
Development and Effectiveness of Rubric-Based Assessment for Computer Science Final Year Project

Chng Chern Wei, Widura Abd Kadir, Siew Woei Shen

Faculty of Computer Science and Information Computing Technology, New Era University College, Kajang, Selangor, Malaysia

E-mail: chernwei.chng@newera.edu.my

Abstract

The final year project (FYP) is a compulsory module for undergraduate students that allows them to design applications and solutions to apply their technical and soft skills. The FYP is significant since it assesses the candidate's abilities in idea construction, literature review, project analysis and design, and project development. Once completed, it remarks as the highest accomplishment of a bachelor candidate and proof indicates they already possessed the significant skill set. While it is common to use rubrics to evaluate projects, the variety of projects and the unique nature of supervisory approaches generate some operational challenges when using such rubrics in evaluation. This paper presents the development and effectiveness of a comprehensive rubric-based evaluation for most of the FYP components. As part of a proper evaluation of FYP, the rubric suggests assessing components in proposal report, dissertation report, project development, progress record, and presentation. This paper also shares the rubrics' evolvement as well as feedback from academicians and students.

Keywords : *assessment; evaluation; final year project; rubrics*

I. INTRODUCTION

The aims of FYP module are to provide students with practical project experience while assessing knowledge and skills in their field [1] [2] [3] [4]. In Faculty of Computer Science and Information Computing Technology (FICT), New Era University College (NEUC), FYP is a 6-credit compulsory course that must be completed by all undergraduate program candidates. The FYP is divided into two phases: phase 1 and phase 2. Bachelor students who are already in their final year will be enrolled in this course which takes two semesters to complete the full module. Students will need to work individually and will be guided by a lecturer who acts as a supervisor. Throughout the FYP, a standard supervisory approach is used, which implies that supervisors will meet with their students in any appropriate way, such as face-to-face or via video conferencing, to discuss project progress. Details of the meeting will be recorded in a logbook for future reference and record-keeping. Students are assessed according to proposal report, dissertation report, project implementation, logbook, and presentation.

Assessment is critical for determining the state of learning and providing appropriate learning guidance [5]. Since the focus of evaluation is on the performance or effectiveness of an educational programme rather than its design [6], the use of

rubric-based assessment in FYP is the best method as it improves the transparency and consistency of the assessment process, which minimizes the risk of inaccurate scoring and bias in performance evaluation [7] [8]. Rubrics also are becoming the norm for this sort of evaluation [9].

This paper focus on the development and implementation of rubric-based assessment on FYP. Bloom's learning taxonomy and the Malaysian Qualifications Framework Second Edition (MQF 2.0) are used as benchmarks of student achievement. Table 1 shows the learning outcome of the FYP course mapped with Bloom taxonomy and MQF 2.0.

II. IMPLEMENTATION OF FYP IN FICT

The FYP assessment contains five components as shown in Table 2. During the Phase 1, series of workshops are being organized to help students enhance their skills and to provide them with additional information as they work on their projects. Students will select or be assigned to a supervisor according to the student's topic and the supervisor's expertise. Supervisor is responsible to guide and assess students throughout their project progress, both in Phase 1 and Phase 2.

In Phase 1, there are three components to be completed for assessment: written project proposal, progress record in a logbook and presentation. The proposal report will be the first

deliverable created by students, and it will include their broad idea for the project as well as project planning. There will be discussions between students and supervisors to refine the project ideas. The faculty will run the FYP proposal presentation session before the end of the semester. Evaluators will be assigned to each presentation during the presentation to ensure a fair assessment. Comments and discussions during the presentation are important to the implementation of the project in Phase 2.

While students may focus on project development in Phase 2, their progress will still be evaluated. This means that in order to gain 8% on the Phase 2 assessment, students must continue to update their logbooks. A dissertation report must be written after the project is completed. Students then need to present and demonstrate their project as part of the assessment.

Table 2 shows the FYP assessment components, corresponding assessors and marks percentage for each component

Table 1 Mapping of FYP Learning Outcome with Bloom Taxonomy and MQF2.0

Learning Outcome	Bloom Taxonomy	MQF 2.0
Phase 1		
LO1. Analyze research problems	C4 – Analyze	Cognitive Skills
LO2. Identify appropriate solution approach for research problems	P1 – Perception	Digital Skills
LO3. Organize the tasks and time that lead to the success of the research	A4 – Organizing values	Personal Skills
LO4. Explain the concept of the project to be developed	P2 – Set	Communication Skills
Phase 2		
LO5. Construct project according to the proposed plan and design	P7 – Origination	Digital Skills
LO6. Compile research and project documentation through technical report	C6 – Create	Cognitive Skills
LO7. Organize the tasks and time that lead to the success of the project	A4 – Organizing values	Personal Skills
LO8. Demonstrate the project that has been completed	P5 – Complex Overt Response	Communication Skills

Table 2 FYP Deliverables and Marks Percentage

Assessor	Components	Percentage of Marks (%)		
		Phase 1	Phase 2	Total
Supervisor / Evaluator	Proposal Report	68		34
Supervisor / Evaluator	Dissertation Report		36	18
Supervisor / Evaluator	Project Development		36	18
Supervisor	Progress record (Logbook)	12	8	10
Supervisor / Evaluator	Presentation	20	20	20
	Total	100	100	100

The assessment for each component in Table 2 are broke down into a set of evaluation criteria. Table 3 shows the proposal report evaluation criteria. The proposal is the student's first deliverable, and it comprises the main idea and some preparation for the project to be completed. The proposal report should be done in Phase 1, together with the progress record in the logbook and the proposal presentation.

The dissertation which reports the project developed is also expected to be delivered in Phase

2. The evaluation criteria for the dissertation report were shown in Table 6. FYP Phase 2 also expects the student to deliver the project outcome, and this is shown in the project development evaluation criteria in Table 7.

A clear learning outcome in FYP module is to explain the concept of the project to be developed in Phase 1 and then demonstrate the project that has been completed in Phase 2. A presentation in Phase 1 will help students comprehend the particular objectives of the planned FYP and arrange their

future work [9]. By doing this, student will be assessed according to the evaluation criteria shown in Table 5. Following the completion of the project, a second presentation is needed to assess the student's ability to articulate their project accomplishments [10]. This should be done in Phase 2. The evaluation criteria for Presentation in Phase 2 are shown in Table 9.

In addition to presentations, student's scores were collected from their meetings with supervisors, where meeting actions were documented in a logbook. This ensures that student progress is closely tracked [1]. The evaluation criteria for progress record in logbook were shown in Table 4 (Phase 1) and Table 8 (Phase 2).

Table 3 Proposal Report Evaluation Criteria

Proposal Evaluation Criteria (Pshase 1 – 68%)	Learning Outcome	Marks
Proposal title	LO1	4
Introduction & background of research	LO1	4
Research problem	LO1	4
Research questions	LO1	4
Project objectives	LO2	4
Scope	LO2	4
Literature Review	LO1	4
Methodology and System Design	LO2	4
Analysis and finding	LO2	4
Conclusion and Suggestion	LO2	4
Gantt chart	LO3	4
Planning of project work	LO3	4
Sources	LO1	4
Referencing	LO1	4
Originality in writing	LO3	4
Clarity	LO3	4
Likelihood for success	LO2	4

Table 4 Progress Record (Logbook) Phase 1 Evaluation Criteria

Progress Record (Logbook) Evaluation Criteria (Phase 1 – 12%)	Learning Outcome	Marks
Organization of the logbook	LO3	4
Adequacy of Content / Information in the logbook	LO3	4
Relevance of Content / Information in the logbook	LO3	4

Table 5 Presentation Phase 1 Evaluation Criteria

Presentation Evaluation Criteria (Phase 1 – 20%)	Learning Outcome	Marks
Content Quality	LO4	4
Organization	LO4	4
Delivery	LO4	4
Visual/Multimedia	LO4	4
Language	LO4	4

Table 6 Dissertation Report Evaluation Criteria

Dissertation Report Criteria (Phase 2 – 36%)	Learning Outcome	Marks
Abstract	LO6	4
Background study	LO6	4
Rationale - Research problem and questions	LO6	4
Critical Review of Literature & Relevance	LO6	4
Results	LO6	4
Limitations	LO6	4
Writing Style	LO6	4
Referencing	LO6	4
Originality in writing	LO7	4

Table 7 Project Development Evaluation Criteria

Project Implementation (Phase 2 – 36%)	Learning Outcome	Marks
Work completed	LO5	4
Use of related computer science / information technology techniques	LO5	4
Methodology and System Design	LO7	4
Implementation results from analysis and finding	LO7	4
Competency in project development	LO5	4
Project implementation	LO5	4
Achievement of project objectives	LO5	4
Testing and Evaluation	LO5	4
Originality of the project	LO5	4

Table 8 Progress Record (Logbook) Phase 2 Evaluation Criteria

Progress Record (Logbook) Evaluation Criteria (Phase 2 – 8%)	Learning Outcome	Marks
Adequacy of Content / Information in the logbook	LO7	4
Relevance of Content / Information in the logbook	LO7	4

Table 9 Presentation Phase 2 Evaluation Criteria

Presentation Evaluation Criteria (Phase 2 – 20%)	Learning Outcome	Marks
Content quality	LO8	4
Organization	LO8	4
Delivery	LO8	4
Language	LO8	4
Product demonstration	LO8	4

III. RUBRIC-BASED ASSESSMENT FOR FYP

The goals of the rubrics' design and implementation are to promote fair assessment among students. In this regard, it would be ideal if students and faculty had a shared understanding of a comprehensive set of grading guidelines. Knowledge of how or what they will be evaluated might improve students' motivation and drive toward a better project outcome [10].

The evaluation criteria used to evaluate FYP performance were described in the previous section. However, the approach used does not specify how each criterion should be evaluated. Despite the fact that the maximum marks have been allocated to each evaluation criteria, the assessment is still subject to the evaluator's personal judgment. This research work presents a rubric to guide the evaluation process.

For each evaluation criteria, a scale was used as a guideline to represent the marks given corresponding to the scope achieved by the students. Intervals were defined based on the maximum scores for the assessment criteria and the depth of research involved. The maximum score for each evaluation criteria was 4 and the depth interval was differentiated into 5 categories. The overview of the project scope is shown in Table 10. Students can

always prepare themselves so that their performance does not deviate from the expectations of each evaluation criteria after all these statements in the project scope are clearly defined. Rubrics are distributed to students so that they can familiarize themselves with the requirements of assessment. It is also a technique for reviewing the accuracy and appropriateness of each statement offered, as well as verifying that students can meet the minimum standards for each assessment criterion.

Furthermore, the rubric acknowledged students for their efforts, by using quantifiers such as some, all, too few, and none. Compared to evaluation criteria, the rubric appears clearer in terms of generating comprehensive and linguistically based criteria, such as the expressions used to evaluate the project objective in Table 11.

The rubrics for FYP Phase 1 were shown in Table 12, Table 13, and Table 14. Table 12 is the rubrics for proposal report, Table 13 is rubrics for Phase 1 progress record, and Table 14 is rubrics for Phase 1 presentation.

The rubrics for FYP Phase 2 were shown in Table 15, Table 16, Table 17, and Table 18. Rubrics for FYP Phase 2 contain the rubrics for dissertation report (Table 15), rubrics for project development (Table 16), rubrics for Phase 2 progress record in logbook (Table 17), and rubrics for Phase 2 presentation (Table 18).

Table 10 Rubrics for Scope of Project

Achievement of project scope		Marks
Exemplary	The scope is addressed beyond expectations	4
Competent	The scope is addressed but not beyond expectations.	3
Needs work	Some of the scope is addressed but may not fit some criteria	2
Unsatisfactory	Very little of the scope is addressed and do not fit the criteria.	1
Student does not attempt	The scope has not been addressed at all	0

Table 11 Rubrics for Project Objectives

Scope Achieved in Project Objective	Marks
The objectives were excellently defined, answered the research questions. At least one of them was at Bloom's Taxonomy level C5 (evaluate) C6 (create). Measurable and achievable goals are set.	Exemplary (4)
The objectives were clearly defined and answered the research questions. At least one of the objectives is at the C5 (evaluate) or C6 (create) level of Bloom Taxonomy. The objectives do not meet one of the criteria: measurable and achievable.	Competent (3)
The objectives were generally defined yet did not answer the research question. None of the goals are at the Bloom Taxonomy level C5 (evaluate) or C6 (create). The objectives do not meet one of the criteria: measurable and achievable.	Needs work (2)
Inadequate, superficial objectives write-up that fails to meet Bloom Taxonomy's C5 (evaluate) or C6 (create) levels. The objectives do not meet any of the criteria: measurable and achievable.	Unsatisfactory (1)
Objectives not stated	Student does not attempt (0)

Table 12 Rubrics for Proposal Report

Evaluation Criteria	Exemplary (4)	Competent (3)	Needs Work (2)	Unsatisfactory (1)	Student Does Not Attempt (0)
Proposal title	The title/topic is current, relevant or important to computer science.	The title/topic is current and appropriate to the computer science.	The title/topic may not be current but focuses on issues appropriate to the computer science.	The title/topic is not current but somewhat related to the issues in computer science.	The title/topic is not related to computer science.
Introduction & background of research	Exceptionally logical, comprehensive, and coherent description of the project's background	Highly logical, comprehensive, and coherent description of the project's background	Describes the project's background but may be unclear and/or incomplete in places	Inadequate description of the project's structure and organization, with lack of logic, completeness and/or coherence.	Introduction & background of project not stated
Research problem	Identifies and defines the research problem with an excellent degree of accuracy, clarity and concision	Identifies and defines the research problem with a high degree of accuracy, clarity and concision	Identifies the research problem, but with some omissions or lack of clarity	Insufficient accuracy, clarity and concision in identifying the research problem	Research problem not stated
Research questions	Exceptionally appropriate, clear and concise framing of the research questions	Highly appropriate, clear and concise framing of the research questions	Rudimentary formulation of research questions; attempt at formulation of question/s; may lack clarity and/or concision	Inadequate, with lack of clarity and concision	Research questions not stated
Project objectives	The objectives were excellently defined, answered the research questions. At least one of them was at Bloom's Taxonomy level C5 (evaluate) C6 (create). Measurable and achievable goals are set.	The objectives were clearly defined and answered the research questions. At least one of the objectives is at the C5 (evaluate) or C6 (create) level of Bloom Taxonomy. The objectives do not meet one of the	The objectives were generally defined yet did not answer the research question. None of the goals are at the Bloom Taxonomy level C5 (evaluate) or C6 (create). The objectives do not meet one of the criteria: measurable and achievable.	Inadequate, superficial objectives write-up that fails to meet Bloom Taxonomy's C5 (evaluate) or C6 (create) levels. The objectives do not meet any of the criteria: measurable and achievable.	Objectives not stated

		criteria: measurable and achievable.			
Scope	The stated scope of the project meets the expectations of the bachelor's degree program and relates to the discipline of computer science. The project implemented according to the scope.	The stated scope of the project meets the expectations of the bachelor's degree program and relates to the discipline of computer science. But some aspect in the project did not follow the scope.	The scope of the project stated does not meet the expectations of the bachelor's degree program or is not related to the discipline of computer science. The project implementation is according to the scope.	The scope of the project stated does not meet the expectations of the bachelor's degree program or is not related to the discipline of computer science. The project implementation is not according to the scope.	Scope is not stated
Literature Review	Outstanding synthesis of information from relevant peer-reviewed primary research articles. Provides an outstanding critical analysis and review of what is known about the topic, including evidence. Gaps arising from the studies are clearly identified and are now.	Excellent synthesis of information from relevant peer-reviewed primary research articles. Provides an excellent critical analysis and review of what is known about the topic, including evidence. Gaps arising from the studies are clearly identified.	Primary research articles were summarized, but only adequately, or not all are directly relevant to the specific topic. Provides an adequate indication about what is known about the topic, but is primarily descriptive. Gaps arising from the studies need to be suggested.	Primary research articles were used. Articles may not be directly relevant to the specific topic, or the topic may not be focused enough. Summary is barely adequate; difficult to understand what is known about the topic.	Literature review is missing
Methodology and System Design	Excellent methodology for addressing the identified research problem and supporting the project	Very good methodology for addressing the identified research problem and supporting the project	Methodology goes some way towards addressing the identified research problem and supporting the project	Selected methodology does not satisfactorily address the identified research problem and/or support the project	Methodology is missing
Analysis and finding	Exceptional analysis and finding demonstrating an excellent grasp of logic, critical thinking, and engagement with sources	Highly effective analysis and finding demonstrating a strong grasp of logical, critical thinking and engagement with sources	Rudimentary analysis and finding with some deficiencies of logic; passable demonstration of critical thinking; some engagement with sources	Inadequate and/or illogical analysis and finding with little or no demonstration of critical thinking and/or engagement with sources	Analysis and finding is missing
Conclusion and Suggestion	Exceptionally clear conclusion and suggestion which enabled the Examiner to easily understand the work	Highly clear conclusion and suggestion which enabled the Examiner to easily understand the work	Satisfactory conclusion and suggestion though with deficiencies that sometimes obscured the work's meaning.	Inadequate explanation of the matter, with lack of clarity and concision.	Conclusion and Suggestion are missing
Gantt chart	Exceptionally thoughtful and realistic timeline; incorporates all necessary tasks for project completion	Highly thoughtful and realistic timeline; incorporates almost all necessary tasks for project completion	Rudimentary timeline; incorporates some necessary tasks for project completion but with less detail and/or unrealistic timeframes	Inadequately developed timeline that does not reflect the necessary tasks or timelines for their completion	Gantt chart is missing
Planning of project work	Complete and well-analyzed task list. Detailed well-around plan of future work. Reasonable timing and task allocation.	Well-defined task list. Good plan of future work. Practical timing and task allocation.	Satisfactory task list. Reasonable plan of future work. Reasonable timing and task allocation.	A possibly incomplete task list without priority. Plan of future work but not well justified. Time and task allocation is not well thought.	No clear task lists. Future work is not well considered. No time and task allocation.
Sources	Exceptional identification of a wide range of appropriate and	Very good identification of a range of appropriate and	Identifies some generally appropriate and	Poor identification of sources	Sources is missing

	authoritative sources	authoritative sources	authoritative sources		
Referencing	Excellent compliance with the proper format (APA/IEEE) bibliography	Very good compliance with the proper format (APA/IEEE) bibliography	Satisfactory compliance with the proper format (APA/IEEE) bibliography	Insufficient compliance with the proper format (APA/IEEE) bibliography	Referencing is missing
Originality in writing	The dissertation report is 100% original (according to any plagiarism detection tool)	The dissertation report is more than 80% original (according to any plagiarism detection tool)	The dissertation report is more than 40% original (according to any plagiarism detection tool)	The dissertation report is more than 20% original (according to any plagiarism detection tool)	The entire dissertation report is plagiarism
Clarity	The argument is logical, coherent with a good balance and relevant to the issues raised. Critical thinking based on evidence, analysis, synthesis and conclusions are clear. Paragraphs are well developed.	The argument is skewed either towards system description or ethical issues. There is evidence of two critical thinking skills - analysis, synthesis or conclusions. Paragraphs are sufficiently developed.	Description and issues are vague or not covered. There is some evidence of critical thinking skills. Paragraphs are not developed. Arguments are not based on analytical essay format.	Incoherent and lacking in structure. Opinions are personal and not based on evidence. Lack of overall clarity.	No clarity in proposal
Likelihood for success	Project has every reasonable expectation of being completed.	High likelihood of success	Moderate likelihood of success	Likelihood of success	The project as designed has little chance of being successful.

Table 13 Rubrics for Progress Record (Logbook)

Evaluation Criteria	Exemplary (4)	Competent (3)	Needs Work (2)	Unsatisfactory (1)	Student Does Not Attempt (0)
Organization of the logbook	Well-organized. All required information is recorded.	Better organized. Most information is included but still some is missing.	Moderately organized. Some information is included	Badly organized. Required information is missing.	No progress record in logbook
Content/Information adequacy in the logbook	The information/content is excellently detailed, offering a comprehensive look at the project.	A sufficient information is provided to offer a comprehensive review of the project.	Some information is used to explain the activities logged/observed.	There are a lot of details missing to prove that activities were logged and observed.	No progress record in logbook
Relevance of Content/Information in the logbook	The reference/attachment/data is extremely appropriate and relevant.	The reference/attachment/data is highly appropriate and relevant.	The reference/attachment/data is quite appropriate and relevant.	The reference/attachment/data might not be appropriate or not relevant.	No progress record in logbook

Table 14 Rubrics for Presentation (Phase 1)

Evaluation Criteria	Exemplary (4)	Competent (3)	Needs Work (2)	Unsatisfactory (1)	Student Does Not Attempt (0)
Content quality	The presenter uses details, examples, and different forms of proof to give information that is appropriate. The presenter adds explanations when needed and allude to the audience's experience in order to tailor content to the audience.	The presenter delivers sufficient substance with a focus on relevant content. The presenters utilise words, concepts, and arguments that are acceptable for the general audience's knowledge and experience, and the content is generally customised to the audience and the occasion.	Some key information may be missing, and the presenter may provide irrelevant information or go off subject. The presenter does a fair job of adapting to the audience and utilizing words, concepts, and arguments that might not really suit the audience's knowledge and experience.	The presenter does not deliver sufficient substance to match the task's requirements. The presenter utilises words, concepts, and arguments that are improper for the audience's knowledge and experiences, and content is inadequately fitted to the listener and circumstance. The presenter says hardly anything, concentrate on unimportant information, or are	Student not presenting

				egotistical, ignoring the audience.	
Organization	The presentation covers a complete, accurate description of important outcomes. Excellent timing and smooth transition among different parts. The message is explicitly organized to assist the audience to grasp the sequence and links of concepts.	The presentation covers an accurate description of important outcomes. The presentation runs at desired pace and finishes within the allocated time. The message is organized, and the audience has no difficulties understanding the sequence and links of concepts.	The presentation covers some of the outcomes. The presentation pace is not well planned but finished within the allocated time. The message's arrangement is jumbled up or hops back and forth. Some assumptions concerning the sequencing and interrelation of concepts are required. The message ideas are hard to define.	The presentation is arranged in a confused and unstructured way. Presentation is too short or too long for the allocated time. The message is so disorganized that it is very difficult to understand.	Student not presenting
Delivery	The presenter stresses and enhances the significance of the message by using volume, rate, and articulation. Pronunciation and intonation are highly clear, and volume and pace fluctuate to create emphasis and intrigue. Use direct eye contact and natural hand movements efficiently to keep the audience's attention.	The pace is neither too fast nor too sluggish, and the volume is neither too low nor too loud. Pauses aren't excessively long or placed at inappropriate times, and pronunciation and intonation are excellent. Maintain attention by making direct eye contact on a regular basis.	The volume is too low or too loud, or the pace is too fast or too slow. Pauses may be too long or occur at inappropriate times. It's possible that the pronunciation and intonation aren't obvious. Only a few eye interactions.	The audience may be unable to comprehend the majority of the message because the volume is too low, or the velocity is too rapid. The audience may be unable to grasp the majority of the message due to imprecise pronunciation and tone. Do not make any attempt to look at the audience.	Student not presenting
Visual/Multimedia	The combination of visual and multimedia components with words and ideas elevates communication and persuasion to new heights, well beyond what could achieve on its own. The combination creates synergy and dramatic effects that reach the target audience.	Visual/multimedia components and information work together to produce a powerful message, with visual representations and words reinforcing one another.	Content is accompanied by visual and multimedia components, but there is little evidence of mutual reinforcing. There is a propensity to employ graphics in an ad hoc manner	There is no visual or multimedia assistance, or the visual aspects are employed to undermine the message and interfere with content and idea delivery.	Student not presenting
Language	Fluent in English and confident. The speakers make extremely few grammatical errors and utilize language to accentuate or improve the message's meaning in highly effective ways.	Fair use of the English language. The speakers make very few grammatical errors and talk in a task-appropriate manner. When describing, presenting information and explaining, and persuading, speakers utilize descriptive language, clear and succinct language, and persuasive language. Complex grammatical structure and sophisticated	There are evident faults in the English used. The speakers make several grammatical errors or communicate in a very simple, uninteresting manner. Simple grammatical structure and concrete words describe this communication style.	Poor command of the English language. Most of the message is incomprehensible due to poor grammar and language.	Student not presenting

		vocabulary describe communication style.			
--	--	------------------------------------------	--	--	--

Table 15 Rubrics for Dissertation Report

Evaluation Criteria	Exemplary (4)	Competent (3)	Needs Work (2)	Unsatisfactory (1)	Student Does Not Attempt (0)
Abstract	Excellent describes the topic to literature and purpose of work. State the method used to support project. Provides explanation of what was expected, discovered, accomplished, collected and produced	Highly describes the topic to literature and purpose of work. State the method used to support project. Provides explanation of what was expected, discovered, accomplished, collected and produced	Describes the topic to literature and purpose of work but maybe unclear. Method used to support project is unclear. Attempts to present findings but might be unclear; or some information missing	Topic is unclear, doesn't connect to literature. Method used to support project is unclear. Unclear findings or misinterpretation of results.	Abstract is missing
Background study	Background information is provided and organized in such a way that the study can be placed in its proper context	Background information is provided but only minimally establishes a context for the study	Adequate background material is supplied but the study's context is not established	Not enough information was provided; not enough basis for judgment.	Information not provided; no basis for judgment.
Rationale - Research problem and questions	Identifies and defines the research problem with an excellent degree of accuracy, clarity and concision. Exceptionally appropriate, clear and concise framing of the research questions	Identifies and defines the research problem with a high degree of accuracy, clarity and concision. Highly appropriate, clear and concise framing of the research questions	Identifies the research problem, but with some omissions or lack of clarity. Rudimentary formulation of research questions; attempt at formulation of question/s; may lack clarity and/or concision	Insufficient accuracy, clarity and concision in identifying the research problem. Inadequate, with lack of clarity and concision	Research problem not stated. Research questions not stated
Critical Review of Literature & Relevance	Evidence of a thorough understanding and critical examination of the literature related to the research and improvement plan	Evidence of sound knowledge and critical analysis of the literature relevant to the study and improvement plan	Evidence of adequate understanding and a limited critical study of the relevant literature in relation to a improvement plan, but with gaps and omissions	With a very restricted selection of relevant materials and no critical remark, there is no persuasive evidence of a comprehension of the literature. There is no link between the literature and the suggested development plan.	Literature review is missing
Results	The results are presented in a clear and comprehensive manner that adheres to the recommended study analysis methodologies.	The results are presented in a way that is consistent with the methodologies of research analysis that have been proposed.	The given results are somewhat consistent with the proposed study analysis methodologies.	The provided results do not adhere to the suggested study analysis methodologies.	No results stated.
Limitations	Discusses the limitations of the project and how these limitations moderate conclusions; offers solutions	Discusses the limitations of the project and how these limitations moderate conclusions; does not offer solutions	Some discussion of the limitations of the project and how these limitations moderate conclusions; does not offer solutions	Modest discussion of the limitations of the project and does not offer solutions	No discussion of the limitations of the project
Writing Style	Excellent grammar, punctuation, and spelling; language choice promotes document effectiveness;	Uses good grammar, punctuation, and spelling; language choice is appropriate and	Uses proper grammar, although there are some punctuations and/or spelling	Multiple spelling, punctuation, and/or grammatical problems; language that is unsuitable or unprofessional;	Not enough explanation/writing in every section

	language is appropriate to the document's goal	professional, enhancing the document's efficacy	problems; language choice is adequate.	distracts from the document's substance	
Referencing	Excellent compliance with the proper format (APA/IEEE) bibliography	Very good compliance with the proper format (APA/IEEE) bibliography	Satisfactory compliance with the proper format (APA/IEEE) bibliography	Insufficient compliance with the proper format (APA/IEEE) bibliography	Referencing is missing
Originality in writing	The dissertation report is 100% original (according to any plagiarism detection tool)	The dissertation report is more than 80% original (according to any plagiarism detection tool)	The dissertation report is more than 40% original (according to any plagiarism detection tool)	The dissertation report is more than 20% original (according to any plagiarism detection tool)	The entire dissertation report is plagiarism

Table 16 Rubrics for Project Development

Evaluation Criteria	Exemplary (4)	Competent (3)	Needs Work (2)	Unsatisfactory (1)	Student Does Not Attempt (0)
Work completed	Progress is beyond expectations with respect to plan. Highly detailed discussions on milestones completed.	Progress is highly satisfactory with respect to plan. Detailed discussions on milestones completed.	Progress is mostly satisfactory with respect to plan. Some discussions on milestones completed.	Progress is not satisfactory with respect to plan. No discussions on milestones completed.	Project not completed
Use of related computer science / information technology techniques	Employ appropriate computer science techniques. Clearly demonstrates mastery of several areas of the curriculum and is able to propose innovative solutions to the technical challenges posed by the project.	Employ appropriate computer science techniques acquired to the project at hand. Clearly demonstrate mastery of many areas of the curriculum and is able to successfully complete the proposed project.	Employ little computer science techniques acquired. Make little progress towards addressing the technical challenges of the project. Complete some of the major tasks in the proposed project.	Employ some/little computer science techniques acquired, but not up to expectation (bachelor's degree level). Does not demonstrate requisite command of the material covered in the curriculum. Complete some tasks in the proposed project.	Does not make use of computer science techniques relevant to the project. Unable to finish the proposed project
Methodology and System Design	Excellent use of methodology during project implementation	Very good use of methodology during project implementation	Appropriate use of methodology during project implementation	Very little use of methodology during project implementation	Not using appropriate methodology during project implementation
Implementation results from analysis and finding	Excellent employ analytical results in the project implementation	Highly employ analytical results in the project implementation	Appropriately employ analytical results in the project implementation	Insufficiently employ analytical results in the project implementation	Not using analytical results in the project implementation
Competency in project development	Perform competently and in addition notice improvements that can be made to the design spec. Deliver code of exceptional quality. Plan and execute thorough list of test cases.	Develop project that follows the design spec. Plan and execute list of test cases with expected result specified.	Develop project that follows some of the design spec. Plan and execute some test cases, but not covering all possible scenarios.	Develop project following the very little design spec. Perform minimal testing of own code, concentrating exclusively on the simplest, most obvious cases.	Fail to develop project.
Project implementation	Implement a fully functional working product with several unique/original features. Show that a lot of effort was put into breaking new ground and getting people excited about the application. The demonstration techniques are	Implement a working product that includes all of the desired features. Provide some new information or a new perspective on the application. The demonstration techniques work well for conveying main ideas.	Implement a functional product with some desired functions that aren't supported or aren't working. Simply demonstrates how the application functions. The demonstration only conveys the most important points.	The product is either incomplete or inoperable. Make a shabby job of developing the app. The demonstration failed to pique the audience's interest and/or the information conveyed was unclear.	Project not implemented. No demonstration was done.

	unique and effective in conveying information to the audience.				
Achievement of project objectives	All objectives are excellently achieved.	All objectives are generally achieved.	One objective might not achieve, other are generally achieved.	One or more objectives not achieved.	All objectives not achieved.
Testing and Evaluation	Product were tested/evaluated; reflects the project's need. Evaluation data are collected to support needs. Solution after testing were selected by the use of comparative data.	Product were tested/evaluated; reflects the project's need. Reasoning for the solution after testing is supported by results.	Product were tested/evaluated, but without any focus. Reasoning for the solution after testing is based on opinion only.	Testing/evaluation were done but report did not include results. No reason provided for the selection solution.	No testing/evaluation were done.
Originality of the project	It is an original idea, unique, shows large amount of original thought. Ideas are creative and inventive.	The idea is based on a known product with a twist, shows some original thought. Works shows new ideas and insights	It is a known idea, but project perfectly implemented. Project is not unique, but modified and improved from the existing source with minimum changes	It is a known idea/product with most of its features implemented.	Evidence shows the whole project was plagiarized or was not develop by student

Table 17 Rubrics for Progress Record (Logbook) Phase 2

Evaluation Criteria	Exemplary (4)	Competent (3)	Needs Work (2)	Unsatisfactory (1)	Student Does Not Attempt (0)
Content/Information adequacy in the logbook	The information /content is excellently detailed , offering a comprehensive look at the project.	A sufficient information is provided to offer a comprehensive review of the project.	Some information is used to explain the activities logged/observed.	There are a lot of details missing to prove that activities were logged and observed.	No progress record in logbook
Relevance of Content/ Information in the logbook	The reference/attachment/data is extremely appropriate and relevant.	The reference/attachment/data is highly appropriate and relevant.	The reference/attachment/data is quite appropriate and relevant.	The reference/attachment/data might not appropriate or not relevant.	No progress record in logbook

Table 18 Rubrics for Presentation Phase 2

Evaluation Criteria	Exemplary (4)	Competent (3)	Needs Work (2)	Unsatisfactory (1)	Student Does Not Attempt (0)
Content quality	The presenter uses details, examples, and different forms of proof to give information that is appropriate. The presenter adds explanations when needed and allude to the audience's experience in order to tailor content to the audience.	The presenter delivers sufficient substance with a focus on relevant content. The presenters utilise words, concepts, and arguments that are acceptable for the general audience's knowledge and experience, and the content is generally customised to the audience and the occasion.	Some key information may be missing, and the presenter may provide irrelevant information or go off subject. The presenter does a fair job of adapting to the audience and utilizing words, concepts, and arguments that might not really suit the audience's knowledge and experience.	The presenter does not deliver sufficient substance to match the task's requirements. The presenter utilises words, concepts, and arguments that are improper for the audience's knowledge and experiences, and content is inadequately fitted to the listener and circumstance. The presenter says hardly anything, concentrate on unimportant information, or are egotistical, ignoring the audience.	Student not presenting

Organization	The presentation covers a complete, accurate description of important outcomes. Excellent timing and smooth transition among different parts. The message is explicitly organized to assist the audience to grasp the sequence and links of concepts.	The presentation covers an accurate description of important outcomes. The presentation runs at desired pace and finishes within the allocated time. The message is organized, and the audience has no difficulties understanding the sequence and links of concepts.	The presentation covers some of the outcomes. The presentation pace is not well planned but finished within the allocated time. The message's arrangement is jumbled up or hops back and forth. Some assumptions concerning the sequencing and interrelation of concepts are required. The message ideas are hard to define.	The presentation is arranged in a confused and unstructured way. Presentation is too short or too long for the allocated time. The message is so disorganized that it is very difficult to understand.	Student not presenting
Delivery	The presenter stresses and enhances the significance of the message by using volume, rate, and articulation. Pronunciation and intonation are highly clear, and volume and pace fluctuate to create emphasis and intrigue. Use direct eye contact and natural hand movements efficiently to keep the audience's attention.	The pace is neither too fast nor too sluggish, and the volume is neither too low nor too loud. Pauses aren't excessively long or placed at inappropriate times, and pronunciation and intonation are excellent. Maintain attention by making direct eye contact on a regular basis.	The volume is too low or too loud, or the pace is too fast or too slow. Pauses may be too long or occur at inappropriate times. It's possible that the pronunciation and intonation aren't obvious. Only a few eye interactions.	The audience may be unable to comprehend the majority of the message because the volume is too low, or the velocity is too rapid. The audience may be unable to grasp the majority of the message due to imprecise pronunciation and tone. Do not make any attempt to look at the audience.	Student not presenting
Language	Fluent in English and confident. The speakers make extremely few grammatical errors and utilize language to accentuate or improve the message's meaning in highly effective ways.	Fair use of the English language. The speakers make very few grammatical errors and talk in a task-appropriate manner. When describing, presenting information and explaining, and persuading, speakers utilize descriptive language, clear and succinct language, and persuasive language. Complex grammatical structure and sophisticated vocabulary describe communication style.	There are evident faults in the English used. The speakers make several grammatical errors or communicate in a very simple, uninteresting manner. Simple grammatical structure and concrete words describe this communication style.	Poor command of the English language. Most of the message is incomprehensible due to poor grammar and language.	Student not presenting
Product demonstration	Present a fully functional working product with several unique/original features. Show that a lot of effort was put into breaking new ground and getting people excited about the	Present a working product that includes all of the desired features. Provide some new information or a new perspective on the application. The demonstration techniques work	Present a functional product with some desired functions that aren't supported or aren't working. Simply demonstrates how the application functions. The demonstration only	The product is either incomplete or inoperable. Make a shabby job of developing the app. The demonstration failed to pique the audience's interest and/or the information	No demonstration was done.

	application. The demonstration techniques are unique and effective in conveying information to the audience.	well for conveying main ideas.	conveys the most important points.	conveyed was unclear.	
--	--------------------------------------------------------------------------------------------------------------	--------------------------------	------------------------------------	-----------------------	--

IV. OBSERVATIONS

This study conducted surveys of faculty, and students who had completed their FYP Phase 1 and Phase 2 to determine the efficacy of the FYP rubrics from the perspectives of students and faculty.

A. Survey of Students

Table 19 summarises the results of the survey on the use of the FYP rubric among undergraduate students who have completed PYP Phases 1 and 2. "Disagree" and "Strongly Disagree" were listed in the assessments, however these were not included in the table because no students submitted feedback in this manner. According to the survey findings, the rubric helps students in comprehending the assessment requirements. The rubric motivated students to improve their performance, according to the students. Students are also likely to refer to the rubric while working on future projects.

The survey results show that FYP rubrics are not only an effective tool for assessing student performance in FYP, but it also assists students to understand the evaluation criteria on a project development.

B. Faculty Survey Results

The survey findings on the use of the FYP rubric among faculty members are summarized in

Table 20. Assessments included “Disagree” and “Strongly Disagree”, but these were not included in the table as no respondents provided such feedback. The faculty expressed concern regarding the FYP evaluation in terms of fulfilling ideas and scope. However, faculty found that when their students realized what and how they were being assessed based on the rubric, students’ sense of innovation and work rate improved. The rubric is also likely to be used by faculty to guide students in other projects.

Table 19 Survey Results on FYP Rubrics Among Bachelor’s Students Who Have Completed FYP Phase 1 and Phase 2

Questions	Strongly Agree	Agree	Neutral
This rubric can be a reference for students throughout their FYP.	41%	52%	7%
This rubric will help students understand what is being assessed for their FYP.	30%	63%	7%
This rubric is an effective tool to evaluate student performance in achieving the learning outcome of FYP	26%	59%	15%
The use of this rubric in FYP is the best method to improves the transparency and consistency in the assessment process	26%	56%	19%
The use of this rubric in FYP able to minimizes the risk of inaccurate scoring and bias in performance evaluation	37%	48%	15%
The use of this rubric will help students achieve their project objectives	41%	52%	7%
This rubric assessment gave guidelines on what/how students should focus on their project	44%	48%	7%
I am likely to use this FYP rubric-based assessment as a reference to my future projects / to grade my students	26%	56%	19%

Table 20 Survey Results on FYP Rubrics Among FICT Lecturers

Questions	Strongly Agree	Agree	Neutral
This rubric can be a reference for students throughout their FYP.	50%	50%	0%

This rubric will help students understand what is being assessed for their FYP.	33%	67%	0%
This rubric is an effective tool to evaluate student performance in achieving the learning outcome of FYP	17%	67%	17%
The use of this rubric in FYP is the best method to improves the transparency and consistency in the assessment process	33%	33%	33%
The use of this rubric in FYP able to minimizes the risk of inaccurate scoring and bias in performance evaluation	50%	33%	17%
The use of this rubric will help students achieve their project objectives	17%	50%	33%
This rubric assessment gave guidelines on what/how students should focus on their project	33%	50%	17%
I am likely to use this FYP rubric-based assessment as a reference to my future projects / to grade my students	17%	50%	33%

V. CONCLUSION

The development and implementation of rubrics ensure that students are assessed fairly and efficiently throughout their FYP. Students have also been encouraged to be more focused and motivated in their FYP as a result of using the rubric. It has also assisted supervisors in guiding their students through FYP as students are more aware of what and how they are being assessed. Rubrics also help the assessor in focusing on each evaluation criteria and giving appropriate marks. Rubrics are used to emphasize the FYP evaluation criteria and serve as a guiding pillar to students to obtain not only good results but also FYP learning objectives.

ACKNOWLEDGMENT




The authors would like to acknowledge the support of Faculty of Computer Science and Information Technology, New Era University College, in providing facilities for this research.

REFERENCES

- [1] N. Mohd Sharef, H. Hamdan, N. Che Pa, F. Khalid, A. A. Ariffin, R. Yaakob and L. N. Abdullah, "RUBRICS-BASED EVALUATION FOR FINAL YEAR PROJECT IN COMPUTER SCIENC," *International Conference on Engineering Education 2013*, pp. 231-238, 2013.
- [2] N. Bukhari, J. Jamal, A. Ismail and J. Shamsuddin, "Assessment rubric for research report writing: A tool for," *Malaysian Journal of Learning and Instruction*, vol. 18, no. 2, pp. 1-43, 2021.
- [3] H. L. dos Santos and C. Cechinel, "The final year project supervision in online distance learning: assessing students and faculty perceptions about communication tools," *Behaviour & Information Technology*, vol. 38, no. 1, pp. 65-84, 2018.
- [4] T. R. Razak, M. H. Ismai, S. S. Mohd Fauzi, M. N. Fikri Jamaludin and R. A. JM Gining, "Assessing Student Programming Skills and Area of Interests in the Final Year Project," *International Journal of Computing and Digital Systems*, vol. 10, no. 1, pp. 255-264, 2021.
- [5] A. Lajis, H. Md Nasir and N. A. Aziz, "Proposed Assessment Framework Based on Bloom Taxonomy Cognitive Competency: Introduction to Programming," in *Proceedings of the 2018 7th International Conference on Software and Computer Applications*, 2018.
- [6] E. Gregori-Giralt and J.-L. Menéndez-Varela, "The content aspect of validity in a rubric-based assessment system for course syllabuses," *Studies in Educational Evaluation*, vol. 68, 2021.
- [7] J.-L. Menéndez-Varela and E. Gregori-Giralt, "The reliability and sources of error of using rubrics-based assessment for student projects," *Assessment & Evaluation in Higher Education*, 2017.
- [8] M. Bearman, "Can a rubric do more than be transparent? Invitation as a new metaphor for assessment criteria," *Studies*

- in Higher Education*, vol. 46, no. 2, pp. 359-368, 2021.
- [9] J. C. G. de Sande, M. Eckert, J. Gutiérrez-Arriola, F. Pescador, P. García-del-Pino, N. Sáenz-Lechón and R. Fraile, "Competence Assessment of Final Year Projects for Undergraduate Telecommunication Students," in *4th International Conference of Education, Research and Innovation*, Madrid, 2011.
- [10] F. Tio, J. Kong, R. Lim and E. Teo, "Developing and applying rubrics for comprehensive capstone project assessment," in *10th International CDIO Conference*, Barcelona, Spain, 2014.

AUTHOR'S INFORMATION

<p>First Author: Chng Chern Wei</p> 	<p>Faculty of Computer Science and Information Technology, New Era University College, Blok B&C Lot 5 Seksyen 10 Jalan Bukit Taman Bukit Mewah, Kajang, 43000, Malaysia</p> <p>E-mail: chernwei.chng@newera.edu.my</p>
<p>Second Author: Widura Abd Kadir</p> 	<p>Faculty of Computer Science and Information Technology, New Era University College, Blok B&C Lot 5 Seksyen 10 Jalan Bukit Taman Bukit Mewah, Kajang, 43000, Malaysia</p> <p>E-mail: widura@newera.edu.my</p>
<p>Third Author: Siew Woei Shen</p> 	<p>Faculty of Computer Science and Information Technology, New Era University College, Blok B&C Lot 5 Seksyen 10 Jalan Bukit Taman Bukit Mewah, Kajang, 43000, Malaysia</p> <p>E-mail: WOEISHEN.SIEW@newera.edu.my</p>