STUDENT PERCEPTION OF LEARNING VERSUS PERFORMANCE IN PROJECT MANAGEMENT EDUCATION

PERCEPCIÓN ESTUDIANTIL DEL APRENDIZAJE VERSUS EL DESEMPEÑO EN LA EDUCACIÓN EN GESTIÓN DE PROYECTOS

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ABSTRACT

This study investigates student perception of learning versus student performance in a project management undergraduate course. Student perception of project management learning is examined using a retrospective survey of 147 students from two academic years. The students' performance is measured by their final grade. Data are analysed using Wilcoxon signed rank and Chi-square tests. The results show students reported increased perceived knowledge of all project management process groups, where the lowest and highest mean increases were Executing and Initiating respectively. The results, however, show there were no significant relationships between students' perception of learning and student performance. The students' perception results, however, can inform teaching strategies regarding where emphasis maybe needed in the process groups with the lowest perceived mean scores.

RESUMEN

Este estudio investiga la percepción de los estudiantes sobre el aprendizaje versus el desempeño, en un curso de pregrado en gestión de proyectos. La percepción de los estudiantes sobre el aprendizaje de la gestión de proyectos se examina mediante una encuesta retrospectiva de 147 estudiantes de dos años académicos. El rendimiento de los alumnos se mide por su nota final. Los datos se analizan utilizando el rango Wilcoxon y las prueba Chi-cuadrado. Los resultados muestran que los estudiantes informaron un mayor conocimiento percibido de todos los grupos de procesos de gestión de proyectos, donde los aumentos medios más bajos y más altos fueron Ejecución e Iniciación, respectivamente. Los resultados, sin embargo, muestran que no hubo relaciones significativas entre la percepción de los estudiantes sobre el aprendizaje y el desempeño. Los resultados de la percepción de los estudiantes pueden indicar estrategias de enseñanza con respecto dónde puede ser necesario enfatizar en los grupos de procesos con las puntuaciones medias percibidas más bajas.

PALABRAS CLAVE

gestión de proyectos; enseñando y aprendiendo; proyectos grupales integradores; percepción del estudiante sobre el aprendizaje

INTRODUCTION

What really works in terms of teaching project management? Oijako, et al. (2011) and Wearne (2008) are but a few researchers who have sought to contribute to answering this question, which, no doubt, arises due to the complexity of project management itself. The uniqueness of each project requires elements from project management knowledge bodies, competencies, and methodologies (Hemming, 2012), which are expected to be developed via formal education that may lead to the award of degree or certification, or via on-the-job formalised training or informal training (Ashleigh, et al., 2012). The formal teaching of project management, however, has unfortunately been found lacking, where it has been criticised as not meeting the needs of industry (Khodeir, 2018). This gap between academia and practice highlights concerns surrounding both the content and delivery in teaching project management, where research has shown that there are multiple teaching approaches used in universities and colleges (Nijhuis, 2017).

The objective of this paper is to investigate student perception of learning of project management, where the teaching strategy involves taught sessions and group projects to supplement direct teaching of project management concepts. Group projects feature heavily in the teaching of project management, as group work on actual projects has been said to lead to effective learning from engaging in project activities (Divjak & Kukec, 2008). The paper presents empirical findings from an undergraduate project management course taught in a Department of Management Studies at a Caribbean university. The paper firstly examines student self-reporting of the perception of their learning with respect to the five project management process groups, and secondly, the paper examines the

relationship between the student perception of their project management knowledge and their final performance in the project management course.

The paper proceeds as follows. Section 2 presents literature on teaching of project management and the use of group projects in the teaching of project management. Section 3 presents the research approach used in the study. Section 4 presents the results and lastly, Section 5 discusses the findings and concludes the paper.

TEACHING PROJECT MANAGEMENT

The teaching of project management in higher education institutions has expanded because of the growing demands from industry for graduates with the requisite project management knowledge, skills, and competencies. Described as still being a 'young discipline' (Turner, Anbari, & Bredillet, 2013), project management has evolved through different schools of thought, with its foundations set in Operations Research. From its beginnings in Operations Research, the discipline has progressed to incorporate theories and practices from other management areas of study, including corporate strategy, leadership, and organisational behaviour (Bredillet, 2008).

The evolution of the project management discipline has seen the growth of a number of professional certification bodies, including the popular Project Management Institute (PMI) and The International Project Management Association (IPMA), along with several other smaller bodies, such as the Association for Project Management (APM), American Academy of Project Management (AAPM), and the Australian Institute of Project Management (AIPM).

These professional bodies have provided much of the structure and approaches used in the teaching of project management in colleges and universities. For example, PMI has developed its Project Management Body of Knowledge (PMBoK) Guide, which details 'the standard for managing most projects' (p.18) (Project Management Institute, 2013). Key elements of the PMBoK include the five project management process groups: initiating, planning, executing, monitoring and control, and closing; and ten project management knowledge areas: integration, scope, time, cost, quality, human resource, communications, risk, procurement, and stakeholder (Project Management Institute, 2013).

Past research has shown that there is a strong teaching emphasis on the so-called 'hard' project management knowledge areas of time, cost, and risk, with now growing focus on 'soft' knowledge areas such as human resource and communication (Nguyen, Chih, & García de Soto, 2017). Whilst the motivation for adhering to these knowledge areas is linked to accreditation, there is often the criticism that the focus on prescriptive tools and methods, as well as the use of a 'linear approach' to train project management students, fail in preparing them to deal with the complexities of real-world projects (Hemming, 2012; Thomas & Mengel, 2008). Likewise, Oijako, Ashleigh, Chipulu, & Maguire (2011) outlined the challenges of student engagement and acquisition of transferable skills in project management education. Research also reported on students dissatisfaction with respect to the time allocated for theory versus project management practice (González-Marcos, Alba-Elías, Navaridas-Nalda, & Ordieres-Meré, 2016). To treat with such deficiencies, researchers such as

Robbins (2019) designed teaching strategies to integrate several project management concepts and skills into exercises to give students practical project management experience.

Related to the issue of 'what' is taught, is the question of 'how' the knowledge areas and project management process groups are taught. The delivery of these knowledge areas and process groups has utilised a variety of methods, including direct teaching approaches, as well as the use of case studies, gamification, instructional units and group projects (Khodeir, 2018; Gonçalves, et al., 2018). This paper focuses on a course which uses group projects in teaching project management, as the group project presents opportunities for practical application. The practical side of project management has been identified as vital, where project management is viewed as a discipline that needs to be 'close to practice' (Nguyen, Chih, & García de Soto, 2017).

The role of group projects in teaching and learning has a long-established history, where these projects are said to not only supplement teaching in terms of course content, but also these projects provide students with practical experience in the subject area and opportunities for developing additional soft skills in terms of managing group dynamics (Raymundo, 2020). In terms of the former, researchers such as Fearon, et al. (2012) point to the benefits of students engaging in experiential learning, problem-solving and active learning, while in terms of the latter, researchers such as González-Marcos, et al. (2016) highlight that group projects allow for students to learn to work in terms, and to communicate, collaborate, manage conflict, and negotiate more effectively.

Types of Group Projects Used in Teaching Project Management

Different approaches have been used towards the classification of projects. At the broad organisational level, projects have been classified in three categories: compliance, operational and strategic (Yim, Castaneda, Doolen, Tumer, & Malak, 2015). Youker (2017) took a more detailed approach in the identification of nine types of projects: Administrative, Construction, Computer Software, Design, Equipment or System Installation, Event, Maintenance, New Product Development, and Research; and further, Youker (2017) specified nine major variables and nine secondary factors to distinguish among projects. In the same vein, Crawford & Pollack (2004) outlined seven dimensions for analysis of the hardness versus softness of projects, as outlined in Table 1.

Table 1. Dimensions for Analysing the Hard and Soft Aspects of Projects (after Crawford & Pollack, 2004)

Dimension	Description
Goal/objective clarity	Clarity with respect to the definition of the project goals and objectives
Goal/objective tangibility	Degree of tangibility or measurability of the project goals and objectives
Success measures	Quantitative and qualitative metrics used to evaluate project success
Project permeability	Level of external risk that could impact the project
Number of solution options	Type of methods used to manage project work
Degree of participation and practitioner role	Team members roles employed to manage the project
Stakeholder expectations	Stakeholders' considerations regarding the way in which the project is being managed

Group projects used in teaching project management face the typical resource constraints that exist in real-world projects. However, these constraints are more acutely obvious as the group projects are designed for students to apply the skills and knowledge that are being acquired during the semester or teaching term. Issues such as scale, complexity and resource requirements must be carefully considered in designing these group projects.

With these considerations, group projects used in teaching project management span short simulations or activities that could be completed in one class session or workshop setting, such as the simulation-based training described in Zwikael, et al. (2015), to integrative projects that can extend throughout a semester, such as the project plan outlined in Pinto (2016).

RESEARCH APPROACH

The research was conducted at the Department of Management Studies in a Caribbean university. The Project Management course is a Level 3 or Final Year undergraduate course, and it is a core course for students pursuing the Bachelor of Science in Management Studies specialisation programme. Further, the course could be read as an elective for other undergraduate students within the department or from other departments within the university. The course is delivered via a Face-to-Face mode, over a 12-week semester. It is assessed via coursework for 50% and a final examination for 50% of the final grade. The coursework comprises three components: two online quizzes, each accounting for 10% and the integrative group project, which accounts for 30% of the student's final grade.

The integrative group project is sub-divided into three parts, as shown in Table 2. Part 1 engages the students in the initiating and planning process groups. The students are introduced to the project by way of the project charter. The course lecturer acts as the project sponsor, who meets with each project team to finalise the project charter, and clarify any issues raised by the team. By the deadline

date, the project teams submit the deliverables for Part 1, and receive feedback from the project sponsor before moving onto Part 2 of the project.

Part 2 of the group project engages the student in the planning and executing process groups. Each project team has to work on a risk management plan, where they identify and analyse the project's risk and propose mitigating strategies for each risk described. Further, each team needs to identify the project activities, estimate the time requirement for completing the activities and identify the critical path on the network diagram. Lastly, the project teams document their meetings via project meeting minutes, where they detail progress made, time spent on project and budget spend on labour and materials, and any issues arising. By the deadline date, the project teams submit the deliverables for Part 2, and receive feedback from the project sponsor before moving onto Part 3 of the project.

Part 3 of the group project engages the students in the monitoring and control and closing process groups. Each project team has to develop an updated GANTT chart, perform Earned Value Management (EVM) analysis, produce a termination report, and deliver the main project output.

The group project is therefore designed for application of the tools and techniques covered in the five project management groups. Additionally, the project requires students to develop a number of soft skills such as teamwork, problem-solving and report writing skills.

Table 2: Structure of Integrative Group Project

	Weighting	Project Management Process Groups	Deliverables
Part 1	5%	Initiating Planning	Finalised Project Charter Work Breakdown Structure Responsibility Assignment Matrix
Part 2	10%	Planning Executing	Risk Management Plan Network Diagram Weekly Minutes
Part 3	15%	Executing Monitoring & Control Closing	Updated GANTT Chart Earned Value Management Termination Report Project Deliverable

This paper reports on the course over two academic years. Participation in the survey was voluntary and confidentiality of the responses was upheld.

Retrospective pre-test-post-test was utilised, whereby students were given a single post-semester survey to indicate the level of their knowledge of the five project management process groups at the start of the semester and at the end of the semester. Retrospective pre-test-post-test analysis is viewed as an effective analysis tool to evaluate learning, as past research suggests that in the traditional pre-test-post-test design, respondents often underestimate the impact of the intervention (Allen & Nimon, 2007; Long & Carlo, 2013).

The survey, shown in Appendix 1, was administered via the course page on Moodle.

In terms of examining the student reporting of knowledge level of the five project management process groups, the following hypothesis is tested:

Hypothesis 1: There is no student self-reported difference between the start of semester knowledge level and the end of semester knowledge level of the project management process groups.

In terms of investigating the relationship between student reporting of knowledge level and the student overall performance, the following hypothesis is tested:

Hypothesis 2: There is no relationship between the student self-reported overall project management knowledge and the student overall course performance.

The results are presented via descriptive statistics of summary table of the student self-reported perception scores (Table 3) and percentage distribution of final grades of the students' performance in the project management course (Figures 1 and 2). Data analysis was done using inferential tests: Wilcoxon signed rank test and the Chi-square test using PSPP software (Version 1.4.1).

RESULTS

In Year 1, there were 83 students, comprising 52 female students and 31 male students. In Year 2, there were 64 students, comprising 51 female students and 13 male students.

Table 3 gives the frequencies and percentage distributions of the student self-reported project management knowledge at the start of the semester and at the end of the semester.

Table 3: Percentage Distribution of Student Rating of Project Management Process Groups Knowledge

PART 1

		YEAR 1: Student Rating of Knowledge				
		1	**2**	**3**	**4**	**5**
Initiating	Start	25 (30.1%)	**30 (36.1%)**	27 (32.5%)	1 (1.2%)	0 (0%)
	End	0 (0%)	2 (2.4%)	19 (22.9%)	**51 (61.4%)**	11 (13.3%)
Planning	Start	21 (25.3%)	**37 (44.6%)**	24 (28.9%)	1 (1.2%)	0 (0%)
	End	0 (0%)	3 (3.6%)	16 (19.3%)	**52 (62.7%)**	12 (14.5%)
Executing	Start	18 (21.7%)	**40 (48.2%)**	20 (24.1%)	5 (6.0%)	0 (0%)
	End	0 (0%)	1 (1.2%)	19 (22.9%)	**51 (61.4%)**	12 (14.5%)

Monitoring and Controlling	Start	25 (30.1%)	**37 (44.6%)**	20 (24.1%)	1 (1.2%)	0 (0%)
	End	1 (1.2%)	1 (1.2%)	24 (28.9%)	**43 (51.8%)**	14 (16.9%)
Closing	Start	**32 (38.6%)**	32 (38.6%)	16 (19.3%)	3 (3.6%)	0 (0%)
	End	0 (0%)	4 (4.8%)	19 (22.9%)	**46 (55.4%)**	14 (16.9%)

PART 2

		YEAR 2: Student Rating of Knowledge				
		1	**2**	**3**	**4**	**5**
Initiating	Start	21 (32.8%)	**32 (50%)**	9 (14.1%)	1 (1.6%)	1 (1.6%)
	End	0 (0%)	1 (1.6%)	20 (31.3%)	**37 (57.8%)**	6 (9.4%)
Planning	Start	15 (23.4%)	**29 (45.3%)**	16 (25%)	2 (3.1%)	2 (3.1%)
	End	0 (0%)	0 (0%)	17 (26.6%)	**33 (51.6%)**	14 (21.9%)
Executing	Start	14 (21.9%)	**32 (50%)**	15 (23.4%)	2 (3.1%)	1 (1.6%)
	End	0 (0%)	2 (3.1%)	18 (28.1%)	**31 (48.4%)**	13 (20.3%)
Monitoring and Controlling	Start	22 (34.4%)	**25 (39.1%)**	13 (20.3%)	2 (3.1%)	2 (3.1%)
	End	0 (0%)	1 (1.6%)	24 (37.5%)	**29 (45.3%)**	10 (15.6%)
Closing	Start	**25 (39.1%)**	23 (35.9%)	11 (17.2%)	3 (4.7%)	2 (3.1%)
	End	1 (1.6%)	5 (7.8%)	19 (29.7%)	**34 (53.1%)**	5 (7.8%)

For both Year 1 and Year 2, the mode for student self-reported knowledge at the start of the semester of Initiating, Planning, Executing, and Monitoring and Control project management process groups was 2, while the mode for the Closing process group was 1. For both Year 1 and Year 2, the mode for student self-reported knowledge at the end of the semester of Initiating, Planning, Executing, Monitoring and Control, and Closing project management process groups was 4.

Further, Table 4 summarises the descriptive statistics of mean and standard deviation of the responses for the student perception of their knowledge levels.

Table 4: Student Perception of Knowledge – Mean and Standard Deviation

Project Management Process Group		Year 1 N=83		Year 2 N=64		Combined Years N=147	
		Mean	Std Dev.	Mean	Std Dev.	Mean	Std Dev.
Initiating	Start	2.05	0.82	1.89	0.82	1.98	0.82
	End	3.86	0.67	3.75	0.64	3.81	0.66
	Difference End–Start	*1.81*		*1.86*		*1.83*	
Planning	Start	2.06	0.77	2.17	0.94	2.11	0.85
	End	3.88	0.69	3.95	0.70	3.91	0.69
	Difference End–Start	*1.82*		*1.78*		*1.80*	
Executing	Start	2.14	0.83	2.13	0.85	2.14	0.83
	End	3.89	0.64	3.86	0.77	3.88	0.70
	Difference End–Start	*1.75*		*1.73*		*1.74*	
Monitoring & Control	Start	1.96	0.77	2.02	0.98	1.99	0.87
	End	3.82	0.77	3.75	0.73	3.79	0.75
	Difference End–Start	*1.86*		*1.73*		*1.80*	
Closing	Start	1.88	0.85	1.97	1.02	1.92	0.93
	End	3.84	0.76	3.58	0.81	3.73	0.79
	Difference End–Start	*1.96*		*1.61*		*1.81*	

The Wilcoxon Signed-Rank Test indicated that the student reporting of knowledge at the end of the semester was statistically significantly higher than the student reporting of knowledge at the start of the semester for all five process management process groups for both Year 1 and Year 2, as showed in Table 5:

Table 5: Results of the Wilcoxon Signed-Rank Test for the Student Reporting of Project Management Knowledge at Start and End of Semester

	Z	Asymp.Sig. (2-tailed)
Year 1: Initiating	-7.86	0.000
Year 1: Planning	-7.76	0.000
Year 1: Executing	-7.58	0.000
Year 1: Monitoring & Control	-7.80	0.000
Year 1: Closing	-7.83	0.000
Year 2: Initiating	-6.86	0.000
Year 2: Planning	-6.77	0.000
Year 2: Executing	-6.70	0.000
Year 2: Monitoring & Control	-6.59	0.000
Year 2: Closing	-5.72	0.000

With respect to the student overall course performance, Figure 1 and Figure 2 show the percentage distribution, grouped by the grading scheme used by the university:

Figure 1. Year 1: Percentage Distribution of Student Overall Course Performance in the Project Management Course
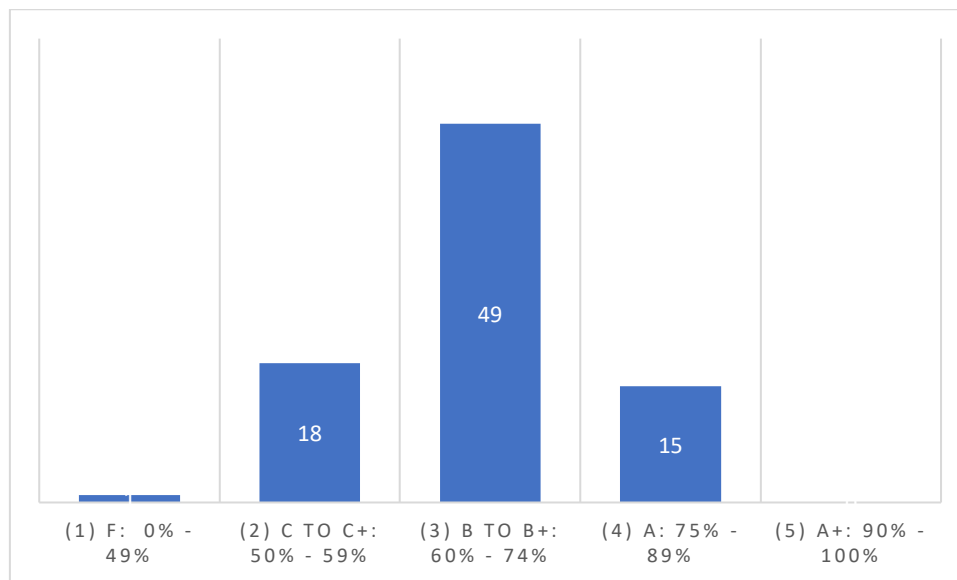

Figure 2. Year 2: Percentage Distribution of Student Overall Course Performance in the Project Management Course
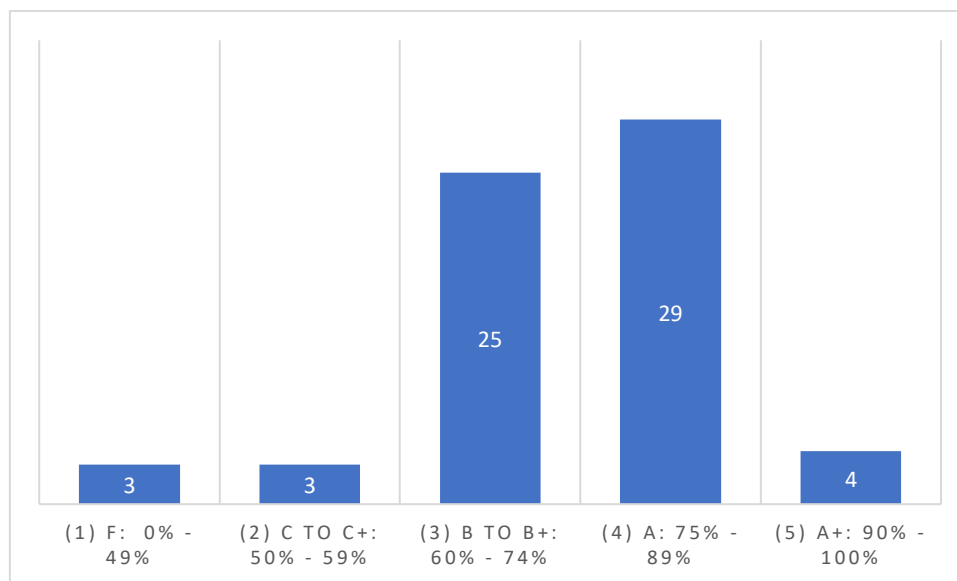

Table 6 gives the results of the relationship between the students' rating of their overall project management knowledge and their overall performance in the project management course. It shows that there is not a significant relationship in either Year 1 or Year 2, where the p-values are greater than 0.05 level.

Table 6. Chi-square Results Showing Relationship Between Students' Rating of the Overall Project Management Knowledge and their Overall Performance in Course.

	Pearson Chi-Square	p-value
YEAR 1 Overall Rating Overall Performance	7.60	0.816
YEAR 2 Overall Rating Overall Performance	14.54	0.559

DISCUSSION AND CONCLUSION

Regarding Hypothesis 1, we examined the students' self-reporting of the perception of their knowledge of the project management process groups at the start and at the end of the semester. Based on the Wilcoxon results, the null hypothesis was rejected. The pre-semester rankings show that the students' perception of their knowledge of the planning and executing process groups were the highest of the five groups. This result may be a reflection of the students' prior exposure to project management tools, such as network diagrams and PERT and as well as activities such as cost estimation and budgeting, which are topics covered in other management courses, such as Quantitative Methods and Financial Accounting. On the other extreme, the pre-semester rankings show that the students' perception of their knowledge of initiating and closing were the lowest of the five process groups. This result is likely a reflection of the students being unfamiliar with project management areas such as the project charter, the work breakdown structure and the formal need for termination reports.

Correspondingly, the post-semester rankings show that the students' perception of their knowledge of the planning and executing process groups were the highest of the five process groups, again conceivably reflecting the students comfort levels with these two project management process groups. The lowest ranked processes were monitoring and control and closing. Again, the result is not surprising as the monitoring and control process group introduces the student to methods such as milestone analysis, S-curves and earned value management, which are often tools not often covered in other courses.

Regarding Hypothesis 2, we examined the relationship between the students reported overall project management knowledge and the students' overall performance in the course, as measured by their final grade. Based on the Chi-square results, we failed to reject the null hypothesis.

Despite this finding, the results of the retrospective pre-semester-post-semester can assist in teaching strategies for improving students' knowledge and understanding of process management process groups. The results of the two years examined suggest that while students perceived both their pre-semester and post-semester knowledge of the planning and executing process groups as high, the students perceived their pre-semester and post-semester knowledge of process groups such as monitoring and control and closing process groups lower. This result provides teaching implications with respect to timing and emphasis of the direct teaching sessions, as well as the design and assessment of the group

project. In this case, the monitoring and control, and closing process groups, being the last two topics taught in the project management course, must be given sufficient time in the class schedule to ensure that students are able to comprehend the content. Similarly, in the group project, where this knowledge is applied, there should be opportunites for students to receive ample feedback to reinforce their learning.

One of the research limitations is the use of the retrospective pre-test-post-test survey, which is described as a useful but imperfect tool (Allen & Nimon, 2007). As such, whilst this research result must be considered in the context of the usage of the retrospective pre-test post-test survey, it is important to note that students' self reporting of their acquired knowledge at the end of a course may not be reflected in their performance in the course's assessed components. This finding is similar to other research that examined student perception of learning and actual performance such as Persky, et al. (2020), which advocates for the use of objectives measures of actual learning. Future research can therefore utilise more objective measures such as the comparison of pre-test – post-test results from quizzes. Student perception of learning can then be used to triangulate these quiz results. The research is also limited in terms of the specific teaching context with respect to the institution, course lecturer and other study resources and conditions. This study can therefore be done in other universities to see if other contexts will produce different findings.

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APPENDIX 1

Survey Instrument for Student Perception of Learning of Project Management Process Groups

- *At the START of the semester, how would you rate your knowledge level of the project initiating process?*
  (1) Very Low, (2) Low, (3) Medium, (4) High, (5)Very High.
- *At the END of the semester, how would you rate your knowledge level of the project initiating process?*
  (1) Very Low, (2) Low, (3) Medium, (4) High, (5)Very High.

- *At the START of the semester, how would you rate your knowledge level of the project planning process?*
  (1) Very Low, (2) Low, (3) Medium, (4) High, (5)Very High.
- *At the END of the semester, how would you rate your knowledge level of the project planning process?*
  (1) Very Low, (2) Low, (3) Medium, (4) High, (5)Very High.

- *At the START of the semester, how would you rate your knowledge level of the project executing process?*
  (1) Very Low, (2) Low, (3) Medium, (4) High, (5)Very High.
- *At the END of the semester, how would you rate your knowledge level of the project executing process?*
  (1) Very Low, (2) Low, (3) Medium, (4) High, (5)Very High.

- ***At the START of the semester, how would you rate your knowledge level of the project monitoring and control process?***
  (1) Very Low, (2) Low, (3) Medium, (4) High, (5)Very High.
- ***At the END of the semester, how would you rate your knowledge level of the project monitoring and control process?***
  (1) Very Low, (2) Low, (3) Medium, (4) High, (5)Very High.

- ***At the START of the semester, how would you rate your knowledge level of the project closing process?***
  (1) Very Low, (2) Low, (3) Medium, (4) High, (5)Very High.
- ***At the END of the semester, how would you rate your knowledge level of the project closing process?***
  (1) Very Low, (2) Low, (3) Medium, (4) High, (5)Very High.

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