34th Australasian Association for Engineering Education Conference
3 - 6 December 2023 – Gold Coast, QLD

Assessing Learning Outcomes in NZ Mechanical Engineering Programmes under Sydney Accord and the Southern Institute of Technology

Carlo Gabriel[a], Joel Torres[b], Orland Basas[c] and Juvenel Mark Rosario[d]
Southern Institute of Technology[ac], Central Luzon State University[b], Saint Louis University[d]
Corresponding Author Email: Carlo.Gabriel@sit.ac.nz

ABSTRACT

CONTEXT

Learners' critical thinking can be realised through the kinds of learning outcomes, teaching strategies and assessment activities tutors give to learners. Bloom's Taxonomy is a classification system of learning outcomes based on the level of students' understanding necessary for achievement or mastery. In Bloom's Taxonomy, learning outcomes are categorised into cognitive, affective and psychomotor skills. Cognitive skills consist of six levels: knowledge, comprehension, application, analysis, synthesis, and evaluation.

PURPOSE OR GOAL

The present study aims to classify and compare the learning outcomes based on the Revised Bloom's Taxonomy for Teaching, Learning, and Assessment found at Southern Institute of Technology and Sydney Accord syllabi in Theoretical and Practical Mechanical Engineering courses offered in the bachelor and graduate degree levels. It also aims to compare the assessment activities in the course syllabi.

APPROACH OR METHODOLOGY/METHODS

The researchers, assisted by three inter-raters, coded programme learning outcomes from course syllabi. Verbs, categorised by taxonomy level, guided the classification process. In instances where verbs overlapped between Lower and Higher-Order Thinking Skills, context was considered. Learning outcomes were classified using Bloom's Taxonomy and grouped into LOTS (remembering, understanding, applying) and HOTS (analysing, evaluating, creating). A final comparison was conducted between learning outcomes and assessment activities.

ACTUAL OR ANTICIPATED OUTCOMES

Results focus on the comprehensive inventory and comparison of programme learning outcomes and assessment activities in mechanical engineering courses between Southern Institute of Technology and Sydney Accord.

CONCLUSIONS/RECOMMENDATIONS/SUMMARY

The analysis of programme learning outcomes and course assessments indicated that engineering programmes have more emphasis on skills related to design, including problem-solving, developing models, and using models. Findings also revealed that Southern Institute of Technology course offerings meet the standards set by the Sydney Accord, as shown in the latter's greater number of LOS, LOs classified as HOTs, and more diverse course assessment activities.

KEYWORDS: course assessment, curriculum mapping, learning outcomes,

Introduction

Compliance with global academic standards and policies is of utmost importance to ensure international accreditation and recognition of the competencies of graduates. As an international agreement between bodies responsible for accrediting engineering technology academic programmes pioneered by the Engineering Council of the UK (ECUK) to complement the Washington Accord, the Sydney Accord (SA henceforth) is committed to developing and recognising good practice in engineering education. Seven founding signatories were signed in June 2001 representing Australia, Canada, Hong Kong, Ireland, New Zealand, the United Kingdom, and South Africa. SA extends the benefits of mutual recognition to engineering technology academic programmes. According to the International Engineering Alliance (2017 as cited in Chan et al., 2020), SA recognises that accreditation of engineering programmes is a key foundation for the practice of engineering technology in each country covered by the Accord. SA's key outcome is that engineering technology programmes approved by any of the SA's signatories would be accredited by the other Accord signatories as the counterpart to their own accredited engineering technology degree and diploma programmes (e.g., BS Engineering degree, Graduate Diploma in Engineering degree).

Higher education institutions within the Accord played a significant role in promoting the international accreditation of engineering education, which has been beneficial to graduates' professional sustainability. As a public tertiary education institute established in 1971, the Southern Institute of Technology (SIT henceforth) is one of New Zealand's largest institutes of technology. SIT is known for the quality of its facilities and equipment. The Institute offers over 200 programmes in a range of academic, technical and professional subjects at postgraduate, graduate, bachelor, diploma, and certificate levels. As part of the SA, SIT ensures that all its programme offerings meet the standards set by the former.

As a medium for quality assessment and ongoing programme quality enhancement, studies on Learning Outcomes (LOs henceforth) at the programme level have been a topic of international interest. Such undertaking requires institutions to define quality standards, resulting in a greater emphasis on both LOs and evidence from Course Assessments (Cas henceforth) to show that students have mastered the expected learning. Monitoring the LOs and CAs may enable institutions to strategise in crafting more robust curricula, improved instruction, and more efficient and effective policies on LOs and CAs that may result in improved teaching and learning.

Despite the bold move to promote the global recognition of engineering education, Zhang et al. (2023) emphasised that the substantial difference in higher engineering systems among member nations results in challenges for international engineering education accreditation attributed primarily to information asymmetry. In addition, there is a gap in the literature as regards the comparison of the LOs as prescribed in the SA and as adopted by educational institutions from the member nations. Hence, the current study aims to classify the LOs in the course syllabi of SIT and SA. It also aims to compare the LOs and assessment activities between SIT and SA.

Methodology

Research Design

To classify and analyse the learning outcomes used in the Theoretical and Practical Engineering course syllabi in SA and Southern Institute of Technology, the current study utilised the qualitative descriptive analytical approach as used in the studies of Abu Humos (2021), Al-Skaf (2017) and Torres et al. (2021). The same design was also followed to compare and contrast the assessment activities.

Data Source and Data Collection Procedure

Course offerings in Theoretical and Practical Engineering subjects with equal distribution of course syllabi from Southern Institute of Technology (n=23) and Sydney Accord (n=23) were used in the

study. The course syllabi for SIT and SA were collected through online databases. Table 1 summarises the course offerings for SIT and SA that served as data sources. Seven of the 23 courses are offered at the Bachelor and Graduate Diploma levels.

Table 1. Summary of Course Offerings at SIT and SA

Southern Institute of Technology (SIT)	**Sydney Accord (SA)**
Communication for Engineers	Engineering Communication
Computer Skills for Engineers	Engineering Computing
Electrical Engineering	Electrical Fundamentals
Energy Use and Management*	Energy Engineering*
Mathematics for Engineers	Engineering Mathematics 1
Mechanics for Engineers	Engineering Mechanics
Engineering Project*	Engineering Development Project*
Ethics, Laws and Professional Conduct*	Professional Engineering Practice*
Mechanics of Fluids (Mechanical)	Fluid Mechanics
Management for Engineers	Engineer Management Principles
Managing Engineering Projects*	Project Management*
Manufacturing Technology	Manufacturing Processes and Production
Materials Fundamentals (Mechanical)	Materials Science
Mechanical Design and Drawing	Engineering Design and Drawing
Dynamics of Machines	Mechanics of Machines
Mechanics of Materials	Strength of Materials 1
Mechanics of Materials 2	Strength of Materials 2
Product Design	Product Design Engineering
Quality Assurance	Quality and Reliability
Assessing and Managing Risk*	Risk Management*
Sustainable Practice*	Sustainable Resource Utilisation*
Thermodynamics 1	Thermodynamics and Heat Transfer
Thermodynamics 2*	Advanced Thermodynamics*

* Offered at Bachelor's and Graduate Diploma levels

Table 2 presents the course title and their corresponding pre-requisites and co-requisites. The table shows that of the 23 course offerings in the Mechanical Engineering courses, 15 courses have pre-requisite and co-requisite courses as stipulated in the SIT course syllabi. Meanwhile, SA has only 13 courses with pre-requisites, which means that SIT has more course offerings with pre-requisites. It could be noted that SA has no pre-requisite courses for Engineering Development Project, while SIT's Engineering Project course has two co-requisites (i.e., Ethics, Laws and Professional Conduct; Managing Engineering Projects). Likewise, SA has no pre-requisite for the course Sustainable Resource Utilisation but SIT has on its counterpart – Sustainable Practice – which is Management for Engineers. In addition, there are courses at SIT that require more pre-requisites compared to their counterparts at SA. These include the course Ethics, Law and Professional Conduct with two pre-requisites (i.e., Communication for Engineers; and Management for Engineers).

The same table also reveals instances where the course offering for both SIT and SA has the same number of pre-requisites; they only differ on the actual course pre-requisite. For instance, the subject Quality Assurance (SIT) and Quality and Reliability (SA) has the same pre-requisite: Mathematics for Engineers (SIT), and Engineering Mathematics (SA). However, the other pre-requisites for the same course are different for SIT and SA, which are Communication for Engineers and Engineering Mechanics, respectively. In the same vein, the course Product Design

(SIT) also has one pre-requisite and one co-requisite, while SA's Product Design Engineering has two pre-requisites (i.e., Engineering Mechanics, Engineering Design and Drawing). Meanwhile, SA has pre-requisite course for Engineering Management Principles, which is Engineering Communication, while SIT's Management for Engineers has no pre-requisite.

Table 2. Course Offerings in SIT and SA and their pre-requisites

Courses	Southern Institute of Technology	Sydney Accord	Remarks
Energy Use and Management* Energy Engineering**	Thermodynamics 2	Advanced Thermodynamics	✓
Engineering Project* Engineering Development Project**	Ethics, Laws and Professional Conduct (Co-requisite) Managing Engineering Projects (Co-requisite)		
Ethics, Laws and Professional Conduct* Professional Engineering Practice**	Communication for Engineers Management for Engineers	Engineering Communication	
Mechanics of Fluids (Mechanical)* Fluid Mechanics**	Mathematics for Engineers Mechanics for Engineers	Engineering Mathematics 1 Engineering Mechanics	✓
Management for Engineers* Engineering Management Principles**		Engineering Communication	
Managing Engineering Projects* Project Management**	Management for Engineers	Engineering Management Principles	✓
Manufacturing Technology* Manufacturing Processes and Production**	Materials Fundamentals	Materials Science	✓
Dynamics of Machines* Mechanics of Machines**	Mathematics for Engineers Mechanics for Engineers	Engineering Mathematics 1 Engineering Mechanics	✓
Mechanics of Materials 1* Strength of Materials 1**	Mechanics for Engineers Materials Fundamentals	Engineering Mechanics Engineering Mathematics 1	
Mechanics of Materials 2* Strength of Materials 2**	Mechanics of Materials 1	Strength of Materials 1	✓
Product Design* Product Design Engineering**	Materials Fundamentals Manufacturing Technology (co-requisite)	Engineering Mechanics Engineering Design and Drawing	
Quality Assurance* Quality and Reliability**	Mathematics for Engineers Communication for Engineers	Engineering Mathematics 1 Engineering Mechanics	
Assessing and Managing Risk* Risk Management**	Management for Engineers	Engineering Management Principles	✓
Sustainable Practice* Sustainable Resource Utilization**	Management for Engineers		
Thermodynamics 1* Thermodynamics and Heat Transfer**	Mathematics for Engineers	Engineering Mathematics 1	✓
Thermodynamics 2* Advanced Thermodynamics**	Thermodynamics 1	Thermodynamics and Heat Transfer	✓

*Southern Institute of Technology

**Sydney Accord

One-hundred ninety-nine (199) learning outcomes were analysed, with 108 and 91 learning outcomes for SIT and SA, respectively. In terms of the verbs in the learning outcomes, 284 (SIT – 150; SA – 134) verbs were analysed and classified based on Bloom's Revised Taxonomy for Teaching, Learning and Assessment. proceedings.

Data Analysis

Using the revised Bloom's Taxonomy for Cognitive Learning, which classifies learning into gradually increasing levels of sophistication, beginning with surface learning skills, such as remembering information, moving to deeper learning skills of knowledge generation, learning outcomes collected from the course syllabi were classified. Similar to what Yamanka and Wu (2014) and Torres et al. (2021) did, the researcher, through the help of three inter-coders, identified the learning outcomes from the course syllabi. Following what Yamanka and Wu (2014) and Torres et al. (2021) observed in instances where more than one learning outcome was specified in a learning outcome statement, each verb or verb phrase was treated and analysed as a distinct learning outcome within a particular learning outcome statement. Each learning outcome (in the form of a verb) was classified by taxonomy level. In instances in which verbs used in a learning outcome appeared in both the LOTS and HOTS (e.g., explains – appeared both in understanding, evaluating and creating; contrasts – appeared both in analysing and evaluating), the context was considered. Table 3 presents the verbs used in Bloom's Taxonomy of Cognitive Learning used in

the study. The same verbs in the revised Bloom's Taxonomy of Cognitive Learning were used in the study of Torres et al. (2021).

Table 3. Verbs in Bloom's Taxonomy of Cognitive Learning

Higher-Order Thinking Skills in Bloom's Taxonomy (HOTS)
(Cognitive)
Creating
(arranges, assembles, builds, collects, categorises, combines, compiles, composes, constitutes, creates, constructs, devises, designs, develops, explains, generates, manages, modifies, organises, plans, performs, proposes, rearranges, reconstructs, relates, reorganises, revises, rewrites, specifies, synthesises, writes)
Evaluating
(appraises, apprises, argues, assesses, compares, concludes, contrasts, convinces, criticises, critiques, decides, defends, describes, determines, discriminates, evaluates, explains, interprets, justifies, measures, ranks, rates, relates, reviews, scores, selects, standardises, summarises, supports, tests, validates)
Analysing
(analyses, arranges, breaks down, categorises, classifies, compares, connects, contrasts, deconstructs, detects, diagrams, deconstructs, differentiates, discriminates, distinguishes, divides, explains, identifies, illustrates, infers, integrates, orders, organises, outlines, relates, selects, separates, structures)
Lower-Order Thinking Skills in Bloom's Taxonomy (LOTS)
(Cognitive)
Applying
(applies, calculates, carries out, classifies, changes, completes, computes, constructs, demonstrates, discovers, dramatises, employs, examines, executes, experiments, generalises, illustrates, implements, infers, interprets, manipulates, modifies, operates organises, outlines, predicts, prepares, produces, relates, shows, solves, uses)
Understanding
(abstracts, arranges, articulates, associates, categorises, clarifies, compares, computes, converts, defends, diagrams, differentiates, discusses, distinguishes, estimates, explains, extends, extrapolates, generalises, gives, illustrates, infers, interprets, interpolates, matches, outlines, paraphrase, predicts, rearranges, reorders, rewrites, summarises, transforms, translates)
Remembering
(cites, defines, describes, identifies, labels, lists, matches, names, outlines, quotes, recalls, recognises, reproduces, retrieves, selects, shows, states, tabulates, tells)

Prior to manually and individually coding the learning outcomes, the raters met and discussed how to code based on the revised Bloom's Taxonomy of Cognitive Learning. This is similar to the inter-coding technique observed by researchers (e.g.,Astrero & Torres, 2020; Torres et al., 2020; Torres et al., 2021; Torres & Flores, 2017; Torres & Medriano, 2020). The three inter-raters are all experts in the field of curriculum evaluation and qualitative research. The first rater holds a Doctor of Philosophy in Curriculum and Instruction and has been in the academe for more than 20 years. The second rater holds a Doctor of Philosophy in Educational Measurement and Evaluation and has published scholarly articles in the field. The last rater holds a Doctor of Philosophy in Applied Linguistics with research publications in the field of qualitative research. The raters begin with their individual coding after the initial discussion on coding the learning outcomes. Cross-tabulation

results for learning outcomes show the following Kappa (κ) values: between Rater 1 and Rater 2 (κ = .893), between Rater 2 and Rater 3 (κ = .91.5), and between Rater 1 and Rater 3 (κ = .90.07). The researcher and inter-raters met virtually after analysing and coding the learning outcomes. They discussed the discrepancies in their coding until they reached a consensus on how to code those items differently coded. Finally, with the help of three raters, the researcher also did a qualitative analysis to compare and contrast the number and types of assessment activities provided in the SIT and SA course syllabi.

Results and Discussion

Learning Outcomes in the SIT and SA course syllabi

LOs provide insight into the content and context of each programme. It refers to the knowledge, skills and abilities a student has mastered for engaging in a specific set of higher education experiences. Table 4 presents the inventory of learning outcomes found in SIT and SA course syllabi. The table also reveals the following information: the number of verbs in the LOs and the number of LOs classified as HOT and LOTS.

As regards the number of LOs, findings reveal that 11 course offerings at SIT have more LOs than SA, while there are only three-course offerings at SA that have more LOs than SIT's course offerings. Of the 23 course offerings, an equal number of LOs was only observed in six-course offerings. These include Communication for Engineers/Engineering Communication, Electrical Engineering/Electrical Fundamentals, Mechanics for Engineers/Engineering Mechanics, Engineering Project/Engineering Development Project, Manufacturing Technology/Manufacturing Processes and Production, Materials Fundamentals/Materials Science, and Assessing and Managing Risk/Risk Management.

Table 4. Learning Outcomes in SIT and SA course syllabi

Courses	SOUTHERN INSTITUTE OF TECHNOLOGY				SYDNEY ACCORD			
	No. of LO	No. of verbs in the LO	HOTS	LOTS	No. of LO	No. of verbs in the LO	HOTS	LOTS
Communication for Engineers* Engineering Communication**	5	8	6	2	5	7	6	1
Computer Skills for Engineers* Engineering Computing**	4	7	4	3	3	4	3	1
Electrical Engineering* Electrical Fundamentals**	3	4	2	2	3	3	-	3
Energy Use and Management* Energy Engineering**	5	7	6	1	4	7	4	3
Mathematics for Engineers* Engineering Mathematics 1**	7	11	2	9	6	11	5	6
Mechanics for Engineers* Engineering Mechanics**	3	3	-	3	3	3	3	-
Engineering Project* Engineering Development Project**	5	7	3	4	5	8	4	4
Ethics, Laws and Professional Conduct* Professional Engineering Practice**	4	7	5	2	5	6	4	2
Mechanics of Fluids (Mechanical)* Fluid Mechanics**	4	4	2	2	5	6	4	2
Management for Engineers*	6	6	3	3	5	8	7	1

Engineering Management Principles**								
Managing Engineering Projects* Project Management**	4	5	5	-	1	6	6	-
Manufacturing Technology* Manufacturing Processes and Production**	5	6	4	2	5	5	1	4
Materials Fundamentals (Mechanical)* Materials Science**	5	7	-	7	5	8	-	8
Mechanical Design and Drawing* Engineering Design and Drawing**	5	6	3	3	3	3	-	3
Dynamics of Machines* Mechanics of Machines**	5	7	2	5	4	6	6	-
Mechanics of Materials 1* Strength of Materials 1**	4	7	3	4	3	3	-	3
Mechanics of Materials 2* Strength of Materials 2**	5	7	4	3	3	4	2	2
Product Design* Product Design Engineering**	4	5	3	2	5	7	4	3
Quality Assurance* Quality and Reliability**	7	9	5	4	3	10	6	4
Assessing and Managing Risk* Risk Management**	3	4	4	-	3	5	1	4
Sustainable Practice* Sustainable Resource Utilization**	4	5	5	-	5	5	4	1
Thermodynamics 1* Thermodynamics and Heat Transfer**	5	10	2	8	3	4	-	4
Thermodynamics 2* Advanced Thermodynamics**	2	8	4	4	4	5	4	-

*Southern Institute of Technology

**Sydney Accord

LO – Learning Outcomes

HOTS – Higher Order Thinking Skills (creating, evaluating, analysing)

LOTS – Lower Order Thinking Skills (applying, understanding, remembering)

In terms of the number of verbs used in the LOs, Table 4 shows 11 course offerings at SIT used more verbs in their LOs, while eight course offerings at SA used more verbs in the LOs. Both SIT and SA have equal number of courses (n=10) that used more HOTS in LOs. Though the number of LOs classified as HOTS has been noted, it was observed that there were no HOTS in the LOs of two course offerings at SIT (i.e., Mechanics for Engineers, Materials Fundamentals). For SA, no LOs coded as HOTS in its six course offerings which include: Electrical Fundamentals, Materials Science, Engineering Design and Drawing, Strength of Materials 1 and 2, and Thermodynamics and Heat Transfer.

For the LOs categorised as LOTS, Table 4 shows there are nine courses at SIT that used more LOTS in the LOs while only six courses at SA used more LOTS in the LOs. It was also noted that there were no LOTS in three SIT courses (i.e., Managing Engineering Projects, Assessing and Managing Risk, Sustainable Practice) and no LOTS in four SA courses (i.e., Mechanics for Engineers, Project Management, Mechanics of Machines, Advanced Thermodynamics). From the foregoing findings, it can be observed that the same course offering (i.e., Managing Engineering Projects/Project Management) at SIT and SA has no LOTS in LOs.

Assessment Activities in SIT and SA

Data in Table 5 reveals that of the 23 course offerings, SIT and SA have different assessment activities in 14 courses. SIT offers more diversified assessment activities in its 13-course offering compared to SA. It was observed that in all the 13 courses in which SIT has more assessment activities which are not seen in their counterpart course offerings at SA, the following activities were added in the respective offerings: initial and final report (i.e., Communication for Engineers), assignment (i.e., Computer Skills for Engineers; Mechanics for Engineers; Management for Engineers, Sustainable Practice), test/examination (i.e., Energy Use and Management; Ethics, Laws and Professional Conduct; Mechanics of Materials 2; Quality Assurance; Thermodynamics 1), laboratory work (i.e., Mathematics for Engineers), project portfolio (i.e., Managing Engineering Projects), and presentation (i.e., Ethics, Laws and Professional Conduct). Meanwhile, the added assessment activities found in SA course syllabi that were not present in the SIT course syllabi are collaborative tutorials (i.e., Engineering Mathematics 1) and examination (i.e., Project Management). It was also noted that there is a course (i.e., Risk Management) in SA in which assessment activities were not clearly defined.

Table 5. Assessment Activities in SIT and SA

Courses	SIT	SA	Remarks
Communication for Engineers* Engineering Communication**	4	3	Separate grading for Initial and Final Report at SIT
Computer Skills for Engineers* Engineering Computing**	4	3	Assignment is an added requirement at SIT
Energy Use and Management* Energy Engineering**	4	3	Test is an added requirement at SIT
Mathematics for Engineers* Engineering Mathematics 1**	4	3	Laboratory is an assessment at SIT Collaborative tutorials is a distinct assessment at SA
Mechanics for Engineers* Engineering Mechanics**	4	3	Assignment is an added assessment at SIT
Ethics, Laws and Professional Conduct* Professional Engineering Practice**	3	2	Presentation and Examination are added assessment activities at SIT
Mechanics of Fluids (Mechanical)* Fluid Mechanics**	4	3	Laboratory is an added assessment at SIT
Management for Engineers* Engineering Management Principles**	4	3	Assignment is an added assessment activity at SIT
Managing Engineering Projects* Project Management**	2	2	Project Portfolio at SIT Examination at SA
Mechanics of Materials 2* Strength of Materials 2**	4	3	Test is an added assessment activity at SIT
Product Design* Product Design Engineering**	2	3	Laboratory is an added assessment activity at SA
Quality Assurance* Quality and Reliability**	3	2	Examination is an added assessment activity at SIT
Assessing and Managing Risk* Risk Management**	3	1	Assessment activities are not defined at SA
Sustainable Practice* Sustainable Resource Utilization**	4	3	Assignment is an added activity at SIT
Thermodynamics 1* Thermodynamics and Heat Transfer**	4	3	Test is an added activity at SIT

The foregoing findings concur with what Torres et al. (2021) found that differences on the kind of assessment activities provided in the prototype course syllabi drafted by an accrediting body (e.g., SA) and in the course syllabi used by an educational institution (e.g., SIT) can be manifestations of tutors' proactiveness and innovativeness driven by learners' diversity and readiness to accomplish tasks.

Conclusion

To meet industry demands, Engineering New Zealand accredits engineering programmes based on Dublin, Sydney, and Washington Accords. This study, using Revised Bloom's Taxonomy, compared learning outcomes (LOs) and course assessments (CAs) in SIT and SA syllabi. Results show SIT offers more LOs and HOTS-classified LOs than SA. Additionally, SIT exhibits greater diversity in CAs. Conclusively, SIT's overall learning experiences meet and, in some aspects, surpass SA standards in terms of LOs, HOTS-classified LOs, and varied CAs.

References

Abu Humos, O. (2021). An evaluative analysis of comprehension questions' level of difficulty: A case of 12th grade Palestinian English student's textbook. *Al-Njah University Journal Research*, *26*(3).

Al-skaf, M.M. (2017). An analytic study of the levels of evaluation questions in English courses in Syrian secondary schools according to Bloom's Taxonomy. *AL-USTATH*, *1*, 25-38.

Astrero, E.T., & Torres, J.M. (2020). Capturing the frames of news story leads in Philippine dailies: A discourse analysis. *Studies in Pragmatics and Discourse Analysis*, *1*(1), 37-46.

Chan, C. Mohd, K. A. S., Hashim, N.H., Ang, P., Yong, T.M., Mustafa, F. & Baba, I. (2020). Bachelor of Civil Engineering Technology: Alignment of Program Educational Objectives with the Learning Outcomes in Accordance With Sydney Accord. *International Journal of Academic Research in Progressive Education and Development*, *9*(1), 100–113.

Torres, J.M., Collantes, L.M., Millan, A.R., Alieto, E.O., Estigoy, E.B., & Barredo, C.P. (2021). Classification of learning outcomes and assessment activities in CHED prototype and SUC syllabi based on Kratwohl's Taxonomy. *Elementary Education Online, 20*(5), 497-510.

Torres, J.M., Collantes, L.M., Astrero, E.T., Millan, A.R., & Gabriel, C.M. (2020). Pandemic humor: Inventory of the humor scripts produced during the COVID-19 outbreak. *The Asian EFL Journal*, *7*(3.1), 138-164.

Torres, J.M. & Medriano, R. (2020). Rhetorical Organization of Ilocano and Tagalog Pre-service teachers in their argumentative essays. *The Asian EFL Journal*, 27(2.2.), 261-286.

Torres, J.M. & Flores, E.R. (2017). Exploring the role of L2 in L1 writing: Clues from English teachers' think aloud protocols. *Philippine Journal of Linguistics*, *48*, 30-50.

Yamanka, A. & Wu, L.Y. (2014). Rethinking trends in instructional objectives: Exploring the alignment of objectives with activities and assessment in higher education – A case study. *International Journal of Instruction*, *7*(2), 75-88.

Zhang, J., Yuan, H., Zhang, D., Li, Y., & Mei, N (2023). International Engineering Education Accreditation for Sustainable Career Development: A Comparative Study of Ship Engineering Curricula between China and UK. *Sustainability, 15*, 11954. https://doi.org/10.3390/ su151511954

Acknowledgements

The authors wish to extend their sincere gratitude to the Southern Institute of Technology Research Committee for their invaluable support and approval of this research endeavour. The assistance and approval provided by the Committee have played a pivotal role in facilitating the successful execution of this research project. Their recognition and endorsement underscore the significance and merit of this research within the academic and institutional context.

Copyright statement