education by the percentage of approval was 93.7% from a total of 95 participants. The validation of the proposed relationship was high. The percentage of credibility in the answers was also very high. The validation of the relation as suggested was high and it will be discussed in detail upon this research paper.

2. LITERATURE REVIEW

The program assessment approach designed by Saeed, et al. [4] establishes a sustainable process that fosters better student learning. This research differentiates itself from the others by adding the method to divide the ABET SLOs into three domains related to NCAAA [5]. Then the academic responsibilities of any applied science program can take the benefit of the transformation to meet their PLO.

A comparative analysis on regional (NCAAA) and International (ABET) Accreditation for Mechanical Engineering Program was explained in [6]

Udshoorn et al. [7], noting a recent increase in ABET accreditation applications made by computing programs at many schools and universities, have developed a set of helpful recommendations for all stakeholders seeking ABET accreditation. Hossain et al. [8] note that despite the variation in scope across institutional and program accreditations, sufficient similarities exist to facilitate a complementary assessment approach towards achieving separate accreditations. As an example, they compare the standards of Middle States Commission of Higher Education (MSCHE) with those of ABET to find many similarities. Irons et al. [9] have also examined different professional accreditation agencies to appreciate the common values of their respective standards for computer science programs.

The documented efforts of many researchers in fulfilling their own accreditation requirements while pursuing ABET accreditation has been employed to assist other institutions seek their own accreditation status. As both the engineering council and ABET are signatories of the Washington Accord, Anwar and Richards [10] have noted how their separate accreditation criteria exhibit many similarities. They propose an alignment of such criteria across all programs represented by the Washington accord. Bachnak, et al. [11] notes how a broader knowledge of accreditation procedures and policies can better prepare an academic program to achieve ABET accreditation.

Goncharow et al. [12] have illustrated how material gleaned from national curriculum standards across accreditation agencies can be used to create a standard repository of materials that are designed to enable instructors of computer science programs to become more aligned with

national accreditation standards. Rabaa'I et al. [13] at the American University of Kuwait provided insights gleaned from the results of their pursuit of ABET accreditation, including the various performance indicators and student outcome metrics that they designed. Osman et al.

[14] created a taxonomy for linking learning objectives for educational programs and student outcome metrics for 32 accredited programs that satisfied ABET self-study reports. They apply various classification methods that produce meaningful insights into such mapping efforts.

Program assessment is a vital effort for verifying how an academic program is satisfying the intended levels of an institution's learning quality. A case study by Carelli [15] illustrates the assessment process of an academic program seeking ABET accreditation to offer guidelines for other institutions seeking ABET accreditation. Shafi et al. [16] also use a case study approach that is based on prior success at attaining an ABET accreditation to demonstrate how proper student outcome assessments can be designed for both computer information systems and computer science programs. Likewise, Khan [17] illustrates how the computer science program at the King Abdulaziz University Jeddah, Saudi Arabia, satisfied ABET accreditation standards. He suggests a detailed methodology for assessing the educational objectives and student outcomes necessary for achieving certification.

Indeed, Ahmad and Qahmash [18] identify 11 success factors that are critical for achieving ABET accreditation. They use a "fuzzy analytical hierarchical processing" methodology that prioritizes these critical factors in a way that assists educational programs to prepare for ABET accreditation. Rashid [19] emphasizes the importance of faculty members and curriculum coordinators to have a clear understanding of how best to prepare the required data for effective program assessment that satisfies ABET standards. Hussain et al. [20] used a longitudinal assessment cycle to examine various engineering programs. They emphasize how an optimal assessment model for quantifying student learning outcomes must consist of tangible, meaningful measures. Creating a quality management system for the entire institution fosters a culture of quality that ultimately assists academic programs to successfully attain and maintain accreditation. Almuhaideb and Saeed [21] identify those best practices to facilitate quality assurance in educational programs that best promotes outcome-based learning. They also suggest key organizational practices for pursuing an ABET accreditation that arose from their own successful accreditation of both their digital forensics program and their bachelor's program in cybersecurity [22]. At Jouf University, Abd El-Aziz et al. [23] illustrate how their computer information systems curriculum contributed to achieving the program's educational objectives mapped student outcomes and learning outcomes in a meaningful and systematic manner. Alarifi [24] illustrates how the mechanical engineering program at Majmaah University Saudi Arabia attained accreditation from both ABET and the NCAAA. This integrative experience revealed a need for an ethics course to be included in their program to develop a greater sense of professional responsibility among its graduates. Recent technological developments have improved the processes of data collection and reporting that are necessary for satisfying the complex ABET assessment process. Sabir et al. [25] created a Microsoft application that expedites data management to assist efforts at program assessment when pursuing ABET accreditation. Alhakami et al. [26] employ various algorithms for data mining efforts on student performance across courses that can predict student success at achieving learning outcomes. Similarly, Schahczenski and Van Dyne [27] designed a software tool for data collection and analysis that reduces program assessment efforts of both instructors and administrators seeking to collect or maintain student outcomes data.

Recently, the COVID-19 pandemic has affected accreditation activities across all academic fields. Hussain et al. [28] developed a digital-based system for assessing quality management systems across three engineering programs. This digital system facilitates various program assessment

efforts that enable virtual ABET accreditation visits. Karimi and Manteufel [29] have detailed the many challenges surrounding a virtual ABET accreditation visit and recommend specific structures and procedures for constructing qualifying digital documents. Mohamed et al. [30] recognize the difficulty in conducting on-line lab experiments and have created a unique methodology for emulating power engineering laboratory experiences within an online curriculum. Their process involves constructing a simulated environment based on common examples found in engineering textbooks. They document how such experiments have improved student outcomes relevant to ABET accreditation.

Despite these numerous accreditation and assessment studies that have been successfully deployed by many educational programs, no systematic study exists to shed light on developing a holistic assessment program strategy that aligns separate accreditation agency requirements. The intent of this paper is to offer a detailed plan involving the elements needed for a successful program assessment strategy that meets the certification obligations derived from disparate accreditation bodies.

3. RESEARCH QUESTION

Is there a method to combine two different academic accreditations obtained for one program?

4. METHODOLGY

Because obtaining the Saudi national accreditation (NCAAA) is a basic requirement in Saudi universities. To increase educational quality, distinguished academic programs in the Kingdom of Saudi Arabia seek to obtain international accreditation in addition to local accreditation. We studied the possibility of compatibility between local and international academic accreditation in an information systems program that has received international academic accreditation (ABET) and is seeking national accreditation (NCAAA). A sample of one of the courses from the Bachelor's degree information systems program was conducted. The program is in King Abdulaziz University which is one the most popular university in the Kingdom of Saudi Arabia. The program has international academic accreditation from ABET and looking forward to getting a national NCAAA accreditation. A questionnaire was conducted to test that the agreement of obtaining local and international accreditations increase the quality of the Academic program in addition to the compatibility between SO's of ABET and domains of NCAAA.

5. THE NCAAA AND THE ABET

Before It is worth understanding the mission of these two accrediting agencies before addressing the optimal method for simultaneously preparing a mutually satisfactory application to both organizations. The NCAAA accreditation evaluation and approval process apply to a specialized scientific institution or academic program. The institution or program must achieve the minimum standards and quality requirements that are determined by NCAAA. The accreditation status benefits the academic institution or program by enhancing its reputation and benefits the students by revealing the relative international ranking of the institution or program. Quality assurance of academic programs and their expected outcomes also attracts quality faculty and professionals through international and domestic recognition. Ultimately, one goal of accreditation is to align institutional and academic program outputs with the needs of society and help coordinate academic and professional labor market [31]. This promotes community confidence in academic programs and assists them in achieving a sustainable financial position. The NCAAA accredits the institution and can accredit each of the programs within the institution. ABET is a form of quality assurance for programs in the areas of applied and natural science, computing,

engineering, and engineering technology [32]. ABET accreditation is recognized globally for providing assurance that a college or university program meets the quality standards of the profession for which that program prepares graduates. ABET differs from the NCAAA in that ABET accredits programs rather than institutions [33]. Another example of their differences is that ABET does not concentrate on the teaching strategies and course specifications. Instead, it focuses on student learning outcomes. Both agencies concentrate on assessing the quality of learning processes within an academic program and both inquire about similar issues of quality assurance. This includes program objectives, course learning outcomes and individual student learning outcomes. Program Learning Outcomes (PLOs) are measurable statements (or metrics) that describe knowledge or skills that students achieve upon completion of their academic program. Course Learning Outcomes (CLOs) are specific and measurable statements that define the knowledge, skills, and attitudes that learners in the program will demonstrate by the completion of a given course.

6. CHALLENGES FACING COLLEGES TO ATTAIN NCAAA AND ABET ACCREDITATION FOR THE SAME PROGRAM

Keep It is worth carefully considering the challenges facing any program seeking simultaneous accreditation from separate agencies. The Information Systems Program, of King Abdulaziz University, Rabigh Branch, has already achieved ABET accreditation, so ABET requirements will be discussed first, to better illustrate the optimal application of integration efforts for also satisfying NCAAA accreditation requirements while using as little additional resources as possible. ABET concentrates in the question verbs of the exams and requires a report consisting of four subcategories of quality measures and instructional examples organized into subfolders: A-syllabus B-Program assessments, C- Course assessment and D- the CV of all faculty instructors for the course and the course slides used in lectures. The question verb of the exam is that each question must be start with a certain verb which specified by ABET to achieve one outcome of the course. Folder A contains the course syllabus, which explains the content and expectations of student learning for the course with a specific form. Folder B contains information on program assessment, such as samples of exams that are conducted across the various courses, as well as a spreadsheet of students' performance results and evaluations of the assessment strategies that were implemented during the semester. Folder C contains the report of each course that is evaluated, including assessments on students' progress in the course during the semester. Folder D contains the CVs of the faculty instructors delivering the courses, as well as examples of the slides and other materials used in delivering the course. All the folders are transferred to fit NCAAA accreditation and may require a little editing to fit the NCAAA format requirements. Additionally, the NCAAA asks for special forms to be completed regarding information for course and program specifications.

7. THE PROGRAM LEARNING OUTCOMES

To achieve NCAAA accreditation, the program learning outcomes must be satisfied in a manner that meets specified conditions defined by the NCAAA. The Information Systems Program, of King Abdulaziz University, Rabigh Branch, has maintained an ABET accreditation for more than 10 years. The first suggestion is to maintain the current PLO with appropriate updates to achieve the domains of NCAAA requirements. This may require some tweaking of the information to be properly collated within the domain of the PLOs of the NCAAA. This process is discussed in the following sections.

7.1. Transfer ABET Files to NCAAA

The content of ABET folders is common between ABET and NCAAA. Only the domain structure may differ, requiring a reallocation of the information to fit the NCAAA structure. This may also require the changing of informational structure and format, if needed

7.2. Mapping Current SLOs to the Three Domains of NCAAA

The existing ABET PLOs can be retained using some updates to satisfy the NCAAA domain definitions. Learning assessment within the NCAAA structure is concentrated in three domains, each with special learning verbs describing the various PLO goals. For example, the ABET structure concentrates the learning verb that measures the outcome. To find an alignmentbetween both accreditation structures, we employ a relationship between NCAAA domains titles and Bloom Taxonomy levels. The NCAAA process asks for three domains. The first is theknowledge domain, which is the least complex level of learning in the Bloom taxonomy, which is depicted in Figure 1. The learning pyramid reflects how the complexity of learning increases along the height of the pyramid. It also reveals that the two lowest levels include remembering and the understanding. The second NCAAA domain is the Skills domain. This domain comprises the third, fourth, fifth and sixth level of Bloom's Taxonomy (Applying, Analyzing, Evaluating, and Creating). The level one and two considered as basic (simple) knowledge. Whereas from level three to level six are more knowledge with skill degree based on the institute teaching strategies and the program objectives. The skills degree is currently tested by an appropriate assessment strategy. The third NCAAA domain involves the value created by learning, rather than learning itself. This domain involves ethics, morals, cooperation, benevolence, perfection, and integrity. Figure 2. illustrates the relationship between the three NCAAA domains and the six levels of the Bloom Taxonomy. Degree of skills based on the institute teaching strategies and the program objectives. The skills degree is currently tested by an appropriate assessment strategy. The third NCAAA domain involves the value created by learning, rather than learning itself. This domain involves ethics, morals, cooperation, benevolence, protection, and integrity. Figure 2 illustrates the relationship between the three NCAAA domains and the six levels of the Bloom Taxonomy.

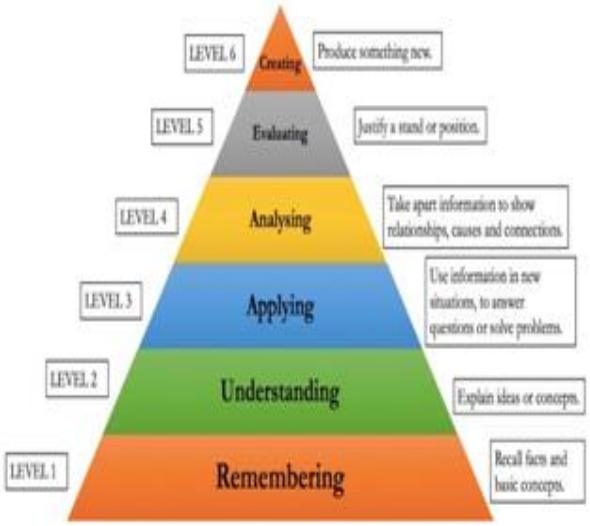

Figure 1.Bloom Taxonomy Levels -

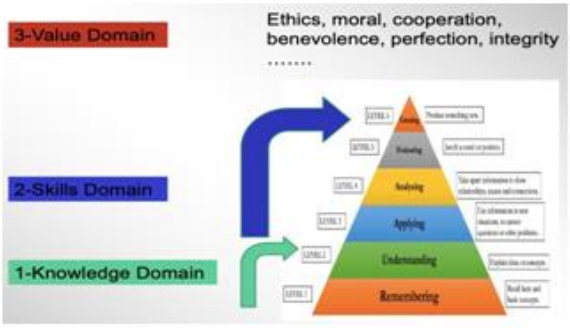

Figure2. The Relation Between the Three NCAAA Domains and theSix Levels of Bloom Taxonomy

8. THE RELATIONSHIP BETWEEN THE SO OF IS BASED ON ABET AND PLO BASED ON NCAAA

Table 1. Program Learning Outcomes

5.Program learning Outcomes*	
Knowledge and understanding	
K1	*Demonstrate the ability to understand the knowledge of supporting disciplines appropriate to the needs of the program. [SO:0]*
	Demonstrate the ability to Understand the fundamental concepts related to Information system discipline. [SO:6]
K3	*Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles. [SO:4]*
Skills	
S1	*Analyze a complex computing problem [SO:1]*
S2	*Design a computing-based solution to meet a given set of computing requirements in the context of the program's discipline [SO:2]*
S3	*Evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline [SO: 2.3]*
S4	*Communicate effectively in a variety of professional contexts [SO: 3]*
S5	*Write a clear, concise, grammatically correct and organized manner [SO: 3.2]*
Values	
V1	*Demonstrate the ability to Lead a team and independency learning and continuous learning [SO: 5]*
V2	*Communicate effectively and professionally in teams to meet the society and partnership requirements [SO:5.4]*

Currently, the Information systems program is considered Student Outcome (SO), as based on the ABET framework. The students are expected to attain six outcomes to qualify for graduationwith a bachelor's degree. These six outcomes are distributed over the entire program of courses that are completed by the students. The alignment between the NCAAA PLOs and the ABETSO is important if the department wishes to maintain both accreditations. The SO is used to implement the courses assessment and the learning verbs discussed above should be used in the assessments. Each NCAAA PLO should be comprised of the sum of all the existing SLOs that the students attain while completing the courses within the program. Once completed, the new PLO will become more general and properly aligned to the vision and mission of the university. The ABET structure concentrates on the concepts surrounding each learning verb, whereas NCAAA structure concentrates in the domains which describe the level of knowledge and skills that the student has attained. The following example will illustrate the differences and the connections between these two structures.

ABET Student Learning Outcomes.

1- Analyze a complex computing problem and to apply principles of computing and otherrelevant disciplines to identify solutions.

1.1: An ability to Analyze a complex computing problem (Analyzing)

1.2: An ability to Apply principles of computing and other relevant disciplines to identify solutions (Applying)

2- Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.

2.1: An ability to design a computer-based system, process, component, or program to meetdesired needs. (Creating)
2.2: An ability to implement a computer-based system, process, component, or program tomeet desired needs. (Applying)
2.3: An ability to evaluate a computer-based system, process, component, or program to meetdesired needs. (Affective Learning)

3- Communicate effectively in a variety of professional contexts.

3.1: An ability to conduct an oral presentation using effective communication skills. (Applying)
3.2: An ability to write in a clear, concise, grammatically correct and organized manner.(Applying)
3.3: An ability to develop appropriate illustrations including hand sketches, computer generated drawings/graphs and pictures. (Applying)

4- Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.

4.1: Understanding of professional responsibilities, ethical theories, legal and social issues. (Understanding)
4.2: Understanding of cyber security threats and corresponding procedures to mitigate thesethreats. (Understanding)
4.3: Understanding of risk management, security policies and audit procedures. (Understanding)

5- Function effectively as a member or leader of a team engaged in activities appropriate to theprogram's discipline

5.1: An ability to prepare a work schedule for the assigned task and complete it within theappropriate deadlines. (Applying)
5.2: An ability to participate in team meetings with full preparedness for providing useful input. (Affective Learning). It supposed to be Value domain of NCAAA
5.3: An ability to share ideas among the team and promote good communication among the team members. (Affective Learning). It supposed to be Value domain of NCAAA

6- Support the delivery, use, and management of information systems within an information systems environment

6.1: Support the delivery of information systems within an information Systems environments (understanding)
6.2: Support the use of information system within an information Systems environments(Applying)
6.3: Support the management of Information Systems within an information Systems environments (Applying)

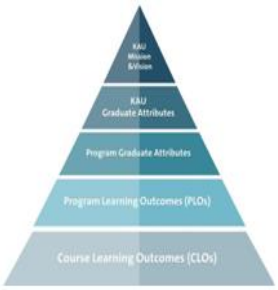

Figure 3. Hierarchy of Setting Learning Outcomes SOURCE:[35]

As recognized in ABET's SO, the lower level of learning outcomes is not considered, as there is no clear lower level of knowledge measured in the recent SO. This was discussed and solved by the researcher of [4]. Whereas NCAAA consider lower levels of the knowledge domain than ABET. Another disadvantage of ABET's SO is that each main outcome has many verbs (skills) to be measured. This conceptual disconnect between the two assessment structures effects the accuracy of the measurement. The suggested approach of this research can be employed toobtain the PLO of these learning domains. This approach suggests that the subpoints 4.1, 4.2, 4.3 and 6.1 of SO 4 and 6, respectively, can all be considered in the knowledge domain. Table 1 shows the suggested collation of learning domains to create a PLO that satisfies the NCAAA structure. The Table 1 is section 5 from the form of program specification NCAAA 2022, it filled with IS department, king Abdelaziz University in Rabigh, Program learning outcome based on ABET.

In the Table 2, the six ABET SO,s were mapped to the three NCAAA Domains. As observed that the ABET SO:3 could be in either SKILL or VALUE domain. This will be consideredbased on the asked question of the introduced assessment and on the course objective and the question goal. Likewise, for ABET SO:6.2 is containing two action verbs which decreases the assessment accuracy. It confused to which skill does the exam test SUPPORT or USE. This will be considered based on the course objective and the introduced question goal.

Table 2 Mapping the six ABET SO to the three NCAAA domains

NCAAA DOMAINS	ABET STUDENT OUTCOMES
SKILL	1-Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.
	1.1: An ability to Analyze a complex computing problem (**Analyzing**)
	1.2: An ability to Apply principles of computing and other relevant disciplines to identify solutions (**Applying**)
SKILL	2-Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline
	2.1: An ability to design a computer-based system, process, component, or program to meet desired needs. (**Creating**)
	2.2: An ability to implement a computer-based system, process, component, or program to meet desired needs. (**Applying**)
	2.3: An ability to evaluate a computer-based system, process, component, or program to meet desired needs. (**Affective Learning**)
SKILL/ VALUE	3-Communicate effectively in a variety of professional contexts
SKILL/ VALUE	3.1: An ability to conduct an oral presentation using effective communication skills. (**Applying**)
SKILL/ VALUE	3.2: An ability to write in a clear, concise, grammatically correct and organized manner. (**Applying**)
SKILL	3.3: An ability to develop appropriate illustrations including hand sketches, computer-generated drawings/graphs and pictures. (**Applying**)
KNOWLEDGE	4-Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.
	4.1: Understanding of professional responsibilities, ethical theories, legal and social issues. (**Understanding**)
	4.2: Understanding of cyber security threats and corresponding procedures to mitigate those threats. (**Understanding**)
	4.3: Understanding of risk management, security policies and audit procedures. (**Understanding**)
VALUE	5-Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline
SKILLS	6-Support the delivery, use, and management of information systems within an information systems environment
	6.1 Support the delivery of information systems within an information Systems environments
	6.2 Support the use of information system within an information Systems environments
	6.3 Support the management of information Systems within an information Systems environments

9. THE IMPLEMENTATION OF COURSE SPECIFICATION

To create course specifications, the department must set the program learning outcomes. Therefore, the instructor must set up the course outcomes to meet the PLOs. This implementation is illustrated using the course of Web Design & Development 492, which is in the level 5 information system bachelor program.

1. Check the current course specification
2. Fill out the NCAAA course specification form
3. Check the current course objectives
4. Check the Course learning outcomes
5. Be sure about the alignment with the program learning outcome is properly aligned with university goals.
6. The title should be a learning verb.
7. Classify the CLOs into to three NCAAA domains
8. Check teaching strategies
9. Check assessment strategies

The challenge of this significant task is to align the course learning outcomes aligned with PLO's. The example course learning outcomes were applied to section three in the course learning outcomes of the NCAAA Course specification form. Table 3 illustrates this section three implementation. These arecourse learning outcomes based on NCAAA course specification form sample of 2022.

Table 3 Course Learning Outcomes

	CLOs	Aligned-PLOs
1	**Knowledge and understanding**	
1.1	Define the concepts in each topic	K1
1.2	Understand each concept in each topic	K2
2	**Skills:**	
2.1	Analyze the main concepts for designing the websites	S1
2.2	Design a styling secured web pages and Master pages using HTML & CSS	S2
2.3	Run the client-side using JavaScript.	S1
2.4	Design a dynamic web pages using ASP.Net	S2
2.5	Demonstrate a practical experience of web design technologies	S4
2.6	Design interactive complex websites	S2
2.7	Evaluate interactive complex websites	S3
3	**Values:**	
3.1	Work in group effectively	V1
3.2	First works individual then work together	V2

10. CONSISTENCY CHALLENGES

To create PLOs that are both consistent with the university plan, and sufficiently flexible to be updated according to the university plan, the college plan must follow the university plan and the PLO must be aligned changes. Further, the plan must be consistent with the National Qualificationsattributes. Figure 3 illustrates the tasks that any colleges must face to obtain the alignment that satisfies accreditation requirements. Therefore, consistency is necessary between the course learning outcomes with the program learning outcomes and the college learning outcomes, and then the characteristics of the graduates in accordance with the university's objectives. Figure 4 shows the Hierarchy of setting learning outcomes.

11. CONSISTENCY WITH THE NATIONAL QUALIFICATION

The term 'learning outcomes' recognizes that learning will generate a range of outcomes, including the intended learning defined in the program of study and learning which is generated by or as experience or which is the by-product of other learning activities. The program learning outcome should be derived from the institution general graduate attributes which consistent with institution mission and vision. Once determined, the learning outcomes for the program of study map directly to the summative assessment, with the assessment methods being appropriate to offer every student an equal opportunity to demonstrate their achievement of the intended learning outcomes (ILOs) irrespective of how and where the student has studied [31]. The Program learning outcome must be aligned with the PLOs which have to be aligned with KAU attribute. Therefore, student learning outcome SLOs must be aligned national qualifications framework (NQF) and the NQF satisfies the NCAAA domains. Tables 4, 5 and 6 suggest an appropriate alignment between SLOs and NCAAA learning domains of Information System department at Rabigh.

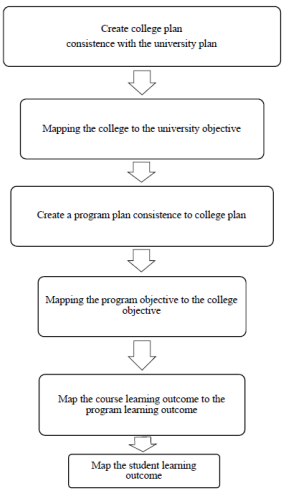

Figure 4. The main tasks that any college faced to achieve sustainable qualification.

Table 4 Mapping the SKILLS domain of SLO with National Qualification for IS Department of King Abdulaziz

NQF Learning Domains	**NQF Learning Outcomes Level 6 (Bachelor Degree)** *At this level, graduates will have*	**PLOs Alignment with NQF**
Knowledge	Comprehensive and consistent structure of knowledge and understanding of the underlying theories, principles and concepts in one or more than one of specialization or work field.	SLO 4,6
	Advanced knowledge and understanding of operations materials, methods and practices, Postulates, and/or terms.	SLO 4,6
	Specialized knowledge and understanding based on recent developments in the field of profession or field of work.	SLO 4,6
	In programs preparing students for professional practice, graduates are aware of relevant conventions, regulations, and technical requirements and of how these might be modified over time in response to changing circumstances.	SLO 4,6
	Knowing and understanding the research methodology, and survey methods.	SLO 4,6

Table 5. Mapping the Knowledge Domain of SLO with NATIONAL QUALIFICATION FOR IS DEPARTMENT OF KING ABDULAZIZ

	NQF Learning Outcomes Level 6 (Bachelor Degree) *At this level, graduates will have*	PLOs Alignment with NQF
	Communication and IT skills	
	Communicate in different ways to show understanding of theoretical knowledge, knowledge transfer and specialized skills and complex ideas for a diverse audience.	SLO 3, 6
	Applying statistical and mathematical techniques to solve problems in complex contexts related to the field of profession or the field of work.	SLO 1
	Choosing and using a variety of digital and ICT tools and applications; to process, analyze and produce data and information; To support and promote specialized research and projects.	SLO 1, 3, 6
	At this level, and within complex contexts; The graduate will be able to:	
	At this level the graduate will have a comprehensive and specialized range of skills cognitive, practical, physical and communication skills; So that he is able to:	
	Cognitive skills	
	Apply concepts, principles, and theories to address issues and/or problems in a range of complex contexts.	SLO 1
	Solving complex and unexpected problems in one or more specializations or work fields.	SLO 1, 2
	Critical evaluation of complex knowledge, and its use to provide innovative solutions to contemporary issues and problems in one or more disciplines of field of work or field of profession.	SLO 1, 2
	Suggest and develop innovative solutions to current issues and problems in the field of profession or field of work.	SLO 2
Skills	Practicing methods of investigation and research issues complex problems.	SLO 1, 2
	Practical, physical skills	
	The use and modification of advanced and specialized processes, tools, machines, materials and devices in dealing with activities related to the field of profession, and the field of work.	SLO 2
	Performing a set of complex practical tasks and procedures in a specific field, related to the field of profession or the field of work.	SLO 1, 2 ,6

Table 6 Mapping the Values domain of SLO with National Qualification for IS Department

	At this level, and within complex contexts; The graduate will be able to:	
	Representing integrity and professional and academic ethics, participating in finding constructive solutions to community issues, and committing to responsible citizenship.	SLO 3, 4
values	Self-evaluation of learning level and performance, in addition to insistence on achievement and excellence, and making logical decisions supported by evidence and arguments independently.	SLO 1, 3, 4
	Leading work teams flexibly and effectively, taking responsibility for professional development, participating in development of group's performance, and enhancing quality of life.	SLO 3, 5

12.SUGGESTION OF PLO FOR IS BACHELOR PROGRAM

This section discusses some suggested PLOs for the bachelor's program in InformationSystems that align with NCAAA Domains, as well as the ABET SO.

Knowledge:
K1: Support the delivery of information systems within an information system environment. K2: Recognize information system and computing system solution to solve problems.

Skills:
S1: Create solutions to social needs using cumulative and subjective knowledge of the information systems and relative fields to reach excellence
S2: Developing information systems techniques and systems design to meet industry and the society requirements
S3: Evaluate a computing-based solutions to meet a given set of computing requirements.

Values:
V1: Communicate effectively and provisionally in teams to meet the society and partnership requirements

V2: Lead teams with commitments and responsibilities behavior

13. THE QUESTIONNAIRE

A questionnaire was distributed to a group of faculty members in the field of computer science from a group of the most famous Saudi universities. The distributed target number was to 100 members. The response was from 95 members, and the percentage of approval in the question of support for obtaining two local and international accreditations at the same time was 93.7%. Figure 5. shows the percentage result.

Figure5 The percentage agreement of obtaining Local & Internationalaccreditations increase the quality of the Academic program.

13.1. The Compatibility Set Questions & Responses

For the questions set of compatibility between SO's of ABET and domains of NCAAA. The questions were about each main outcomes by choosing its compatibility with the appropriate domain among the three domains. The asking question was for each subpoint of each main student outcome. The responses were explained by Table 7 & Figures 6 to 20, follows:

Table7 Showing the result and the related question number for each SO of ABET

Q#			The Compatibility question Set		The Reliability Questions Set		
	D	SO	# Comp	% Comp	#Agr	%Agr	% Reliability
Q#1	Skills	1.1	93	97.90%	95	100%	98.95%
Q#2	Skills	1.2	93	97.90%	95	100%	98.95%
Q#3	Skills	2.1	94	98.90%	93	97%	97.95%
Q#4	Skills	2.2	93	97%	95	100%	98.50%
Q#5	Skills	2.3	91	95.8	93	97.90%	94.20%
Q#6	Skills	3.2	92	96.8	93	97.90%	94.20%
Q#7	Skills	3.3	95	100%	94	98.90%	99.45%
Q#8	Knowledge	4.1	93	97%	94	98.90%	97.95%
Q#9	Knowledge	4.2	94	98.90%	95	100%	99.45%
Q#10	Knowledge	4.3	92	96.80%	94	98.90%	97.85%
Q#11	Value	5.1	62	65.30%	66	96.50%	80.90%
Q#12	Value	5.2	93	97.90%	95	100%	98.95%
Q#13	Value	5.3	94	98.90%	95	100%	99.45%
Q#14	Knowledge	6.1	86	90.50%	93	97.90%	94.20%
Q#15	Knowledge	6.2	49	51.60%	67	70.50%	61.05%
Q#16	Knowledge	6.3	48	50.50%	66	69.50%	60.00%

whereas:

- Q# is the question number of the questions of Compatibility set and the questions of reliability set, whereas the questions in reliability set ask about the agreement of the relation compatibility which was asked in compatibility set.
- D is the domain of NCAAA
- SO is the students' outcomes of ABET
- Related SO is the student learning outcomes of ABET related to the corresponded Domain of NCAAA

Comp is number of the compatibility responses of the suggested relation between the domain of NCAAA and SO of ABET, which was asked by the compatibility questions % Comp is the compatibility percentage of the suggested relation between the domain of NCAAA and SO of ABET, which was asked by the compatibility questions
#Agr is the correct responses number of agreements for related responses to the questions in the reliability set %Agr is the percentage of agreement about the compatibility between the SO of ABET & domain ofNCAAA, in the reliability questions

-For the value domain, the question was q11, q12 , q13, q14 and the reliability questions were q11, q12 , q13, q14 in the reliability set. The result is showing in Table 7 and in the following graphs:

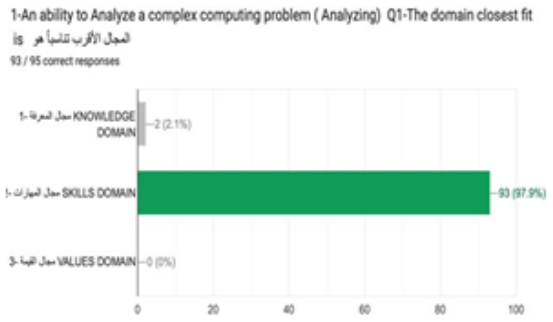

Figure 6. Testing Compatibility Between Knowledge Domain & ABET SO 1.

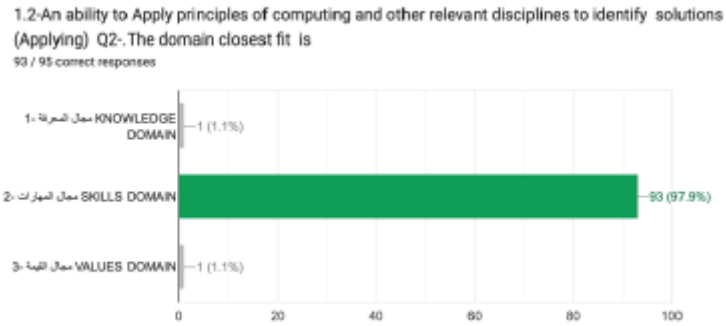

Figure 7. Testing compatibility between Skill Domain & ABET SO 1.2

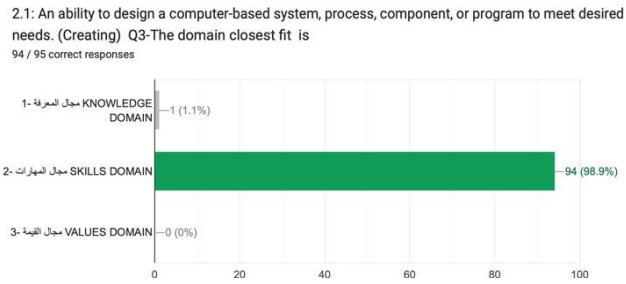

Figure 8. Testing Compatibility Between Knowledge Domain & ABET 2.1

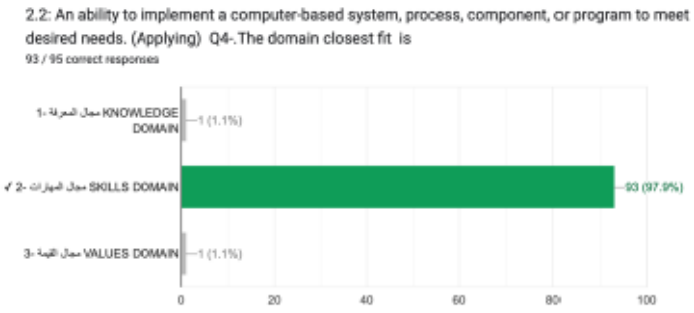

Figure 9. Testing Compatibility Between Knowledge Domain & ABET SO 2.2

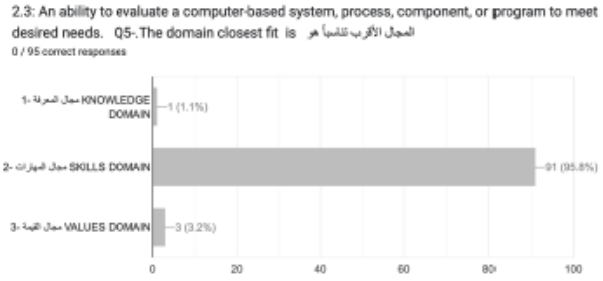

Figure 10. Testing Compatibility Between Knowledge Domain & ABET SO 2.3

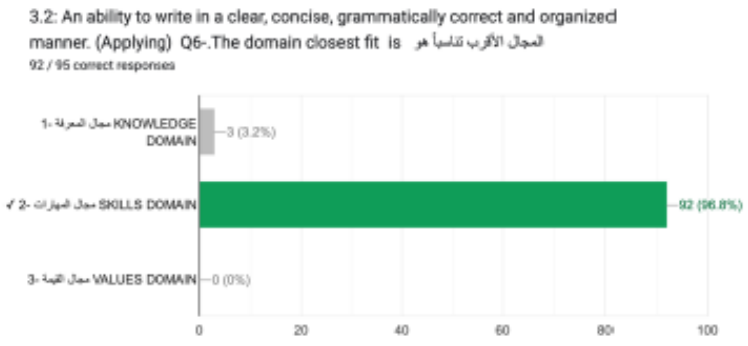

Figure 11. Testing Compatibility Between Knowledge Domain & ABET SO 3.2

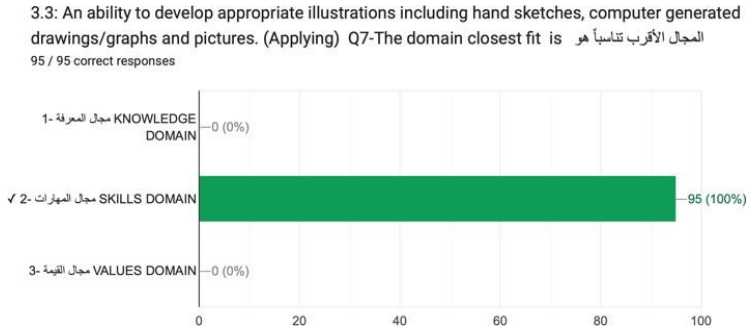

Figure 12. Testing Compatibility Between Knowledge Domain & ABET SO 3.3

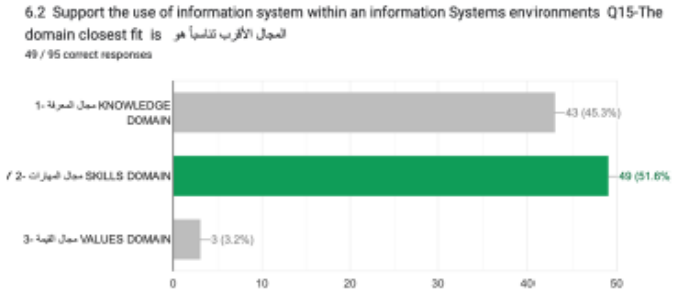

Figure 13. Testing Compatibility Between Knowledge Domain & ABET SO 6.2

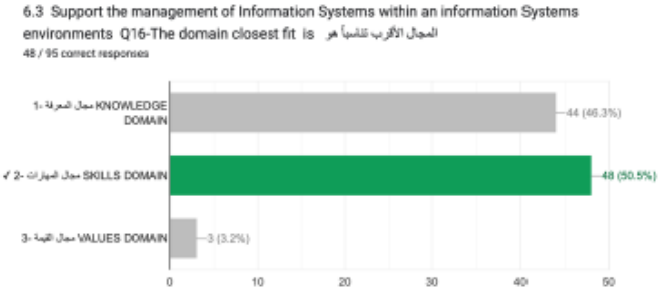

Figure 14. Testing Compatibility Between Knowledge Domain & ABET SO 6.3

-For the knowledge domain, the questions were q8, q9 and q10 in the compatibility set. The reliability questions were q8, q9 and q10 in the reliability set. The result of the compatibility was as the following:

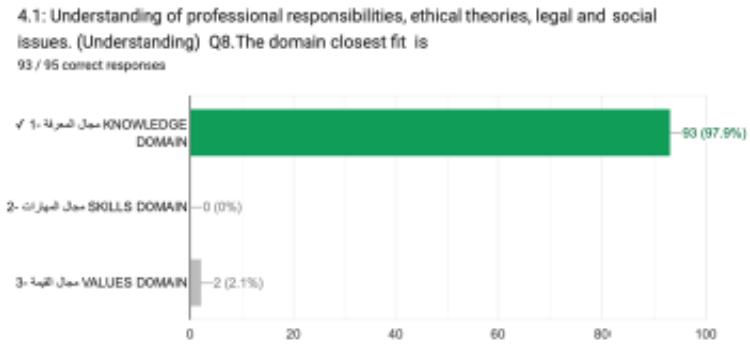

Figure.15. Testing Compatibility between Knowledge Domain & ABET SO 4.1

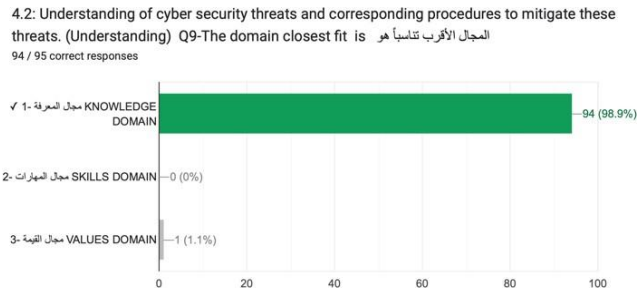

Figure 16. Testing Compatibility Between Knowledge Domain & ABET SO 4.2

Figure 17. Testing Compatibility Between Knowledge Domain & ABET SO 4.3

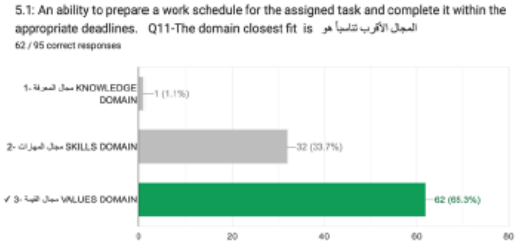

Figure18. Testing Compatibility Between Knowledge Domain & ABET SO 5.1

Figure 19. Testing Compatibility Between Knowledge Domain & ABET SO 5.2

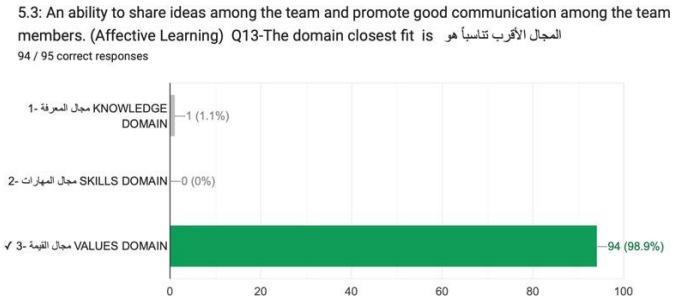

Figure 20. Testing Compatibility between Knowledge Domain & SO 5.3

13.2. The Reliability Set Questions & Responses

The percentage of the reliability's questions of the compatibility between the skills domain and SO

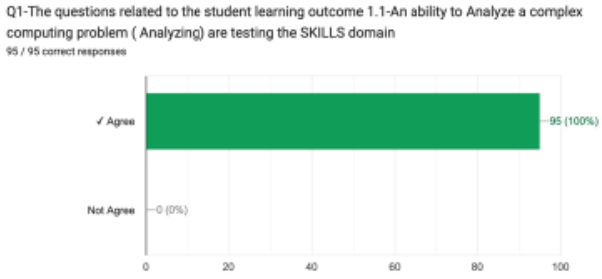

Figure 21. The Reliability of Responses of the Relation between the NCAAASkills Domain and ABET SO 1.1

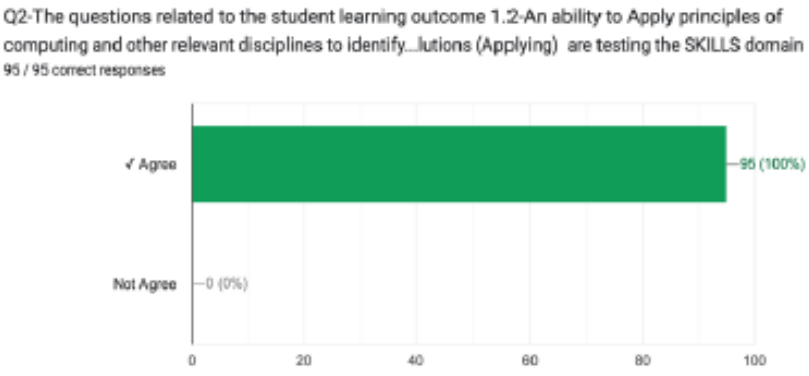

Figure 22. The Reliability of Responses of the Relation between the NCAAASkills Domain and ABET SO 1.2

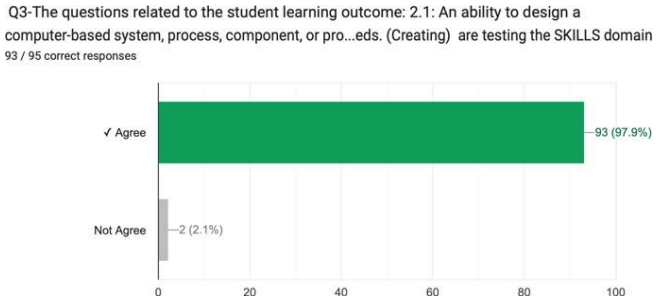

FIGURE 23. The Reliability of Responses of the Relation between the NCAAASkills Domain and ABET SO 2.1

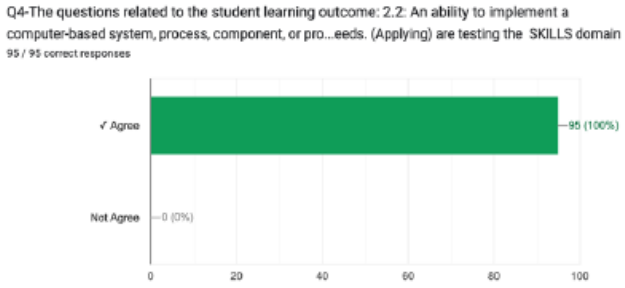

Figure 24. The reliability of responses of the relation between the NCAAA skillsdomain and ABET SO 2.2

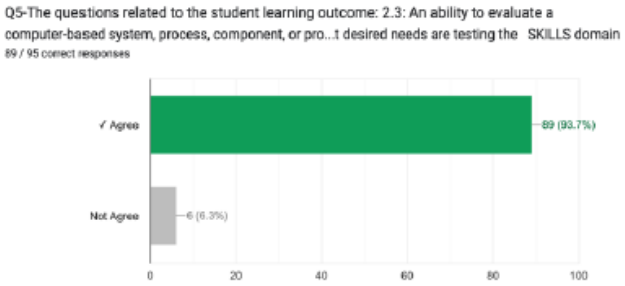

Figure 25. The Reliability of Responses of the Relation between the NCAAASkills Domain and ABET SO 2.3

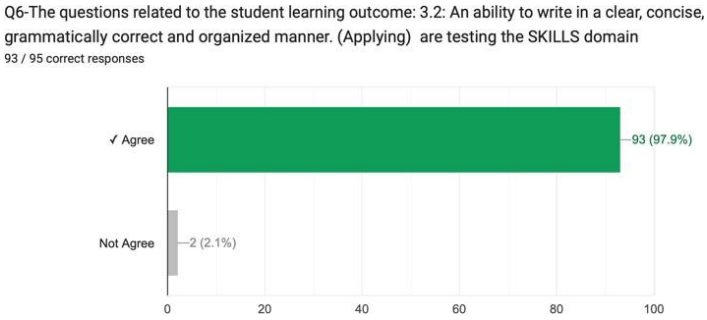

Figure 26. The Reliability of Responses of the Relation between the NCAAASkills Domain and ABET SO 3.2

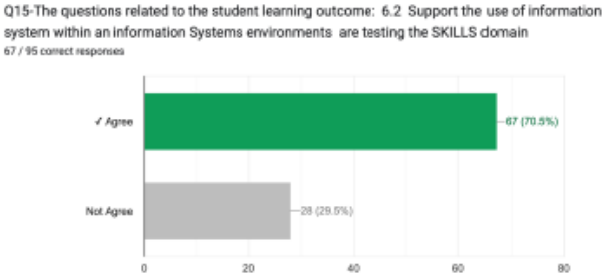

Figure 27. The Reliability of Responses of the Relation between the NCAAASkills Domain and ABET SO 6.2

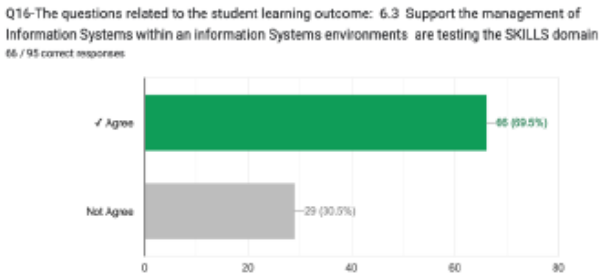

Figure 28. The Reliability of Responses of the Relation between the NCAAASkills Domain and ABET SO 6.3

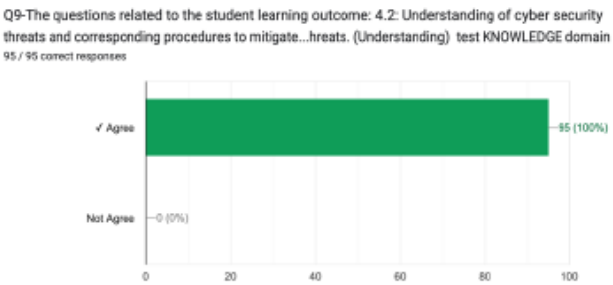

Figure 29. The Reliability of Responses of the Relation between the NCAAASkills Domain and ABET SO 4.2

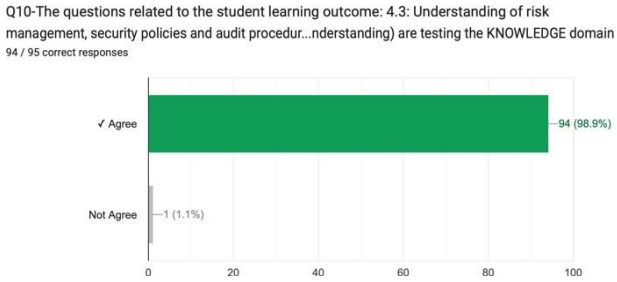

Figure 30. The Reliability of Responses of the Relation between the NCAAASkills Domain and ABET SO 4.3

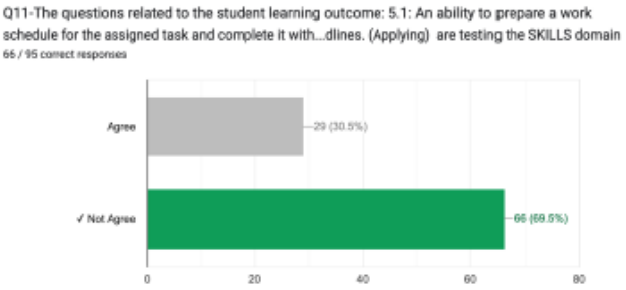

Figure31. The Reliability of Responses of the Relation between the NCAAA SkillsDomain and ABET SO 5.1

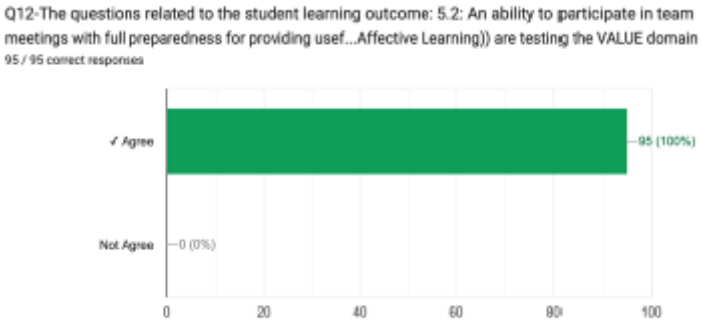

Figure 32. The Reliability of Responses of the Relation between the NCAAASkills Domain and ABET SO 5.2

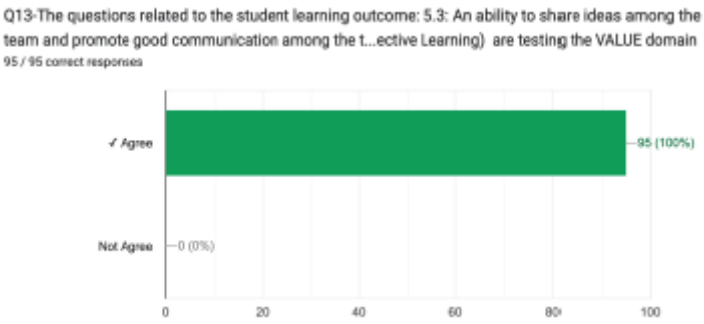

Figure 33. The Reliability of Responses of the Relation between the NCAAA SkillsDomain and ABET SO 5.3

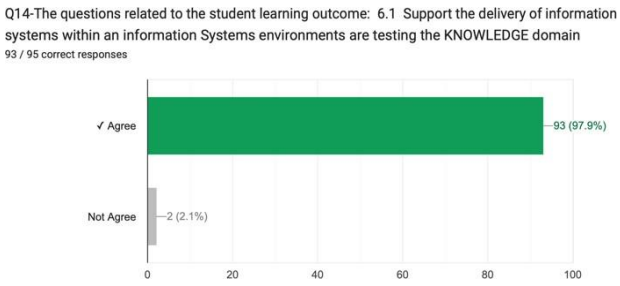

Figure 34. The Reliability of Responses of the Relation between the NCAAASkills Domain and ABET SO 6.1

13.3. The Questionnaire Analysis

Table 7 shows the percentage of the responses to the questions asked about the compatibility between the ABET SO's and the mapped NCAAA domains. Also, it shows the percentage rate of responses to the questions in the reliability set. The figures, 6, 7, 8, 9, 10, 12, 13, 14, 15, 16, 17, 18, 19, 20, illustrate the compatibility between ABET SO & NCAAA domains. The highrate of the responses to the questions of the compatibility set means that, the success of the suggested compatibility relations between the SO of ABET and the appropriate NCAAA domain. The validation percentages were, 97.90% 97.90%, 98.90%, 97%, 95.8, 96.8. 100%, 97%, 98.90%, 96.80%, 65.30%, 97.90%, 98.90%, 90.50% respectively. The reliability percentage for q1 to q14 was high as the following 98.95%, 97.95%, 98.50%, 94.20%, 94.20%, 99.45%, 97.95%, 99.45%, 97.85%, 80.90%, 98.95% and 99.45%, Which indicates the stability of the participants' answers. The percentage is illustrated in Figure 21, 22, 23, 24, 25,26, 27, 28, 29, 31, 32, 33 and 34. The percentages is summarized in Table 7

Table 7 shows high percentage of compatibility and reliability set in the questions q1 to q14, excluded question 11. where it is noted that the percentage of choose the correct domain was 65.3% . The question 11 was testing the compatibility between the value Domain & ABET SO:

5.1 which is "An ability to prepare a work schedule for the assigned task and complete it within the appropriate deadlines". This point is confused and could be considered as measurement of student outcome in skill level, "apply" in Bloom taxonomy NCAAA domain. On other perspective it tests the value domain in NCAAA such the commitment and respect the time.

5.2

The responses percentage for SO:5.1 was shown in Figure 1, Likewise, the reliability percentage of the same point 5.1 was low. The result is illustrated in Figure 30. The reason for the low percentage may be that SO: 5.1 asked about the ability to manage the time, as well as the ability to stick to deadlines, and this represents value domain in the NCAAA, as well as the skill of creating a schedule to set times. On other hands, the answer here depends on the awareness and opinion of each person, and it varies in its validity between the interdependence between the skill of the individual and the values of the individual. This was confirmed by the percentage of responses agreeing that SO:5.1 tests the skill, and the responses were disagreement 69.51% and the agreement was 3.5%. The percentage is shown in Figure 30. The fact is that SO: 5.1 is asked about the value and skill domain. What determines the domain that we ask about is the goal of the question, so it is placed based on the goal. Is it measuring a value or a skill. For SO:6.2 and SO:6.3, showed in Figures 13 & 14, the compatibility percentages were low. The question number 15 & 16 were asked about these points and the responses rate was 51.60% 50.50% respectively. For the reliability percentages for the same points were 61.05%, 60.00% respectively which indicates the dispersion of the participants' responses. In q15 was noted that the percentage of agreement between the SO:6.2 and to choose the domain skills or knowledge is

low, and this may be due to the lack of clarity of the objective verb in this SO, where there are two verbs: “suppport” and “use”. As the quality of education system and based on any academic accreditation such as NCAAA, using a single verb in setting educational objectives is important because it increases the accuracy of the objectives and thus helps in generating the questions that follow this verb. Likewise, with the SO:6.3, as there are two verbs “support” and “manage”.

14. DISCUSSION

The most related work was [4]. The researchers added statement SO:0 to measure knowledge domain in NCAAA Accreditation. In our research, a more accurate relationship was created through using Bloom Taxonomy to map between the two accreditations. The mapping between ABET Student Outcomes & NCAAA domain was obtained as shown in the Table 2. By using the Bloom taxonomy to map between ABET students Outcomes and NCAAA domains the knowledge domain was founded from the ABET SO:4 and. SO:6. This domain was not recognized as Knowledge domain in the work of [4]. On other hand, using Bloom taxonomy provides space and flexibility in the event of any change or development in educational objectives or assessment strategies. Likewise, in the event of any change in the accreditations.

15. CONCLUSION

This research illustrated a methodology for transfer ABET SLO’s to NCAAA’s PLOs. The methodology attempts to transfer the SO, which based on ABET’s specifications, to NCAAA’s PLO domains using the various levels of Bloom’s taxonomy of Learning. The domain of knowledge can use level 6 and subpoints of level 4. The domain of skills can use levels 1, 2, and 3. The domain of Value can use criteria from level 5 and subpoint 1 from level 3 by including language that addresses ethical values. While the department is free to implement a different PLO, it must consider the complex alignments that are necessary between the two accreditation domains of ABET and NCAAA. Also, it must take in mind that the ABET information needs updating, which presents a good opportunity for undertaking this integrative effort. In the future, the possibility of one academic program obtaining several academic accreditations will be taken advantage of. The work will be on creating smart applications and using artificial intelligence to create adaptive questions that are compatible with two basic local and global accreditations.

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