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Pedagogical Sales Emails Writing Framework: From Needs Analysis to Course Development

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ABSTRACT: In order to accomplish the objectives outlined in the Malaysian government's Educational Blueprint 2016 that highlighted the importance of business and entrepreneurship in learning, the curriculum needs to be reorganised and restructured in a strategic manner into specific programmes. In the process of establishing a curriculum for a language, needs analysis plays a significant role in determining the end result that the students should be able to reach. This study explores the needs of a pedagogical sales email framework to assist educators in designing teaching activity and material using suitable vocabulary and content of business courses. (1) Although business courses enrolments continue arising, only a few researches can be found highlighting generic structures and relevant contexts of sales emails writing. (2) Thus, this paper proposes a needs analysis of sales email writing modules for the undergraduates of business courses. The methodology utilised data gathered from semi-structured interviews with industry informants and subject specialists and the data was analysed using thematic analysis. In order to have an extensive understanding of the undergraduates' writing needs, the interview questions were constructed based on Munby's (1978) Communicative Needs Processor (CNP). (3) Three general themes were found from the recorded responses with the interviewees which are; Purposive Domain, Strategies Used in Writing Sales Emails (Instrumentality) and Target Level of Knowledge. (4) The findings of this study enable ESP practitioners to investigate the needs of learners and educators in understanding pedagogical sales emails. This study also allows a systematic and detailed study of the learner's linguistics behaviour, especially from the responses given by the subject specialists.

Keywords: ESP, Needs Analysis, Pedagogical Writing, Sales Emails, Thematic Analysis.

INTRODUCTION

When it comes to the many ways that businesses can communicate with one another, business letters have been and continue to be of utmost significance in building and sustaining business connections, both within an organisation and with their contacts outside of the organisation. As different companies adopt different structural writing, the format and conventions of writing business letters vary from organisation to organisation and country to country. The ever-changing structure in business correspondence makes it complicated and confusing for those involved in drafting the letter. Not only are those structures inconsistent in the business world, but the method is also now shifted to a less time-consuming communication approach which is electronic mail or email. Email is progressively supplanting more conventional written and spoken modes, hence it becomes the prevailing method of communication for most companies around the world. Attributable to this developing slant towards the utilisation of emails, it has turned out to be progressively vital to reveal the idea of this moderately new mode of communication and how it fulfils different communicative purposes in various discourse communities. To reach this goal, researchers worked on the genre examination of email and writing in various contexts among others are Flowerdew & Wan (2006), Jensen (2009), Jucker & Dürscheid (2012), Mehrpour & Mehrzad (2013) and AlAfnan (2015). In utilising email at the workplace, a newly appointed worker, though freshly graduated from an entrepreneurship university, is likely to face difficulties if asked to draft sales email for the first time. Thus, a standard generic structure of correspondence incorporated at target situations should be developed to ensure an efficient administrative task. A needs analysis prior to developing a framework of writing sales emails would help detect the problem that the undergraduates endure to prepare their emails appropriately and convincingly when they start working in the business-related field.

Purpose of the Study

For many years, genre analysis has provided pedagogical implications for ESP classrooms regarding internal structures and language features. Since its inception in 1960, ESP has engaged three major methodologies in exploring language. The first approach, more popular as register analysis, focused on differences in language and vocabulary at the sentence level. Its application was limited due to its inability to elucidate why certain linguistic and grammatical features are more frequent or less frequent in a given variety. Then, discourse analysis took over, with the goal of putting sentences together in socio-cultural contexts to epitomise specific communicative acts. Discourse analysis was popular for a few years until it was critiqued by Bhatia (1993) for failing to demonstrate the essential relationship between constraints and conventions. Thus, genre analysis has given a significant framework to inquiring about parts of writing, and its academic uses are arranged for instructing as well as studying in academic settings. The forerunner in the genre domain, Bhatia (1993) trusts the studies of genre are advantageous to the understudies and instructors of ESP because these studies give a prior formal and content schemata information that will encourage both the linguistic assets and non-specific conventions learning which could assist in acknowledging these conventions. Based on both the researchers thought of the genre, there are various non-specific structure of communications (i.e. letters and emails) have been investigated; Park, Dillon, & Mitchell's (1998) research on business complaint letter, Santos (2002) on business letter of negotiation, Vergaro (2004) on sales promotion letter and Liao & Nesi (2017) on business request emails to cite a few.

Research Objectives

These studies of the schematic structure and textual communicative goals in various disciplines and cultures have recently sparked many researchers' interests in genre analysis. However, based on the studies done on business email writing, there is not much exposure given to the generic and communicative purpose of the emails from the point of the study of language. Therefore, we do not know much about the generic structure of the business emails written internally, and whether there are similar social or cultural factors in the writing of business emails among university students. Hence, having a needs analysis will identify the necessary details to be included in the teaching and learning of pedagogical sales emails.

There are three objectives of the current study which are;

1. To find out what language skills a learner needs in order to write an effective sales email.
2. To help determine if an existing course adequately addresses the needs of potential students.
3. To collect information about a particular problem learners are experiencing.

Theoretical Framework

Needs analysis first made its way into the linguistics field through English for Specific Purposes (ESP) movement. Around the 1960s, specific language courses were in demand and applied linguists employed a needs analysis procedure to investigate the requirement and relevancy of the subjects and the module offered. Evans & John (1998, p. 45) mentioned, the necessity to conduct needs analysis for ESP courses and subjects is because "It asks questions about students' needs and wants, the expectations of the institution, the features of the actual teaching situation" .What needs analysis offers to researchers and ESP practitioners is essential information regarding students, their needs, the subject requirements, and aids in the decision-making process to meet the needs (Graves, 2000; Long, 2005; Workineh, 2018). Therefore, needs analysis in second or foreign language teaching can be summed up as the process of understanding what to teach to the L2 learners and how to teach it.

Fuentes (2006) mentioned that in Europe, the need to communicate in specialised domains such as academic and scientific disciplines at university, is heavily emphasised. This is of a different situation in the Asian region especially in Malaysia. There is an apparent dearth of researches in needs analysis on English for Specific Purposes particularly in sales and business fields. The Malaysian Education Blueprint 2016 has stated in its guideline referred to by all institutions in this country that, in order for the Malaysian education system to keep evolving with the global pace, it is crucial to instil entrepreneurial traits among the graduates. The pressure in realising this vision into the ESP field led many educators to pursue a complete guide, especially in the mastery of the four essential skills; reading, writing, listening and speaking. Although writing is an exceedingly important

skill for most foreign language learners, the skill is deteriorating among the undergraduates that companies are complaining about (Slutsky & Sardegna, 2018; Samsudin, 2015). Slutsky & Serdegna (2018) further reported that a survey revealed the lack of preparation problem among college graduates in their workplace. Thus, having a pedagogical framework of writing sales emails would be an excellent assistance for the undergraduates and the instructors in the process of teaching and learning.

There are many ways of conducting a need analysis research for example using questionnaire (Ibrahim, 2020), interviews (Rubab et. al., 2019), and mix-mode (Thepseenu, 2020). Apart from the parameters of variation mentioned above, the lack of researches in generic structure 7 TH Inspirational Scholar Symposium ISS2022, Malaysia 10 in the ESP context and comparative study of business emails composed in English by the undergraduates has yet to be discovered. It can be a noteworthy example of research as it reveals insights into an obscure method of correspondence, i.e. email. Hence, the examination of the way diverse individuals with various dialect foundations embrace the English language in their emails can produce useful discoveries and show the degree to which the interlingual and intercultural exchange impact the email messages. Through this study, organisation mediators can be prepared in more viable rhetorical techniques and linguistic conventions that can improve the exchanges with the local English speakers.

Methodology

This section focuses on the writing needs of Business courses in a public university in Malaysia. The sampling for the semi-structured interviews is small, purposive and is chosen to fulfil the fundamental purpose of this research only. The aim is to explore the written communicative events produced by the undergraduates from the perspectives of the lecturers teaching them and also from the perspectives of local entrepreneurs. The interview questions were tailored based on the literature from the genre analysis. In order to strengthen the content and the structure of the interview questions. Modifications were made in order to gather the necessary information from the respondents. It applies especially on the information related to the extent of the identified moves in the genre. The details of the parameters adapted are as below:

Purposive domain: in this area, the goals for which the learner would use the second language at the end of the ESP training will be considered and investigated.

Instrumentality: this area investigates the medium of the language to be used whether written or spoken-, the mode of the language to be used- whether in monologue, dialogue or any other form-, and the channel of communication in the language to be used- whether face to face, on the phone, or any other.

Target level: this area predicts the language proficiency level of the L2 users by the end of ESP training, which might not necessarily be the same for all skills.

Overall, there were four lecturers and three entrepreneurs were involved in the interview. The lecturers are teaching English for Business and entrepreneurship subjects in a Malaysian public university; thus, they have in-depth experience and knowledge in the structure of pedagogical sales emails and its criterion. Meanwhile, the local entrepreneurs were chosen from the companies attached to the university's Entrepreneurship Unit.

In order to achieve reliable clarity, depth, equality and validity of the responses elicited, the attention was given to the formality of the interviews conducted, the settings of the interviews and the approach used. However, due to the constraint from Covid-19, all the interviews were conducted online; via video conference application and google forms.

Clarifications were sought for confusing and contradictory explanations, and extensive opinions were made using prompts when necessary. As the interviewees requested a high level of confidentiality and to remain anonymous throughout the research, the responses were taken as short notes and then transcribed into a word document. Therefore, the recording was avoided as it was deemed necessary to create a sense of confidence during the interviews and to avoid being obstructive.

Before embarking in the analysis and interview session, determining the experts for the task is the difficult part of the process. Specialist informant according to Bhatia (1993, p. 80) "is a practising member of the disciplinary culture in which the genre is routinely used." Huckin & Olsen (1984, p. 129, as quoted in Bhatia, 1993) mention that "Perhaps the most useful specialist informant one can find for an LSP text is the actual author of that text."

While acknowledging the fact that no one is a better informant of its own text rather than the author himself, for this study even if the students are experts in their roles, they are not suitable to be chosen as the informants in the validation. Lacking of exposure in the specific field of the course they are taking and in-depth knowledge in text and context of the discourse, the students might not be able to provide relevant judgment and insight of generical analysis. Thus, to achieve these objectives, the analysis and interview conducted involves these experts:

(i) industry informants: three local entrepreneurs from various business sectors.

(ii) subject specialists: two English II lecturers and two business course lecturers. The industry informant (1) is a 33 years old entrepreneur, who inherited his business from his parents and is actively involved in the local and international business society and programmes. He has 10 years' experience in the field and continuously seeks to improve his company. Industry informant (2) is a 55 years old retailer who has operated her business from age 15. She uses sales email constantly with her agents and manufacturers. Industry informant (3) is an online marketer who sells beauty products and street clothing. She has vast experience in modern marketing and uses sales emails daily to communicate with her drop shippers and managers. Table 1 below summarises industry informants' details.

Table 1

Details of the Industry Informants

Age	Gender	Business Field	Experience
33 years old	Male	Inheritance	10 years
55 years old	Female	Retailing	40 years
25 years old	Female	Drop shipping	5 years

For subject specialist (1), a lecturer with PhD in linguistics and has 8 years' experience in teaching English for Business. For subject specialist (2), a lecturer teaching in the Faculty of Business and is responsible for handling the Entrepreneurship Unit of the university. Subject specialist (3) is a lecturer in the Language Faculty with more than 10 years teaching experience. Subject specialist (4) is a lecturer with PhD and teaching students Business subjects. The information of the subject specialists involved in this study is illustrated in Table 2.

Table 2

Details of the Subject Specialists

Age	Gender	Subject Niche	Experience
43 years old	Male	Linguistics	4 years
45 years old	Female	Business and Entrepreneurship	8 years
45 years old	Female	Language	10 years
45 years old	Male	Business	12 years

There are many studies in the field of linguistics that utilise specialist informants to validate theories and confirm the findings. For instance, Huckin & Olsen (1984) did a study on genetics and used the author of the genetics article as their specialist informants. While much earlier, Selinker (1979) utilised the help from genetics professor to interpret a journal article in the said field. Moreover, Tarone et. al. (1981) used astro-physics specialists for their journal analysis and a much extensive study using specialist informants from Bhatia (1982).

Literature Review

Because of the tremendous growth that has taken place in the fields of business and technology over the past several decades, English language programmes all over the world have experienced a paradigm shift over the course of those years. This shift has occurred both in regard to the professional users and learners of the language. Malaysia is not an exception to these paradigm shifts. The Malaysian Education Blueprint 2016 has stated in its guideline referred to by all institutions in this country that, in order for the Malaysian education system to keep evolving with the global pace, it is important to instil entrepreneurial traits among the graduates.

To achieve its goal of developing an effective curriculum for tertiary education, the government must first gain an accurate understanding of the situation facing the Malaysian educational system as it currently exists in the

country's many local universities. Therefore, one of the ways to discover the true state of education in Malaysia is to do a needs analysis, which is one of the many ways this may be done. The purpose of this study is to investigate the function that needs analysis plays in the process of designing curriculum and developing materials. There includes a discussion of the reasons for conducting a requirements analysis during the curriculum building process, as well as the fundamental principles of language curriculum design.

Numerous academics have acknowledged that conducting a needs analysis is beneficial not only in the process of initially developing a curriculum but also in the process of maintaining and renewing a curriculum in order to assess the efficacy of the curriculum (Smith et. al., 2022; Brown, 2016). This is significant in a course development because evaluation of programmes based on the participants' needs not only encourages the growth of effective pedagogy but also assists programmes in avoiding curricular crises and the complaints of dissatisfied stakeholders.

Users of needs analysis will vary depending on the aim of the needs analysis they are participating in. For instance, when conducting a needs assessment to assist in the revision of the tertiary English curriculum in a country, the end users include curriculum officers in the ministry of education, who may wish to use the information to evaluate the adequacy of existing syllabuses, curricular, and materials; lecturers who will teach from the new curriculum; learners who will be taught from the curriculum; authors who are preparing new textbooks; testing personnel, who are involved in the development of assessment instruments; and companies, who are interested in knowing what the expected level will be of the undergraduates and what problems they may face (Richards, 2001).

According to Nation and Macalister (2010), the needs analysis is the first step in the design of a course, and they feel that it offers validity, reliability, and practicality for all subsequent activities involved in the design of a course. The targeted results or expectations of a high-quality programme, the role of assessment, the present level of student success, and the actual programme content should all be included in this material. The material should also consider the concerns and perspectives of the learners, as well as those of the administrators, parents, and teachers. While the data should include examples of assessments, lessons from teachers, assignments, scores on state standardised tests, the textbooks that are currently being utilised, students' perceptions, and feedback from parents, the data should also cover all of these things.

Findings

Thematic analysis was used to analyse responses from the semi-structured interview questions—the emergence of three general themes recorded from the responses of the interviews. The themes found were based on Munby's (1978) model of Communicative Needs Processor (CNP), which are; Purposive Domain, Strategies used in writing sales emails (Instrumentality), and Target Level of Knowledge. The following section discusses each classified theme emerging from the responses of the interview questions probed. The discussion is supported by samples of the responses collected.

a) Interview Analysis with Industry Informants

In order to add validity to the analysis, a series of interviews with the industry informants from the Entrepreneurship Unit of a Malaysian public university were conducted.

Table 3

Semi-structures interview questions for industry informants.

Interview Questions	Classified Themes
1. How frequent do you use email at work? 2. What purpose do you usually use it for? To promote your company's service? To build a network? 3. Do you struggle to write an effective sales email? Why?	Purposive domain
1. Is there any specific structure that your company applies in writing sales emails? 2. Could you explain the writing structure in detail? 3. What would you emphasize when writing a sales email? Is it the price or quality of your product/service? 4. Would you consider making a comparison with your competitor's company in the email? 5. Is it significant to mention how your company's product/service can provide a solution to your client's problem?	Strategies used in writing sales emails (Instrumentality)
1. What are your desired outcomes when writing sales emails? 2. What do you like best about your current email writing structure? 3. Is there anything you like to change about the structure? If yes, what and why? 4. If you can give advice to those who are preparing for a job, what would you recommend them to prepare in terms of writing skills?	Target level of knowledge

The discussion of themes found from the interview is supported with samples of the responses collected.

Theme 1: Purposive domain

The first theme was derived from the first part of the interview, which is related to the purpose of email application in the business field. A semi-structured question was asked to indicate the occurrences and examples of the responses received are shown below.

Sample 1: On what purpose do you usually use it for?

ERC5520: I usually use sales emails to promote our products and services to existing customers because they are familiar with the nature of our company so (the use of sales emails) more towards updating our current or new product and services.

Sample 2: How frequent do you use email at work?

ECC20520: Umm...quite frequent actually because it is easier using email. We do not waste paper and ink. The response also fast. So I use it always.

Theme 2: Strategies used when writing the sales emails (instrumentality)

The second theme was identified from the content of writing that the company used involving the strategies applied to achieve the company's goal. Specific structure points priorities and the organisation of the moves used are among the information gathered from the theme. Basically, this area investigates the details of the language used. The sample of responses are as recorded below:

Sample 3: Could you explain the writing structure in detail?

ETH18520: First, we introduce ourselves, our company. Next, our tujuan (purpose of writing).

ECC20520: We write our name, nama (name of) company. Then, we inform about our products and services. We also update our customers if we have new product and the offer.

Theme 3: Target level of knowledge

The third theme was derived from the predictions given by the local entrepreneurs of the future of writing sales emails. The improvement needed, the current contents and the highlight acquired in the structure. Below are the response samples.

Sample 3: Is there anything you like to change about the structure? If yes, what and why?

ETH18520: We hope that we can write more of the solution for our customer's problem. Also, if possible, to have knowledge of new words (vocabulary) in business field.

From the interview with industry informants, the needs assessment revealed that Business undergraduates are expected to know the basic writing structure and its relevant content. The interviewees also showed that they are well aware of the fundamental format and specific information required in the email. Managers of the company recommended additional information to be included when teaching sales emails, for example, providing solutions and updated business jargon. Upon being asked about the frequency of the utilisation of sales email as their business communication means, the employers all agree that they used sales emails quite frequently due to its massive benefits.

b) Interview analysis with subject specialists

In order to avoid any faulty inferences occurring from the time-constrained observations or due to personal postulation on the issue, it was necessary to consult and interview the subject experts directly. The subject experts involved in this interview are two lecturers from the English Language Department of a Malaysian university and two lecturers from the Business Faculty who have been teaching language and business subjects for more than three years. This has led to the major findings of this particular study which is the need analysis for a framework of sales email that suits pedagogical content-based ESP courses in the tertiary learning institutions in this country.

Table 4
Semi-structured interview questions with subject specialists.

Interview Questions	Classified Themes
1. Do the students have problems writing emails? If yes, what problems do they face?	Purposive domain
1. What are the skills that need to be developed for students to succeed at their workplace in future? 2. Is it necessary to teach them the writing structure of a sales email?	Strategies used in writing sales emails (Instrumentality)
1. Do you think the students have sufficient knowledge to write sales emails at their future workplace? 2. Would having a specific module in writing sales emails help to improve their writing skills? 3. If you can give advice to those who are preparing for a job, what would you recommend them to prepare in terms of writing skills?	Target level of knowledge

Theme 1: Do the students have problems in writing emails? If yes, what problems do they face? Example of responses given by the interviewee;

PBI12420:

"...students mostly do not know how to write feedback (reply) email"

PBI61020:

"The most crucial thing in their writing is their grammar and vocabulary. In class, it may be that this is their first semester writing business related email, yet majority of the have no working experience in business. Even if they

do work, they are not asked to send emails to clients. Thus, their approach in writing is only satisfactory, only to fulfill academic purposes."

Theme 2: Do you think the students have sufficient knowledge to write sales emails at their future workplace?
Example of responses given by the interviewee;

PBI28420:

"...not really. Students need to constantly update their vocabulary especially business jargons in order to be reliable in this field. Furthermore, basic grammar knowledge is also a requirement to be successful in their future workplace."

FKP25420:

"Yes, students have basic knowledge to write letter. They know the format and basic words."

Theme 3: What are the skills that need to be developed for students to succeed at their workplace in future?
Example of responses given by the interviewee;

FKP26420:

"Students must have sufficient English language knowledge to succeed at their future workplace. It (will) help them a lot. Also they must be fully aware of all the business skills for example sales emails, marketing, interpersonal and intrapersonal must be excellent."

Theme 3: Do you think the students have sufficient knowledge to write sales emails at their future workplace?

PBI61020:

"With syllabus specifically focusing students to polish their English language and require them to write few sales emails; yes. Only then it will be sufficient."

It was observed that from the observation of the lecturers, students faced difficulties in writing sales emails when they entered the working field. Lecturers from both courses agree that students are lacking the skills of writing and are not aware of the importance of the subject. This may be because students have limited information about the actual target situation or limited exposure of what to expect in their future job. Instructors also repeatedly mentioned the needs to equip the learners with sufficient vocabulary and knowledge on the structure of sales emails. In addition to the perceived needs of the subject specialists, deficiencies in suitable teaching materials were identified. It can be summed up that from the needs analysis, specialised English language framework for sales emails is a necessity.

Conclusion

The current study proposes an organised and effectively designed framework focusing on sales reply writing instruction to be initiated at business college or entrepreneurship university level. The present English language writing framework at tertiary level education may not be able to cater to the specific genres of entrepreneurship that future graduates will encounter in their career. In turn, by having a sales writing framework investigated, it will give students the advantages in a career field that meet the market needs and the requirements of the industries for a consistent and reliable supply of educated and skilled graduates.

Therefore, it is hoped that future researchers, English teachers, and business-related students can get useful information based on the findings. Future study may include a more thorough frequency analysis of communicative purpose in professional writing to identify their relationship with the genre. Besides, the researchers can stimulate interest to conduct studies in more critical details regarding candidates' culture and also educational background. Overall, teachers may impart associated email writing skills which also involve teaching suitable discourse to a particular context, especially to those who are ESP writers. Lastly, the applicants should also be aware of the significance of certain moves in the sales reply emails and the related implications of missing some moves that might impede understanding of the structure.

References

- Brown, J. D. (2016). *Introducing needs analysis and English for specific purposes*. Routledge
<https://doi.org/10.4324/2F9781315671390>.
- AlAfnan, M. A. (2015). Language Use in Computer-Mediated Communication: An Investigation into the Genre of Workplace Emails. *International Journal of Education & Literacy Studies*, 3(1), 1-11.
 Doi: 10.7575/aiac.ijels.v.3n.1p.1
- Askehave, I., & Swales, J. M. (2001). Genre identification and communicative purpose: A problem and a possible solution. *Applied Linguistics*, 22(2), 195–212. <https://doi.org/10.1093/applin/22.2.195>
- Baron, A., Rayson, P., & Archer, D. (2009). Word frequency and key word statistics in historical corpus linguistics. *Anglistik: International Journal of English Studies*, 20(1),41-67.
- Bhatia, V. K. (1993). *Analysing Genre: Language Use in Professional Settings*. Pearson Education Limited (Vol. 19). [https://doi.org/10.1016/0889-4906\(95\)90021-7](https://doi.org/10.1016/0889-4906(95)90021-7)
- Crystal, D. (1997). *Making Sense of English Usage*. Edinburgh: Chamber.
- Evans, D. T., & John, S. M. J. (1998). *Developments in ESP: A multidisciplinary approach*. Cambridge: Cambridge University Press.
- Flowerdew, J., & Wan, A. (2006). Genre analysis of tax computation letters: How and why tax accountants write the way they do. *English for Specific Purposes*, 25(2), 133-153. doi.org/10.1016/j.esp.2005.03.005
- Fuentes, A. C. (2006). A corpus-based focus on ESP teaching. *Teaching English with Technology* 6(4).
[\[http://www.iatefl.org.pl/call/j_esp26.htm\]](http://www.iatefl.org.pl/call/j_esp26.htm)
- Gimenez, J. C. (2006). Embedded business emails: Meeting new demands in international business communication. *English for Specific Purposes*, 25(2), 154–172. <https://doi.org/10.1016/j.esp.2005.04.005>
- Graves, K. (2000). *Designing Language Courses: A Guide for Teachers*. Boston: Heinle and Heinle.
- Hanel, S., & Cortes, V. (2010). Identifying moves and elements of persuasion in collection letters. *Revista de Lenguas Para Fines Específicos*, 1127(April), 83–108.
- Ibrahim, H. H. (2020). Needs Analysis as a Prerequisite for Designing an ESP course for Medical Students. *Open Journal of Modern Linguistics*, 10, 83-103.
- Jucker, A. & Dürscheid, C. (2012). The linguistics of keyboard-to-screen communication. A new terminological framework. *Linguistik Online*. 56. 10.5167/uzh-67310.
- Liao, L., & Nesi, H. (2017). An empirical study of business request emails in the context of Business English as a Lingua Franca. *CALR online Linguistic Journal*. Issue 8.
<https://www.researchgate.net/deref/http%3A%2F%2Fweb.aou.edu.lb%2Fonline-journals%2Fcalr-8th-issue>
- Long, M. (2005). *Second Language Needs Analysis*. Cambridge: Cambridge University Press.
- Mehrpour, S., & Mehrzad, M. (2013). A Comparative genre analysis of English business e-mails written by Iranians and native English speakers. *Theory and Practice in Language Studies*, 3(12), 2250-2261.
 doi:10.4304/tpls.3.12.2250-2261
- Munby, J. (1978). *Communicative Syllabus Design*. Cambridge: Cambridge University Press.
- Nation, I. S. P. & Macalister, J. (2010). *Language Curriculum Design*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Park, M. Y., Dillon, W. T., & Mitchell, K. L. (1998). Korean Business Letters: Strategies for Effective Complaints in Cross-Cultural Communication. *The Journal of Business Communication*, 35(Number 3, July), 328–345.
- Richards, J. C. (2001). *Curriculum Development in Language Teaching*. Cambridge: Cambridge University Press.
- Rubab, I., Khan, M., & Khan, F. (2019). Academic English Language for Social Sciences Learners: A Case Study of Bahauddin Zakariya University, Multan. *Pakistan Social Sciences Review* June 2019, Vol. 3, No. 1. 180-193.
- Samsudin, Z. (2015). Comparing the Process Approach with the Product Approach in Teaching Academic Writing to First-year Undergraduates. *Proceedings of the International Seminar on Language Teaching ISeLT 2015*, 4-5 February, Bangi, Malaysia.
- Santos, D. V. B. (2002). Genre analysis of business letters of negotiation. *English for Specific Purposes*, 21(2), 167-199. doi:[https://doi.org/10.1016/S0889-4906\(00\)00028-4](https://doi.org/10.1016/S0889-4906(00)00028-4)
- Singh, M. K. S. (2011). *Syntax in a Business Context: A Learner Corpus Analysis*. *ELT: Converging Evidence and Challenges*. (March).
- Shauki, N. B. I., & Singh, M. K. S. (2018). Analysing Generical Moves in Pedagogical Sales Reply Emails. *Journal of Entrepreneurship and Business*, 6(2), 48-59. DOI: 10.17687/JEB.0602.05.
- Slutsky, J. M., & Sardegna, V. G. (2018). Business writing strategies and guidelines for preparing effective memorandums. *Journal for Excellence in Business Education*, 5(1),1-13. Retrieved from <http://www.jebejournal.org/index.php/jebe/article/view/80>

Swales, J. M. (1990). *The concept of discourse community*. Cambridge University Press.

<https://doi.org/10.4000/asp.4774>

Thepseenu, B. (2020). Needs Analysis for ESP Course Development: Thai Civil Engineering Students' Perspectives. *Asian Journal of Education and Training*. 6. 433-442. 10.20448/journal.522.2020.63.433.442.

Vergaro, C. (2004). Discourse strategies of Italian and English sales promotion letters. *Englishfor Specific Purposes*, 23(2), 181–207. [https://doi.org/10.1016/S0889-4906\(03\)00003-6](https://doi.org/10.1016/S0889-4906(03)00003-6)

Workineh, T. (2018). English Language Needs Analysis of Business Students. *Nawa Journal of Language and Communication*. Volume 9: Number 1, June 2015.

Application Of 4C Elements in Online Project- Based Learning to Assist Students' Communication Skills and Problem Solving Skills for Biology Subjects

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ABSTRACT: The success of communication skills and problem solving skills through online Project-Based Learning (PBL) can be achieved when students are able to express opinions, discuss with others to find solutions, interact, dialogue, argue based on evidence and solve a problem based on the real world. In recognition of the importance of online Project-Based Learning strategies in influencing students' communication and problem-solving skills, this paper aims to synthesize the existing relevant literature to establish a theoretical foundation of project-based learning that highlights the application of 4C elements namely communication, collaboration, creativity and critical, which focuses its influence on students' communication skills and problem-solving skills. The study design was conducted qualitatively using purposive sampling method. Interview data, observations and documents were analyzed using the snowball method. Researchers selected the first case that met all the specified criteria to obtain concise data. The analysis was conducted on six respondents. In conclusion, project-based learning fulfills the key features of effective interventions for 21st century learning because project-based learning (PBL) is an educational model that prioritizes projects in teaching and learning (PdP) which is also an instructional method that allows students to build skills and acquire knowledge through projects, cooperative learning and 'hands on' techniques. Through the implementation of the project, students can build knowledge and skills through the inquiry process. The integration of project-based learning strategies makes this instructional method adaptable to students of varying backgrounds, ages and levels of education.

Keywords: Communication, Collaboration, Kreative, Kritical, Project-Based Learning, Problem Solving

Introduction

PBL uses a dynamic approach so that problems and challenges in the real world can be explored by students. (Moursund 1999; Gultekin 2005; Blumenfeld et al. 1991; The George Lucas Foundation, 2012). According to Stephanie (2010), PBL is an approach that can enhance students' 21st century skills, where these skills are critical to producing a balanced human capital in terms of spiritual and physical. However, the effectiveness of PBL cannot be implemented effectively if the elements of the PBL approach are not disclosed to students during the learning sessions. Pupils were found to be unable to apply the concepts and processes of science learned in school to their daily living practices outside of school hours when teachers relied solely on textbook content (Nordine, 2007). PBL is the right choice that teachers should take as a teaching practice in the classroom as suggested by Barak and Dori (2005). Through PBL students' knowledge and skills can be built through an inquiry process to solve any problems that revolve around real life as stated by The Buck Institute for Education, BIE (2005).

Sema et al. (2009) also reported that during his observations during the implementation of the study found that students who use PBL more actively cast views, make discussions with friends, pay attention and focus on the issues discussed and smarter to make connections between problems discussed and real situations. PBL stimulates active learning among students because students can discuss with their peers, however, how can PBL ensure active learning among students who implement PBL individually? Whereas, according to Pyatt and Sims (2007), students' understanding of the problems studied cannot be built by students themselves through regular experimental activities that they do in the laboratory.

21st century learning applies the concept of 4C, namely communication, collaborative, critical thinking, creativity and also 6C with the addition of 2 elements of the application of noble values and ethics according to the Malaysian context (Pendidik2u.my, 2018). These 4C skills are an important element to ensure high quality PBL construction. A study conducted by Masyuniza and Zamri (2013) found that the six components of 21st century skills studied (communication, digital age literacy, inventive thinking, effective communication, high productivity production as well as spiritual values and norms) are still at a moderate level. Therefore, these elements need to be developed and nurtured among teachers and students to ensure the achievement of high standards. Teachers are an important element because they are the implementing agents and facilitators who need to prepare themselves in ensuring the effectiveness of a learning.

Critical thinking skills and effective communication skills are essential skills in leading and facing rapid developments in science and technology. There are many challenges facing educators in this day and age. Among them is the challenge to guide students to always think creatively and critically. Biology is a subject that not only focuses on the memorization of concepts alone, but also involves the understanding of sciences such as chemistry, physics and biology is more to the understanding of the mechanisms and processes of science supported through experiments, and inventions. All 21st century skills such as collaboration skills, critical thinking skills, creative and effective communication skills can be nurtured through activities such as problem solving and design innovation projects. The Malaysia Education Blueprint 2013-2025 considers activities based on creativity and innovation as important, where all these activities can encourage students to always think about new solutions and create opportunities for their careers (Ministry of Education Malaysia 2017). Therefore, PPPM 2013-2025 has placed emphasis on developing creative and innovative human capital to meet the needs of the country in the 21st century.

Based on the Astro awani website (<https://www.astroawani.com/berita>), dated 9 April 2020, in line with the Movement Control Order (PKP) implemented by the Malaysian government to curb the spread of COVID-19, an online learning method is a necessity. All schools in Malaysia have no other choice but to use online teaching and learning methods. This is important to ensure that learning topics can be presented effectively. However, not all students are able to implement online learning systematically because they are unable to adapt to learning in the new norms. There are students who do not have internet access or technology to participate in digital learning. This gap can be seen across countries and between domestic income brackets. For example, although 95% of students in Switzerland, Norway and Austria have computers to use for their school work, only 34% in Indonesia, according to data from the Organization for Economic Co-operation Development, OECD. In the United States, there is a significant gap between those from special and underprivileged backgrounds, while nearly all 15-year olds from special backgrounds say they have a computer to use, nearly 25% of them from underprivileged backgrounds no. While some schools and governments have provided digital equipment to students in need, such as in New South Wales, Australia, many are still concerned that the epidemic will widen the digital divide. Therefore, teachers need to diversify teaching methods to suit learning in the new norms. Teachers can use the various platforms available to ensure that the learning and teaching process can be implemented effectively. Teachers can also apply PBL in online learning.

In the face of this pandemic season, all students and teachers will implement online learning. This is to ensure that all students are not left behind in following the learning sessions and the teacher can finish the teaching topic. However, various concerns arise when wanting to implement this online teaching and learning session.

This is because not all students have personal smartphones, some do not have enough internet data, some do not have direct internet access and some are unable to adapt to learning in the new norms. In addition, teachers who want to implement PBL are also worried about how to implement PBL online and most of them use the trial and error method. Not all students have the opportunity to be involved in PBL activities conducted online. Therefore, it is not surprising that there are a few students who choose to act as observers only (Siti Aloyah 2002). Whereas when all students are involved in carrying out project work hands -on learning will be more effective (Blumenfeld et al. 1991). The development of technology especially the evolution of the internet has challenged the concepts and theories of traditional education, especially the concept of classroom and teaching and learning methods (Hunt, 2004; Resnick and Wirth, 1996.) Gunasekaran (2013) has conducted a study on blended learning that is about research and application . According to him, the existence of broadband technology will further improve the quality of online learning by using various applications. Learning will be more interactive than traditional learning.

In general, the purpose of this study was to identify how the application of 4C elements in project -based learning can help students' ability to communicate effectively and problem - solving skills in the form of KBAT for online biology subjects. According to Azalya (2003), to face the challenges of globalization, Malaysians need to be equipped with various basic skills in education and strong training and have a variety of general skills including the ability to communicate, master multiple languages, critical thinking and innovative. Based on the problem statement described in the previous section, this study aims to examine in more depth how the application of 4C elements in project- based learning can help students, especially in terms of communication skills and problem solving skills in the form of HOTS for Biology subjects online.

Literature Review

Pupils' Communication Skills While Implementing Project Based Learning (PBL) For Biology Subjects

One of the scientific skills is communication. According to Rogers and Kincaid (in Cangara, 1998, p. 19) communication is a process in which two or more people form or exchange information with each other, which will lead to the emergence of deep mutual understanding. Based on the researchers' observations on the

teaching and learning process of Biology found that teachers tend to explain the learning materials and provide explanations without using media. In biology learning, teachers usually function as informants and students as recipients of information. This causes students' communication skills to become passive and the teaching process to become a process of memorizing concepts or procedures, but at the same time Biology process skills and students' achievement are at a low level (Rose Amnah 2004). This has become even more troubling since the world was hit by the Covid-19 epidemic, teachers and students need to drastically change the methods of online learning and teaching. Pupils will continue to be observers and recipients of information during the online learning sessions implemented. If this continues, the learning sessions will become increasingly boring and students' communication skills will become passive as students will increasingly lose focus on the subject of Biology. The findings also show that the factors that cause students to lose focus are from boring learning and teaching sessions. According to Reinhartz and Beach, 1998; Wiles and Bondi, (1998) stated that concentration during a learning session is very important because a student's concentration is able to help in improving their mental intelligence. This in turn helps them to adapt, achieve success in life and always be ready to be in society in the increasingly challenging future. According to Amir Hasan (2009), in a learning environment, each student has different psychology and abilities from each other. Therefore, the planned teaching should be appropriate and arranged according to the level and environment of the students. In addition, it should be supported by the use of appropriate teaching aids to stimulate students' communication skills to the maximum level. An important element in the curriculum learning system today is the selection of appropriate teaching methods that involve students actively in learning, whether mentally, physically or socially. Teachers need to emphasize on understanding concepts, problem solving skills and provide teaching aids that are appropriate and able to attract students to follow the teaching and learning process (Depdiknas 2006; Rose Amnah et al. 2004).

Communication skills are an ability to establish interactions or relationships through the medium of intermediaries or vice versa with others. Good interaction between teacher and student can create a positive relationship in the classroom. The quality of social development and teaching in an organization is determined by the social relationship mechanisms built into it such as effective use of language, interaction processes, open communication and verbal skills (Rahim, 2011). However, when implementing PBL online, the nature of communication changes. The language used by students and teachers is different, work processes are different, and the relationship between teacher and student is also different. New communication strategies and techniques must be used when implementing PBL online. The teacher acts as a facilitator and guide to develop the learning experience, not as a mere informant and instructor.

When implementing PBL online, teachers should provide opportunities for students to submit their ideas and imaginations and encourage them to participate in discussion sessions about an idea presented (Lehesvuori et al., 2011). Speaking power can stimulate and motivate students to think as well as enhance students' learning and understanding through dialogue methods (Alexander, 2006). According to Alexander (2006), dialogical teaching can improve students' reasoning skills and comprehension. During dialogic teaching, teachers will take into account students' ideas and students are encouraged to participate in discussions about the ideas presented (Lehesvuori et al., 2011). This phenomenon will trigger a culture of thinking among students and prevent students from simply memorizing the facts and concepts learned.

According to Kearney and Bandle (1990) in Nurazmallail Marni, Ahmad Kilani Mohamed, and Kamarul Azmi Jasmi (2004), stated that teamwork can improve and smooth the communication process in an organization. There are many advantages of teamwork, among them are that team members can improve their understanding of organizational goals, more effective problem solving, encouragement to be creative, increased motivation and morale, opportunities to identify and develop better leadership and communication (Zaidatol, 1990). The results of a study by Mohd Fadzli Ali, Normah Salleh and Juhazren Junaidi (2007), found that group work skills also improve communication skills through group discussion. This opinion is supported by Akindele (2012) in Mohd Akmal Masud (2013), who states that students are aware of teamwork, they can improve communication with classmates, communicate with friends of different races, and can strengthen trust between group members.

However, Mills & Treagust (2003) and Siti Fatimah et al. (2006) argue that PBL can be carried out individually or in groups. In this case, students are given the freedom to choose to implement PBL individually or in groups. Therefore, there is a dominance of work in students who implement PBL individually. Therefore, teachers play an important role as mentors who can control the course of the teaching and learning process in the classroom for students to build knowledge through teaching activities that can improve students' communication skills. Tal et al. (2006) stressed that the implementation of PBL allows students to enhance their learning experience outside the classroom through meaningful questions relevant to the surrounding community. Daily life -based learning is also able to encourage students to learn actively. This is because students have the opportunity to generate their ideas, imaginations and experiences during the learning session. Therefore, students will interact with each other and ask questions to each other.

However, there are still students who implement Biology learning methods that are more focused on the conventional method of teacher-centered learning (Henderson et al., 2000). Not surprisingly, therefore, there are still students who are unable to apply what they have learned to daily life. This is because teachers rely solely on

the content of textbooks (Nordine, 2007). When students only focus on the content of the textbook alone, students do not have the opportunity to interact, let alone dialogue. Whereas, through the implementation of ordinary practicals done in the laboratory cannot build students' understanding (Pyatt and Sims, 2007), let alone online learning. Learning will become increasingly passive. The failure of students to build their own understanding is due to the learning methods practiced are more focused on teachers as channeling information while students are not actively seeking their own learning resources and tied to textbooks (Martinez, 2003; Middlebrooks & Slupski, 2002). Through conventional learning methods such as this, not all students have the opportunity to be involved in the activities carried out and some even choose to act as observers only (Siti Aloyah 2002). Whereas when all students are involved in carrying out project work hands-on learning will be more effective (Blumenfeld et al. 1991). This statement is supported by the opinion of Drew and Ottewill (1998) who found that students who fail in lessons are also influenced by the inadequacy of the learning strategies they use. Therefore, teachers are responsible in diversifying learning approaches and ensuring a conducive learning environment.

Pupils' Problem Solving Skills While Implementing Project Based Learning (PBL) For Biology Subjects

Biology learning can be used to develop students 'high -level thinking skills such as critical thinking. Critical thinking is a complex thought process consisting of interpretation, analysis, conclusion, evaluation, explanation and self- organization (Facione, 2011). Critical thinking is referred to as high- level thinking that encompasses the top three abilities in Bloom's Taxonomy namely the ability to analyze, synthesize, and evaluate (Bookhart, 2010; Moore & Stanley, 2010). The development of critical thinking skills can be done with open -ended questions or different questions. Open -ended questions are questions that expect many possible correct answers (Collete & Chiappetta, 1994; Subali, 2013). Nevertheless, there are studies that state that Biology subjects do not challenge the mind because the focus of learning is more in the form of memorization (B. Barron, 2000). The report of the Planning and Research Division found that overall students only used memorization techniques in the subject of Biology and as a result students did not answer questions in the form of problem solving (Ministry of Education Malaysia, 2010). Therefore, it is not surprising that students are not able to answer questions in the form of analysis and correlation. This is because learning by "deep learning" does not occur among students during the learning session because learning occurs passively and is only teacher-centered. This is even more worrying if this traditional learning continues to happen during the online learning that is happening nowadays. If this situation persists, then students' problem- solving skills cannot develop because passive learning cannot help the development of students' critical and creative skills. Pupils will continue to be listeners to the information presented by the teacher while the teacher acts as an informant. One of the learning models that develops students' critical and creative thinking skills for the subject of Biology is project- based learning. PBL not only provides students with knowledge but also enhances their problem -solving skills, critical and creative skills, future learning, communication skills, teamwork, adaptation to change, and self-assessment

(Khoiri et al., 2013). In PBL, real world problems are used to push students through the problem (Farhan & Retnawati, 2014). During the problem solving process, there will be an exchange of information between students and other students so that the problem can be resolved. Students have the opportunity to continue to seek information, exchange knowledge, share experiences and collaborate to achieve a common goal. Through PBL, students 'in-depth knowledge and creative skills can be developed through an inquiry process to solve any problems related to real life as stated by The Buck Institute for Education, BIE (2005). One of the widely supported features of PBL is that PBL is one of the meaningful question- based learning that is learning that encourages students to think deeply and stimulates their curiosity about a problem or issue related to the real world (Blumenfeld et al., 1991 ; Yamzon, 1999; Doppelt, 2000; Thomas, 2000; Schneider et al., 2002; Turner & Grizzaffi, 2003; Chin & Chia, 2006; Lehman et al., 2006; Tal et al., 2006; Wu & Krajcik, 2006; Harriman, 2007; Brodi, 2008; Chan Lin, 2008; Halil, 2008; Lopez & Lacueva, 2008; Nation, 2008; Yalcin et al., 2009; Bell, 2010; Kamaruzaman & Khairul, 2010; Papanikalou & Boubouka, 2010; Kaldi et al., 2011; Roessingh & Chambers, 2011).

The process of teaching and learning Science requires innovative and creative approaches, methods and techniques of student- centered teaching and learning and active learning among students. Creativity development aims to provide students with a variety of skills and knowledge to face the challenges of the world of work (Kind & Kind, 2007). In fact, the development of students' creativity in school has not yet reached the optimum level. This is because, the lack of attention to the development of creativity is due to the notion that creativity cannot be learned and measured. Trilling & Fadel (2009) state that creativity can be learned through a learning environment that supports questions, patience, openness to new ideas, high trust and learning from mistakes and failures. Creativity can be developed with constant practice. One of the most effective ways to develop creativity is by learning through projects to find ways out of real -world problems. Project- Based Learning (PBL) is the right choice that teachers should take as a teaching practice as suggested by Barak and Dori (2005). Lou et al. (2011) in the subject of Science, Technology, Engineering and Mathematics (STEM) which showed that the implementation of PBL in this subject has had a positive effect on students' attitudes and knowledge and also helped in improving students' creativity skills on their project work and in terms of the methods they use to present the results of their project. However, students and teachers face problems to implement PBL in this pandemic season because teachers and students are not able to face each other as in

previous learning. In addition, one-way learning during this pandemic season also causes students not to have the opportunity to develop their creativity skills. If this continues, students will have trouble answering problem-solving-shaped questions because they are not exposed to real-world-related learning that exposes them to scientific measures and skills. Therefore, technology -assisted learning is a necessity for students and teachers in facing education in the pandemic season. Learning will be more interesting and effective if PBL is implemented by using various interactive technologies today such as google meet, zoom and more. This also supports the government's intention to integrate schools in Malaysia will also be achieved by making PBL as one of the learning methods in accordance with the current circulation in addition to other practices such as problem-based learning, computer-assisted learning and 21st century learning (Educational Technology Division 2010). Through a variety of technologies, teachers and students can implement online learning more systematically. The diversity of technological facilities allows students and teachers to carry out discussions about findings, ideas and questions by way of decision sharing, constructive questions and problem solving (Churach & Fisher, 2001).

Methodology / Methods

This study was conducted based on research questions; How can the application of 4C elements in online Project -Based Learning help students' communication skills and problem- solving skills for Biology subjects? To answer this question, a qualitative study was conducted. This study also examines in depth how project -based learning can help students implement online learning, issues or challenges in implementing project -based learning online, the effectiveness of communication skills and problem solving skills and evaluation of the implementation of PBL online.

Research Paradigm

Qualitative research is descriptive in nature i.e. the researcher is interested in the process, meaning, and understanding gained through words or observations. The process of qualitative research is inductive in nature in which researchers build abstracts, concepts, hypotheses, and theories based on a study. Qualitative research helps researchers make in -depth research through direct observation of the natural environment (Creswell, 2012: 17).

Research Design

A case study is an appropriate research design to use if the research process is about a process (Cannon 2001) because it can provide an overview or pattern for understanding the process. To explain the importance of researching processes in case studies, Sander (1981) explains that case studies help us understand the processes involved in an event, project and program and explore the features of the context that will shed light on an issue or object.

Study Determination

A school is an educational institution that provides learning and teaching facilities to students and teachers. Education in Malaysia is supervised by the Ministry of Education. Public secondary education in Malaysia is known as Sekolah Menengah Kebangsaan (SMK). Sekolah Menengah Kebangsaan uses Malay as the main medium of instruction because Malay is the National language of Malaysia, while English is a compulsory subject in all schools. Since 2003, Science and Mathematics have been taught in English, but in 2009, the government decided to return to using Malay starting in 2012.

Study Location

This study was conducted in a school in Kota Kinabalu, Sabah because this school is one of the schools that have implemented project -based learning starting in 2016. In addition, there are many facilities, especially 21st century learning facilities readily available at this school. The school has a demographic that suits the surrounding area. Thus, it encompasses a population comprising of various categories such as race and socioeconomic status. Selsin, the school was also selected based on good internet facilities such as Wi-Fi connection, as well as LAN connection. This facility is seen as an opportunity to support student needs and learning.

Principal Investigator

Although the researcher has an educational background related to Biology education at the level of Bachelor of Science Education (Biology/Chemistry) and Master of Science Education (Biology), the researcher believes that the application of 4C elements in PBL can expose students to active learning experience online, if PBL strategy designed according to the needs of the student. He also believes that technology should be combined with the integration of other learning strategies to influence systematic learning outcomes. For example, the

implementation of PBL needs to be applied 4C elements to encourage students to learn actively, especially while implementing online learning during this pandemic season. Researchers are also interested in understanding how teachers devise online learning strategies to produce positive learning among students using technology. The researcher also serves as one of the judges for the implementation of project-based learning at the Kota Kinabalu district level. This allows the researcher to work with the highest implementers of the State Education Department (JPN) for the implementation of PBL. In addition, as one of the teachers responsible for the implementation of PBL in the schools studied, it further facilitated the respondents to continue to consult the researcher on issues related to the implementation of PBL.

There are two main roles in this study: a) Teacher who teaches Biology subject and b) Researcher. Teachers only have the role of teaching Biology subjects, providing PBL work as well as evaluating PBL work which is part of this study (Assignment 1 and Assignment 2). In the subject of Biology, the teacher's role is to evaluate the students' PBL work based on the scoring rubric provided, analyse the results of the semester 1 examination and the students' SPM test as well as the students' PBD mastery level.

Biology Subject Description

Biology is a scientific study of life. Biology studies the structure, function, growth, origin, evolution and distribution of living things. This field focuses on the classification and description of organisms, the functions of organisms, the ways and reasons why species exist, as well as their interactions with each other and the environment. Biology subjects are based on four main principles, namely cell theory, evolution, genetics and homeostasis. The biology curriculum is organized according to several themes. Each theme contains several Learning Areas (BPs), each BP has several Learning Objectives (OPs) and each OP has one or more Learning Outcomes (LS). In total, there are 5 learning themes, 28 learning areas, 489 objectives and learning outcomes in all for the Biology syllabus form 4 and form 5. As stated in the Biology Syllabus Form 4 and Form 5, teaching and learning strategies in biology curriculum prioritize learning thinking. Thoughtful learning is a process of acquisition and mastery of skills and knowledge that can develop a student's mind to an optimal level. Thoughtful learning is able to expose students to various learning approaches such as inquiry, constructivism, contextual learning and mastery learning.

In the Biology curriculum, it is suggested that apart from teacher-guided experiments, students are given the opportunity to design experiments, i.e. they themselves design the relevant experimental methods, measurable data and how to analyze data as well as how to present their experimental results. Among the activities proposed are discussions, simulations, projects, visits and the use of natural resources as well as the use of technology. One of the proposed activities is project implementation. A project is an activity carried out by an individual or a group of students to achieve a specific goal. Projects take a long time as well as spanning formal learning time to complete. Project results can be produced in the form of reports, artifacts or others and they need to be presented to teachers and other students. Project work encourages the development of problem-solving skills, time management skills and self-learning.

3P PBL Online Model

In this study, students are expected to conduct project-based learning that incorporates 4C elements during its online implementation. Students will carry out 3 phases of PBL. The first phase, students are divided into several groups. Each group consists of students who have differences in terms of abilities, inclinations, knowledge and experience of existing students as stated in the STAD learning Model. Next, students will be exposed to the learning objectives for the field of learning as the steps recommended in the ASSURE model. Students will also be exposed to issues related to the area of learning. Afterwards, the teacher will act as a facilitator and question the students using a set of meaningful questions created based on reference to the learning objectives and questioning techniques of 5W1H. Pupils are guided to discuss and encouraged to prepare a mind map during the discussion.

In the second phase, students are encouraged to discuss and make partnerships in groups to build products. Students will share information, dialogue and use technology. The teacher acts as a facilitator to guide the students to achieve goals and agreement in the group. Next, the third phase, students will present the results of their products. Pupils are encouraged to prepare a mind map. Students will be guided to dialogue and argue about the pros, cons and improvements of the products they produce. The presentation session was conducted using a set of questions created using the 5W1H questioning technique.

Model 3P



Sample Selection

Once a case is selected, purposive sampling is performed. The initial case for this study was an upper secondary student who took a pure science stream and took Biology as an additional subject in the Sijil Pelajaran Malaysia (SPM) examination at a school in Kota Kinabalu, Sabah. There were 3 female students and 3 male students who were 17 years old. Using this method, all respondents were selected based on identified criteria; all students are positive towards the use of technology, such as computers and the internet, all individuals have their own gadgets and internet, have experience conducting project-based learning and have achieved level 3 in Classroom Assessment (PBD). Pupils had no option to withdraw from completing two projects in data collection and analysis for this study. Nevertheless, students can still choose whether they want to engage in a focused group to be interviewed.

All these respondents were selected as a unit because one of the research questions was to look at the application of elements of collaboration, communication, creative and critical thinking in online project-based learning. For this study, diversity was determined through observations of respondents' activities while implementing project-based learning online. Therefore, the unit of analysis for this study is the online project-based learning approach and the application of 4C elements in PBL. Their experiences and perceptions of PBL were obtained through interviews, observation and analysis of academic achievement documents and classroom assessment (PBD). The figure below shows the demographics of all the respondents. A total of 6 respondents were involved in this study, namely 3 female respondents and 3 male respondents aged 17 years. They were the same group of students for the past five years, only from different classes. Codes were given to each respondent because the study used a variety of sources from each individual. Individual codes are very important when analyzing data because this information is used to see similarities or comparisons among respondents.

Table 1

Data Sources Based on Research Questions

No	Research Question	Data Source
1	How can the application of 4C elements in online PBL help students' communication skills for Biology subjects?	<ol style="list-style-type: none"> 1.Observations on student activities implementing PBL online, comments, conversations, student discussion activities, student presentations, student responses, enjoyment, understanding and influence on student attitudes). 2.Focus group interviews. 3.Document analysis (Level of mastery of PBD learning semester 1 and semester 2, Project marks (PBP) semester 1 and semester 2, academic achievement of semester 1 students and SPM test).
2	How can the application of 4C elements in online PBL help students' problem solving skills for Biology subjects?	<ol style="list-style-type: none"> 1.Observations on student activities implementing PBL online, comments, conversations, student discussion activities, student presentations, student responses, active student involvement in discussions, use of technology, craftsmanship, creativity, self-reliance, realistic, investigative, courage). 2.Focus group interviews. 3.Document analysis (Level of mastery of PBD learning semester 1 and semester 2, project marks for semester 1 and semester 2, academic achievement of semester 1 students and SPM test).

Study Procedures

In the first stage, the researcher conducted a study to identify the problems faced by the students in terms of communication skills and online problem solving skills for the subject of Biology. The three methods of data collection used at this stage are to interview 6 informants, make observations based on the constructs set in the study on the six informants and make document analysis on academic achievement in semester 1, project marks (PBL) in semester 1 and evaluation level of learning (PBD) in semester 1 for these six informants (further explanation is found in appendix H). Next, the researcher will make triangulation for all the data collected. The research was conducted for 8 consecutive weeks. The implementation of the study at this stage did not involve the role of teachers because this study only focused on data related to problem identifiers.

In the second stage, the research focuses on the research question, or the preliminary theory being tested. Researchers conducted a study at this stage to see how the application of 4C elements in online PBL can help students' communication skills and problem-solving skills for Biology subjects. The study was conducted for three consecutive weeks. The three methods of data collection used at this stage are to interview 6 informants, make observations based on the constructs set in the study on the six informants and make document analysis on essay marks, project marks (PBL) and learning level (PBD) for the sixth -these six informants (further explanation is found in appendix I). Next, the researcher will make triangulations for all the data collected. The following is the Study Procedure Diagram (Second Stage).

In the third stage, the research focuses on theories or findings that have been refined. The researcher will draw conclusions and determine patterns using cross- case techniques. In addition, the researcher will also focus on the comparison of PBL implementation strategies, theory and then intervene on this theory. The study was conducted for eight consecutive weeks. The three methods of data collection used at this stage are to interview 6 informants, make observations based on the constructs set in the study on the six informants and make document analysis on academic achievement on the SPM test, project marks (PBL) in semester 2 and level learning in classroom assessment (PBD) for these six informants (further explanation is available in appendix J). Next, the researcher will make triangulation for all the data collected. At this stage, teachers will not be involved because the study only focuses on the findings for the implementation of this research. The following is the Study Procedure Diagram (Third Stage).

Data Analysis

Interview transcripts, observation notes for PBL activities, comments, responses and conversations during discussions in telegram groups and google meet.

All data sources were analyzed using thematic analysis. Thematic analysis was used to categorize the data and form an appropriate theme to answer the research questions. This analysis begins by analyzing the data, constructing code and then presenting the data in the form of tables, maps or diagrams to facilitate the reader to examine the findings obtained.

For the aspect of communication skills, the researcher focuses on the elements of effective communication as stated by Jaafar Muhammad (Petaling Jaya: Leeds Publication, 2004) and Hisham Al-Thalib (Kuala Lumpur: Nurin Enterprise, 1992). Among the elements focused are communication, influence on attitude, enjoyment and understanding. Whereas according to Abdullah and Ainon (2000), effective communication has five characteristics namely understanding, enjoyment, influence on attitudes, improved relationships, and the presence of follow -up actions. According to Nusaabaum, 2007, these communication skills include the skills of writing, reading, arguing, listening, ethics in communicating, and the use of technology. In the current era of globalization, communication skills have become an essential element that is highly emphasized to be mastered by everyone.

Thinking Skills (HLTS), the researcher focuses on the elements of problem solving as stated by the Ministry of Education Malaysia (MOE), 2013. According to the MOE, HOTS is the ability to apply knowledge, skills, and values in making reasoning and reflection to solve problems, make decisions, innovate, and try to create something. Curriculum Development Division (2013), states that, the concept of assessment is the ability to apply knowledge, skills and values in reasoning and reflection to solve problems, make decisions, innovate and be able to create something. Whereas psychologists state that an individual is learning something when he is trying to solve a problem. This is because in the process of problem solving the individual will seek conclusions, apply problems in daily life, learn the law of problem solving and create some techniques or suggestions for problem solving. This process makes an individual more mature (Anderson 1993).

Classroom Assessment (PBD) and Student Academic Achievement

Classroom Assessment (PBD) and academic achievement are documents analyzed by researchers. Classroom Assessment (PBD) focuses on analysis for the review of notebooks, exercise books and projects produced by

students. This review analysis is done in stages based on 3 main domains, namely the domain of knowledge, the domain of scientific investigation and the domain of scientific attitude and pure values. The level of proficiency in students for each component in this excel template is recorded for the purpose of reporting the progress of student learning for a certain period, namely the middle and end of the year. Assessment is done all the time and the level of proficiency in students is monitored on an ongoing basis. This level of proficiency is recorded in a record book, or other place of record and reported twice a year, ie in the middle of the year and at the end of the year.

The Classroom Assessment (PBD) assessment rubric for this student has been prepared by the Ministry of Education Malaysia. This matter is stated in the e-book Guide to the Implementation of Classroom Assessment 2nd Edition, 2019 obtained through the official portal of the Ministry of Education Malaysia. This 2nd Edition Classroom Assessment Implementation Guidebook was published by the Ministry of Education Malaysia Curriculum Development Division, in 2019. The following table shows the PBL scoring rubric for students.

Student Academic Achievement

Researchers also obtained information and data related to students' academic achievement in the summative examination and SPM trial examination for the subject of Biology in the form of documents. Among them are analysis of marks for examination questions, analysis of test specification tables and headcount of student results. The defined document is in the form of a written text (Cortazzi, 2002). Silverman (2000) has stated that document analysis is a written storage material such as books, magazines and newspapers. While the analysis of unwritten documents is like video, audio and film recordings. Additionally Suseela (2001) has stated that document data are available from a variety of sources. Therefore, the researcher will obtain document data related to students 'problem -solving and communication skills through records of students' academic results in the subject of Biology. The record of this document is important to assist researchers in strengthening support for the study conducted later. In addition, the researcher also compared the academic results of students for the Biology subject examination in 2021 through the headcount document in the google drive of a school in Kota Kinabalu. A continuous analysis of the improvement of students for the subject of Biology is made from the results of the summative examination until the trial examination of SPM 2021 (further explanation in appendix K).

Results and Discussion

1. Analysis of Observations on Respondents' Activities While Implementing PBL Online

Problem Solving Criteria	Identify Problem	<u>Defined Problem</u>	Create Strategy Statistics	Create Strategy	Product Effectiveness
Fara	Yes	Yes	Yes	Yes	Yes
Des	Yes	Yes	Yes	Yes	Yes
Col	Yes	Yes	Yes	Yes	Yes
NG	Yes	Yes	Yes	Yes	Yes
Adam	Yes	Yes	Yes	Yes	Yes
Fun	Yes	Yes	Yes	Yes	Yes

The figure above shows that all respondents were able to identify problems and define problems when implementing PBL online. In addition, they can also make statistics on the implementation strategy of PBL and implement the strategy. Next be able to produce creative and functional work. In addition, they also showed an understanding of the projects they were implementing through the responses given during the online PBP implementation. The six respondents interacted with each other, dialogued, asked about issues related to daily life and discussed while performing problem-solving processes. Pupils are able to be actively involved in the learning activities they participate in. It is clear here that through exposure to the problem- solving process during learning sessions, students are able to actively engage in the activities in which they participate.

PBL Draft Analysis

Name	Draft
Fara	Yes
Des	Yes
Col	Yes
NG	Yes
Fun	Yes
Adam	Yes

The figure above shows that all respondents prepared a draft of PBL work before implementing PBL online. As defined in the Malay dictionary, a draft is a writing or drawing prepared roughly at the initial stage or beginning of the implementation of a work. This shows that all respondents make preparations or planning while implementing PBL face to face.

2. Interview Analysis

The following are the statements made by the respondents related to the 3P model. Among the things that drive communication, collaboration, creative and critical skills are the speaking opportunities provided by teachers. In addition, project -based learning is best done in groups as it encourages communication, collaboration, creativity and critical skills among group members. Open and focused questioning techniques are also able to encourage students to collaborate with each other. This in turn encourages students to express opinions, ideas, make connections and explain something based on evidence.

"...what is the factor ... that helps you to communicate actively?..."

[T1_TC_1]

"... when ... given the opportunity to share opinions or ideas, I can go through the results of the information search that I do..."

[T1_DS_1]

"... When I am given the opportunity ... I will feel appreciated because... it seems, all the information I am looking for, I can share with other friends through the opportunity to give an opinion... hmm, and I feel more confident to do PBL in groups..."

[T1_CL_1]

"...I will interact with my group members through direct question and answer... we can work with each other and give each other's opinions..."

[T1_FR-1]

"...open-ended questions and answers conducted by teachers, allowing us to express our opinions with each other's explanations..."

[T1_AD_1]

"... Okay ... for you, through open question and answer... you can give your opinion during PBL... right?..."

[T3_TC_1]

"...when the teacher told us to implement a project that was not related to the textbook..."

[T3_FR_1]

"...on the other hand, express my opinions and talk more in groups when implementing a new project, especially issues related to daily life... because it's not boring, it even encourages me to interact more actively to get information ... hmmm... talk more actively..."

[T3_AD_1]

In addition, PBL issues that are not related to the content of the textbook are also able to encourage students to apply the 4C elements in learning sessions. This is because, through issues related to real world problems, they have the opportunity to conduct the research process more closely. They can also understand a biological concept in more detail. This in turn encourages students to innovate through the implementation of PBL. It is clear here that the implementation of PBL is also able to encourage students to apply their imagination and creativity.

"...what are the factors that motivate you to conduct question and answer sessions while implementing PBL?..."
[T1_TC_1]

"...hmmm... I have a lot of question and answer with other group members because this issue is very interesting and not unrelated to textbooks... through this issue, only then did I know apparently the concepts I learned all this time have something to do with my daily life..."

[T1_FR_1]

"...for you, right... hmmm... what is the difference between pdp that we have made so far with the implementation of PBL?..."

[T2_TC_1]

"tcer ... bfore this, I just listened and focused on what the teacher in front of the class said ... I just kept quiet and focused... that time, I don't know what I've learned so far has anything to do with with daily life. But, through PBL... I can clearly see the relevance of a concept to my daily life... because I ask a lot of questions and share information with other group members..."

[T2_DS_1]

"...PBL provide the opportunity for me to implement the project. So, to find the solution... I ask a lot of questions and share information and experiences with other group members... I get more information... the more I learn from these questions and answers, the more questions arise in my head about this concept..."

[T2_FR_1]

"...encourage me to interact more... because sy is a quiet and shy person... when my opinion is disputed, I will try to explain the info more clearly based on the evidence I have so that they can receive the info I am looking for..."

[T2_AD_1]

"...how about specific question given during PBL? is that okay?..."

[T3_TC_1]

"...focused questions help me to focus more on the investigation I am doing... therefore, I can understand the meaning of a concept in more depth... For example right... the concept of mitosis occurs in plant cloning... through the information search I did, I was excited to make a serum innovation that uses clove flower extract... because the serum concept uses the concept of cell division..."

[T3_AD_1]

"...questions asked by the teacher while he was monitoring us making PBL in groups helped us to stay on track... we were able to implement PBL effectively because our investigation focused on the results of the teacher's guidance... n were able to eat again..."

[T3_AD_1]

"...what makes you eager to implement PBL? ..."

[T3_TC_1]

"... an interesting issue but related to our lives ..."

[T1_FD_1]

"... when we discuss a new and life -related issue... at least we know this thing is useful and it works... then we can apply it in our daily routine..."

[T1_FD_2]

"... example kan tcer... in the textbook state about the concept of cell division... so, when we make PBL... we use the issue of making serum... the function of this serum is actually to promote younger cells... when we know plant extracts that can be used in making serum , we can also make our own serum... more eager to make products that can benefit ourselves... "

[T2_CC_1]

"... because if you study to use a textbook... for pbl also use the same kind... kind of good don't bother for a project... better just copy the textbook..."

[T3_AD_1]

"... for sy okay tcer... because kan... focused questions help me to focus more on the investigation that I do... therefore, I can understand bah a concept in more depth ..."

[T9_AD_1]

"... I agree with adamlah... unfocused questions will make me focus more in the process of finding information..."

[T9_FD_2]

"... me too tcer... I prefer if PBL uses open -ended but focused questions because I can find out something new in more detail and thoroughly..."

[T9_CC_1]

"... when we were guided... he really helped me and my friends to find information in a focused way than before, I only implement passive learning... so an observer ..."

[T10_CC_1]

In addition, the role of the teacher as a facilitator is also able to ensure that the implementation of a learning can be implemented systematically and effectively.

"... tcer time to be a facilitator... tcer can guide us... then we have a guide to make pbl..."

[T11_NG_]

"... when tcer acts as a facilitator... we can stay on track... we can implement PBL effectively because our investigation focuses on the results of teacher guidance ..."

[T11_AD_1]

"... best again tcer just facilitator... because tcer guides us how to solve the problem... instead of... just teach in front... if teaching in front is very boring and passive ..."

[T11_FD_1]

"... I prefer the teacher to function as a facilitator rather than the teacher just giving an explanation in front of the class ..."

[T11_CC_1]

"... it's very interesting and encourages me to think of more new things that have to do with the biological concepts I'm learning ..."

[T13_NG_1]

Even so, during the execution of group work, task specifications need to be implemented. This is important to prevent group members from taking advantage of the abilities of other group members. In addition, it can also prevent the domination of work by certain individuals.

"...so in group work... if there is no task specification... does anyone take advantage? ..."

[T2_TC_1]

"... yes ... tcer... Even before this, I just sat and waited for other friends to complete group projects, then, some didn't do it right... because I don't feel like there is back up too... so, when the teacher for us the task specifications in detail, I feel more responsible and I know bah... focus of the project that I need to complete in groups..."

[T2_DS_1]

"...hmmm... Teamwork trains us to talk to each other, share information, and make decisions together..."

[T2_FR_2]

Responses from participants showed that they were more motivated to resolve an issue in PBL that was related to real life and not tied to the content of the textbook. Issues that revolve around real life expose students to problem-solving processes. Therefore, students can understand a concept and the relationship of the concept of biology with real life clearly. Students will appreciate knowledge more when they can understand the benefits of that knowledge to them. Therefore, teachers need to be more creative in the selection of issues or problems while using project -based learning methods. This is important to ensure that a biological concept is widely and deeply exposed. If the teacher only relies on the content of the textbook alone, students will feel bored and continue to be passive from engaging in learning activities carried out.

"... high curiosity encourages us to ask more questions, sharing knowledge and experience ..."

[T4_DS_2]

"... Example kan tcer... when we share information... I can further develop the idea that I am... through the sharing of knowledge and experience... our discussions are so more detailed... and broad..."

[T5_NG_2]

"... I just listened and focused on what the teacher in front of the class said ... I just kept quiet and focused... that time, I didn't know what the function and relevance of the concepts I learned was to my daily life.... I've been bored for a long time... but when I do PBL online... I do pbl guided... I know what I need to focus on... we can discuss... we collaborate... and I'm excited to create a new product ..."

[T6_DS_2]

"... I'm a tcer... Pbl online encourages me to interact more and have a dialogue... because we both discussed compare from before... I just became an observer and just did what was instructed..."

[T6_CC_1]

In addition, online PBL can also facilitate the discussion process among group members. Students are not only able to share information and ideas, but students are more motivated to collaborate in producing quality and functional products. Pupils are able to discuss systematically through question and answer and dialogue sessions among group members. Discussions become more systematic when the discussion is guided by the teacher. Indeed, the role of the teacher as a facilitator is very important to ensure that the discussion that takes place can be conducted in a focused manner through questioning sessions. Student -centered learning provides opportunities for students to build a variety of knowledge and skills.

"... pbl best... but I'm also worried if we do it right... but other members make sambal lewa... then... our marks are affected ..."

[T7_DS_1]

"... if the scoring system is done externally... individually and in groups, I feel more confident to implement PBL in groups... because I no longer have to worry about the performance of other group members that will affect my marks..."

[T8_CC_1]

"... Before this, I was willing to offer myself to complete the project on my own even if I did PBL in a group... because I was worried that... hahah... other group members could not do their best and could affect my marks..."

[T8_FD_2]

"... separate marks motivate me and the other group members to be more alert... and we are still diligent in producing the best project... we communicate a lot because we want to produce the best project ..."

[T8_DS_2]

One of the aspects that need to be considered when implementing PBL online is the student scoring system. Preferably the scoring system is implemented individually and in groups. This is important to ensure continued commitment from each member of the group. They will continue to collaborate, communicate, discuss, dialogue and exchange views to produce projects that work best. This also encourages students to be actively involved in the learning activities in which they participate. They will be more motivated to implement project -based learning.

3. Document Analysis

Examination Marks

Analysis of SPM Trial Examination Marks

Name	Paper 1	Paper 2	SPM Trial Test Results
Fara	35	65	71 (A-)
NG	33	67	72 (A-)
Adam	37	72	78 (A-)
Des	30	54	60 (B)
Col	35	72	76 (A-)
Cel	38	76	81 (A)

Comparison of Semester 1 Examination Marks and SPM Test

Name	Semester 1 Result	SPM Trial Result	Comparison
Fara	44	71	+27
NG	59	72	+13
Adam	51	78	+27
Des	43	60	+17
Cel	60	76	+16
Col	55	81	+26

Based on the figure above, all respondents showed a significant increase in marks in the semester 1 examination and the SPM trial examination. All respondents got A- and A grades, while another respondent got a B grade. This shows that all respondents can achieve the optimum level in the SPM trial semester examination. All respondents have been able to get used to answering questions in the form of easy, medium and KBAT in the SPM trial examination. This is because the percentage of preparation of questions in the form of KBAT for this examination question is 40%, the percentage of preparation of simple questions is 20%, while the percentage of preparation of medium questions is 40%. In addition, all respondents indicated that they have mastered at least 50% in the learning syllabus in semester 2 for the subject of Biology. This is because respondents can understand the content of learning that they learn and there is an improvement in students' problem-solving skills.

Pupils' Learning Levels in Classroom Assessment (PBD) and Project Marks of Semester 2 Respondents Level of Learning (PBD) and Project Marks of Respondents Semester Two

Name	Semester Two Level	PBL Project Mark
Fara	6	92
NG	5	96
Adam	5	92
Des	5	90
Cel	6	96
Col	5	90

The figure above shows that all respondents were able to achieve levels five and six in classroom assessment (PBD) in semester 2 for the subject of Biology. Respondents who achieved level five of learning in PBD showed respondents were able to formulate how concepts are used to address a particular problem or issue, formulate the effects of a problem, and always use scientific language to communicate with them. well and document all sources of information used. While level six shows students who can formulate how concepts are used to address a particular problem or issue, discuss, and analyze concepts to solve a particular problem, use scientific language consistently to communicate clearly and accurately, document information sources and be role models to other students.

Conclusion

In developing balanced and prosperous students who are nurtured with the Six Aspirations of Students, teachers and administrators need to be creative to use the resources available, or that can be obtained through the cooperation of various parties to optimize the teaching and learning process. Pupils who come to school these days are no longer like 'empty barrels' that need to be filled with knowledge. Pupils in the 21st century go to school armed with knowledge gained from various sources from outside the classroom.

It is recommended that students be aware of and use the various forms of support provided by peers, teachers, schools or existing technology available to them. teachers should also promote a constructivist learning environment by taking into account three main principles namely pedagogical, social and technological aspects. Teachers must ensure that the rules and strategies implemented can be clearly defined. Therefore, to improve the quality of communication, necessary facilities such as better internet connection should be provided, or improved to ensure that online support can be fully utilized by students.

References

- Akhtar H, Abdul Ghani Azmi I, (2017). Komunikasi kepimpinan berkesan. *Jurnal syariah*, 25 (3).
- Amir, Aris, Ahmad Rozelan, Yunus, (2016). Komunikasi Berkesan. ResearchGate.
- Aziza Kaylu. (2015). Implementation of Project-Based Learning (PBL) in EFL (English as a Foreign Language) classrooms in Fezalar Educational Institutions (Iraq). 5th Internasional Research Conference on Education, ISSN 2298-0180.
- Brown C, TEXAS A. (2012). The implementation of project-based learning. *National Forum of Educational Administration & Supervision Journal* 26-26, 30(1).
- Fazilah Binti Razali, Othman Bin Talib, Azraai Bin Othman. (2016). Aplikasi Kemahiran Proses Sains Dalam Pembelajaran Berasaskan Masalah Untuk Mata Pelajaran Biologi. *Jurnalkurikulum & Pengajaran Asia Pasifik*, Bil 4, Isu 3
- Fazliza Binti Che Mat. (2015). Kesan Pengajaran Dialogik Terhadap Kemahiran Menaakul Saintifik, Kemahiran Berhujah dan Pencapaian Sains Dalam Kalangan Murid Sekolah Rendah. (Tesis Doktor Falsafah, Universiti Sains Malaysia). Diambil semula dari <http://eprints.usm.my/31391/1/FAZLIZA.pdf>
- Hafiza Binti MD Nasir. (2012). Keberkesanan Pembelejaran Aktif Terhadap Pencapaian Pelajar Perempuan Dalam Biologi. *Fakulti Pendidikan Teknik dan Vokasional*.
- Halim, Mohamad Nizam Arshad dan Abdul, (2017). Menjana kemahiran berfikir aras tinggi (KBAT) dalam penyelesaian masalah matematik tambahan. *Universiti Teknologi Malaysia*.
- Halizah Binti Awang. (2010). Kesan Pembelajaran Berasaskan Masalah Terhadap Penguasaan Kemahiran Generik Dan Pencapaian Akademik Pelajar Di Politeknik Malaysia. *Tesis Doktor Falsafah*.
- Ismail, Anita, Muda @Ismail, Farah Laili, Sulaiman, Adibah, Mohd Nizah, Mohd Azmir, Abdul Latiff, Latifah, Sulaiman, Mashitah, Mat Yaacob, Siti Norbaya, Kandil, Hisham Mohammad Taky Eldin, (2020). Pembentukan Pemikiran Kreatif dan Kritis: Hubungannya Dalam Menyelesaikan Masalah. *Sains Insani*, 5(1).
- Jeremy L. HSU, Stanley M. LO, Brian K. SATO. (2021). Defining Understanding: Perspectives from Biology Instructors & Biology Education Researchers. *The American Biology Teacher*, No. 6.
- Joseph, Suresh Kumar, Alimon, Hashimah, Yusoff, Amri. (2019). Learning Biology through Digital Games (DG) in Form Four Classrooms in Malaysia. *Journal of Science and Mathematics Education in Southeast Asia*, 42.

Mock Domestic Inquiry As An Alternative Assessment for Human Resource Management Course

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ABSTRACT: The Human Resource Management course covers topics of employee recruitment and selection, performance and appraisal, pay and working hours systems, benefits and rewards, managing industrial disputes, increasing productivity and commitment, training and development, safety and health, as well as disciplinary and termination systems. One of the important objectives of this course is to ensure that students can handle cases of misconduct in the organisation through mock domestic inquiry. Relevant lectures are delivered to students to ensure that students understand the methods of conducting domestic inquiry. Alternative assessment is one of the significant ways to assess students' abilities and highlighting a more holistic level of student understanding. For that purpose, to ensure the effectiveness of this Human Resource Management course, alternative assessment through role-playing mock domestic inquiry has been designed to produce human resource practitioners who not only understand the functions of human resource management but also able to adopt an efficient and fair approach to managing human resources. Most importantly, this alternative assessment will able to assess students' ability to understand the procedures in domestic inquiry in resolving the issue of employee misconduct in the organisation. This alternative assessment is found to provide added value to students in terms of communication skills, problem solving as well as teamwork.

Keywords: alternative assessment, human resource management, domestic inquiry, communication skills, problem-solving skills.

Introduction

One of the core courses offered in the Industrial Relations programme, Faculty of Social Sciences, University Malaysia Sabah is Human Resource Management (HRM). HRM is one important course as it helps students to develop a strategic approach to recruitment, discipline and every other intricacy of human resource.

HRM is an important element in an organisation. HRM functions among others include employee recruitment and selection, training, performance appraisal, payment system wages and working hours, benefits and rewards, occupational safety and health, productivity, as well as discipline and termination of service (Aminuddin, 2018). Managing employee discipline through domestic inquiry practices is credible evidence that employers have taken the necessary steps to ensure that employees are treated fairly should complaints of misconduct are reported within the organization (Aminuddin, 2020).

Human Resource Management course is a core course of the Industrial Relations Programme offered to second year students (2) in semester I. One of the objectives of this course is to ensure students are able to demonstrate techniques /steps to solve misconduct cases through mock domestic inquiry (LOD3).

Smaldino et al. (2000) noted that traditional assessment often focuses on students' ability in memorization and remembering, which is a lower level of cognitive skills. In addition, traditional assessment tools require students to demonstrate their knowledge with a predetermined way (Timmins, 1996). Alternative assessments, on the other hand, assess a higher thinking skill, whereby students have the opportunity to demonstrate what they have learned (Dikli, 2003).

Thus the rational of the project and in ensuring that graduates are able conduct domestic inquiry in order to practice in the real world upon their graduation, students are exposed to handle mock domestic inquiry through performance-based assessment. This assessment of mock domestic inquiry requires students to form an inquiry panel which then handles cases of misconduct with a proper methods.

In the mock domestic inquiry, they have to submit relevant documents and evidence on behalf of the prosecution team in order to prove the 'accused' guilty and the defence team to give the opportunity to the 'accused' to be treated fairly. The panel the domestic inquiry should then produce a result and justify the decision.

Alternative assessment is one of the significant ways of helping to enhance students' abilities and highlighting a more holistic level of student understanding. For that purpose, to ensure the effectiveness of this Human Resource Management course, alternative assessment through role -playing mock domestic inquiry has been designed to produce human resource practitioners who not only understand the functions of HRM but also to adopt an efficient and fair approach to managing human resources.

The Course Approach

Basically, domestic inquiry is a common practice performed by the Human Resource Management Department in real-world organisations to handle cases of misconduct among employees. However, to elevate it into an alternative form of assessment in learning and teaching sessions in the Human Resource Management course, this mock domestic inquiry is an original idea. The idea came when I attended a Domestic Inquiry Workshop in Petaling Jaya in 1999 which was most attended by HR practitioners.

Since then, it gave me the inspiration to make a mock domestic inquiry as one of the methods to enhance students' understanding of related topics. Usually lecture related to the system of discipline and handling of employee misconduct are delivered conventionally. However, to ensure that students' ability to understand this topic is at the optimum level, it is appropriate to have a role play activity to be implemented. This method is not only intended as an assessment tool, but it is also involving all students to equally highlight their natural talents and abilities through the roles and characters they play. Students also feel elated to be able to highlight their hidden side all this time. Most importantly, students are able to practice the methods of conducting domestic inquiry directly.

Whether when mock domestic inquiry face to face in mock court (before COVID-19 movement control order - MCO) or online mock domestic inquiry (during COVID-19 pandemic MCO), the results shown by students are fruitful and beyond expectations. It seems that the internet constraints during MCO did not prevent the success of the learning outcomes of this course. This can be seen through the results of the assignments they do are indeed great whereby their ability in solving the problem of misconduct cases through mock domestic inquiry has been successful (see Figure 2). The positive motivation and dedication of students in succeeding in this alternative assessment task is also shared in the course reflection through SmartUMS (UMS online learning management system) at the end of the semester.

Alternative Assessment and Learning Outcomes

There are three Course Learning Outcomes (CLOs) have been developed for this course. One of the CLOs of this course is to ensure that students can handle cases of misconduct (discipline issues) in the organisation through mock domestic inquiry. The objective of this alternative assessment project is to produce students who can demonstrate techniques problem solving through mock domestic inquiry.

One of the main features of this course is that it involves practical skills in conducting an internal investigation through a role-playing method referred to as mock domestic inquiry. This is in line with the Malaysian Qualifications Framework (MQF) learning domain (PLO 3) - to play the role of conducting important domestic inquiry as one of students' continuous assessment. This alternative assessment is important because students need to know; (i) to form a domestic inquiry panel; (ii) submit relevant documents and evidence; (iii) role-play and , (iv) make decisions and justifications on cases of misconduct under investigation. Thus, alternative assessment through role-playing method is very much in line with the learning outcomes.

Mock Domestic Inquiry: Performance-Based Alternative Assessment

According to Simonson and others (2000), there are three approaches in alternative assessment: Authentic assessment, performance-based assessment, and constructivist assessment. Similarly, Reeves (2000) suggests three main strategies to integrate alternative assessment into online learning settings: namely cognitive assessment, performance assessment, and portfolio assessment. Researchers and educators use the term performance-based, alternative, and authentic assessment interchangeably. As Wangsatorntanakhun (1997) states the term, performance-based assessment, embraces both alternative and authentic assessment.

As such, the alternative assessment for this mock domestic inquiry is based on performance assessment. In general, performance-based assessment measures a student's ability to apply the skills and knowledge learned

from a single topic. Typically, an assignment challenges students to use their higher order thinking skills to complete and explain the process.

In the context of mock domestic inquiry, the student's ability to demonstrate 'the know-how' and steps in conducting domestic inquiry of misconduct cases is critical, in addition to being able to animating each other's roles facilitates students to practice the correct methods. In addition, planning performance-based assessments through role-playing, is essential for in-depth learning, student engagement, and giving students experience of real-world applications. Thus, this alternative form of performance-based assessment through mock domestic inquiry is indeed suitable for measuring the learning outcomes that have been set.

Mock Domestic Inquiry: Planning, development and implementation of alternative assessments

Moving in groups, students are required to select cases of fictitious misconduct in the organisation of their creations. Based on the background of the Sabah / Sarawak Labour Ordinance 1959 / Employment Act 1955, each group must have an 'accused' (who is being tried for misconduct); inquiry panel (consisting of Chairman, Deputy Chairman and Secretary); the prosecution team (consisting of human resource management and witnesses); as well as the defence force (consisting of the union, employees and witnesses). Each student needs to master 'the know- how' and 'step-by-step' in conducting this domestic inquiry.

The misconduct case in this mock domestic inquiry is fabricated (which can be inspired from real cases) and need to be discussed with the lecturer for approval. The selection of the case also needs to go through a process of screening and the consent of many members of the group as each prosecution and defence team needs to think of the evidence that needs to be presented during the mock domestic inquiry.

To succeed in this assessment, students need to provide all relevant documents such as complaint letter, preliminary investigation notification letter, charge letter, panel appointment letter, internal investigation letter as well as provide evidence related to charges and defence. Each group was then required to do a rehearsal before the final mock domestic inquiry can be performed. The following Figure 1 illustrates the planning and mock implementation of domestic inquiry.



Figure 1: *Planning and implementation of mock domestic inquiry*

Student Involvement

For the purpose of ensuring that the course learning outcome (CLO) of this course is achieved through alternative assessment — performance, teaching and learning methods are important. These performance-based alternative assessments are able to optimally increase student engagement as each individual has to play a role, they are each in the success of this mock domestic inquiry. Each group must solve one case of misconduct that is common in real organisations. However, in this assignment, each group can create a case of misconduct and their own pseudo-organisation. In order to succeed in this activity, each individual needs to understand and know the steps in conducting a domestic inquiry.

In addition to emphasizing the cognitive aspect, this assessment also indirectly enhances the affective element when the role played by each student carries a different function but to achieve the same goal which is the resolution of the misconduct cases. Students who take on the role of the domestic inquiry panel function to listen

analyse evidence and make decisions. Students working in the prosecution team aimed to show that the accused was guilty. While those who defend the accused aim to ensure that the accused is defended. Thus, this mock domestic inquiry is indeed able to increase the involvement of all students in meaningful teaching experiences from both cognitive and affective aspects.

Impact On Learning Outcomes

Impact on learning outcomes: Value-Added

Alternative performance-based assessments are structured based on real-world scenarios in fostering and reinforcing critical thinking and problem solving. It is also structured to measure students' ability to apply the knowledge and skills they have learned.

The misconduct case in this mock domestic inquiry is fabricated (which can be inspired from real cases) and need to be discussed with the lecturer for approval. The selection of the case also needs to go through a process of screening and the consent of many members of the group as each prosecution and defence team needs to think of the evidence that needs to be presented during the mock domestic inquiry.

This role-play assessment involves all students working together to succeed in their mock domestic inquiry. The process of handling mock domestic inquiry requires proper steps and methods and students measure their abilities through a holistic understanding of domestic inquiry in the organisation. Assessment shows that students successfully achieve the learning outcomes of the course as illustrated in the following Figure 2. A total of 30% is allocated for this assessment.

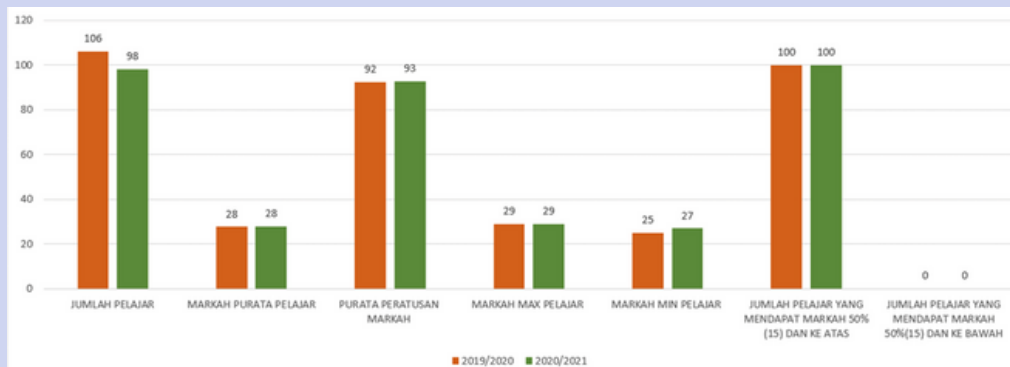


Figure 2: Achievement of Learning Outcomes of CLO3 Through Mock Domestic Inquiry

Prior to the COVID-19 MCO, the assessment was conducted face-to-face in a mock court (Photo 1). However, during MCO, the assessment was done online through mock pre-recording of domestic inquiry (Photo 2). Both methods show that students are able to achieve the learning outcomes of the course.



Photo 1: Mock domestic inquiry at the mock court



Photo 2: Online mock domestic inquiry

Impact on learning outcomes: Benefits and Potential

Impact on Students. Mock domestic inquiry essentially measures students' understanding of the steps of conducting an domestic inquiry specialising in the field of human resource management. However, it can also be extended to different fields such as communication, language, law and others, especially if it involves improving communication skills. Communication students for example, can use this mock domestic inquiry to hone their oral communication skills. Language learners can apply their language skills (including foreign language skills). Meanwhile, law students can take advantage of this mock domestic inquiry activity in arguing, presenting evidence and then applying their understanding and skills in the field of law, especially labour law.

Alternative assessment through this mock domestic inquiry is an exercise for students to understand the ins and outs of operating a disciplinary system and employee misconduct in an organisation. Furthermore, its use can be extended to all workplace organizations as long as it involves employers and employees.

Impact on Work Organisation. This alternative assessment project also has the opportunity to be used as a guideline (manual) and adapted for the use of work organizations, especially small, medium firm and informal industries that are commonly still not exposed with the handling of employee issues. This is important in ensuring that employers and employees achieve a win-win situation and that both parties get justice if it involves issues of discipline and misconduct.

Conclusions

The Human Resource Management course covers topics of employee recruitment and selection, performance and appraisal, pay and working hours systems, benefits and rewards, managing industrial disputes, increasing productivity and commitment, training and development, safety and health, and disciplinary and termination systems. To ensure that students benefit from this course, alternative assessment is used so that students can increase their understanding and experience as HR practitioners through various activities such as mock domestic inquiry.

This mock domestic inquiry project is indeed beneficial especially to students. High authority and discipline in implementing mock domestic inquiry can certainly mature and convince students especially when entering the world of work. The experience of handling mock domestic inquiry to some extent can help students when graduating to manage the organisation specifically if it involved issues of employees' discipline and misconduct.

Importantly, students are also exposed to the 'knowledge' and 'know-how' to conduct domestic inquiry whereby enhance their practical skills which can be adapted by students from other disciplines e.g. law or communication. Additionally, this alternative assessment project can also be adapted to other courses that emphasise communication skills, teamwork as well problem-solving skills.

This mock domestic inquiry project has won gold medals in International Putera InnoCreative Carnival in Teaching and Learning (PicTL 2021) and in Anugerah Kecemerlangan Dan Inovasi Pengajaran & Pembelajaran (AKIPP) Universiti Malaysia Sabah, 2021. It is hoped that this mock domestic inquiry project will be able to give an idea about the uniqueness and benefits of alternative assessment and at the same time be able to enhance students' understanding of a course more effectively.

References

- Aminuddin, M. (2018). Human Resource management. Principles and Practices. (4th ed.). Kuala Lumpur: Oxford University Press.
- Aminuddin, M. (2020). Termination of employment. Understanding the process. (3rd edition). Kuala Lumpur: CLJ Publications.
- Dikli, S. (2003). Assessment at a distance: Traditional vs. Alternative Assessments . The Turkish Online Journal of Educational Technology – TOJET. 2 (3) pp. 13-19. <https://files.eric.ed.gov/fulltext/EJ1101956.pdf>
- Reeves, T. C. (2000). Alternative assessment approaches for online learning environments in higher education. Educational Computing Research, 3(1) pp. 101-111.
- Simonson M., Smaldino, S, Albright, M. and Zvacek, S. (2000). Assessment for distance education (ch 11). Teaching and Learning at a Distance: Foundations of Distance Education. Upper Saddle River, NJ: Prentice-Hall.
- Timmins, A.C.B. (1996). Multiple Intelligences: Gardner's Theory. Practical assessment, practical and evaluation. 5 (5). pp. 1-3.
- Wangsatorntanakhun, J. A. (1997). Designing performance assessments: challenges for three-story intellect [online document]. Teaching with internet. Available online: <http://www.geocities.com/Athens/Parthenon/8658/>

Secondary School Students' Achievement in STEM-Based Learning

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ABSTRACT: This paper discusses the status socio-economy of families that impact students' achievement in STEM-based learning. A total of 138 students 13 years old age involves in this research. The collected data was then analyzed using descriptive analysis and two-way ANOVA. The test contains 37 items and the reliability of Cronbach Alpha is 0.64. The findings showed that there was a significant difference in the mean score of Post-test achievement for the treatment group with the control group. However, the mean score of the Post-test achievement for the HSE group was significantly higher than the MSE and LSE groups. In addition, the HSE group given the treatment with the STEM Inspiration Module achieved better than the HSE group that received conventional learning. Thus, to encourage students from Middle socioeconomic status and Lower socioeconomic status families to participate in STEM based-learning the materials and tools used in the module were inexpensive, easy-to-find, and recycled items. By doing these, the teachers can motivate them to join STEM-based learning that is integrated into the science classroom.

Keywords: science, achievement, socio economic status

Objectives

The aim of the study was to:

- 1) Identify the mean score of the Achievement of the Pre-Test between the group participating in the STEM Inspiration Module and the group that follows conventional learning.
- 2) Identify the difference in the mean score of Post-Test achievement between the group participating in the STEM Inspiration Module and the group that followed conventional learning.
- 3) Identify the difference in the mean score of the Post-Test achievement between different groups Socioeconomic status participating in the STEM Inspiration Module.

Research Questions

Specifically, the study wanted to find answers to the main questions as follows:

- 1) Is there a difference in the mean score of Post-test achievement for different SSE pupils between the control group and the treatment group?

Methodology

This study employed a quasi-experiment that used purposive sampling to collect data from 138 Form One students. The sample was divided into treatment group and control group. Sample in each group then labelled based on their family socio-economic background (High Income, Middle Income and Lower Income).

The students are grouped according to their family socio economic status. Based on Poverty Guidelines that issued by Economic Planning Unit (2014), poor families in Sabah are those with household income lesser than RM1170. Based on these reports, families with monthly income of RM710 and below are categorized as Lower Socioeconomic Status (LSE) group. Families monthly earned between RM711-RM1170 were categorized under Middle Socioeconomic (MSE) group. While families with monthly earned of RM1171-RM12159 categorized under Higher Socioeconomic (HSE) group.

The science test contains 37 items and covers six topics in Form One Science subject. The face validity was investigated by getting help from panel of expert to ensure readability of the instruments and students' comprehension. The science test was tested on 34 students. Linacre (1994) explained that 30 examinees are sufficient for well-designed pilot studies. The reliability of the Science Test instrument result showed value of 0.68. The content and face validity of the test was verified by experts' panel.

Literature Review

The post-industrial and post-globalization era has been circled with the progress of Science and Technology. Thus, Science-Technology-Engineering-Mathematics (STEM) was introduced and became the focuses of Ministry of Education Malaysia. In 2013, it is reported that the participation of secondary school students in the science stream was low, which is 29% and a small fraction of 4.5% in the vocational stream (Mohamad et al., 2015). Moreover, the national achievement score in TIMSS has declined from year 2003 to 2011, and in 2015 students' show slightly increases in science achievement (Curriculum Development Division, 2015).

Thus, innovation in science teaching is needed to increase participation and to improve students' achievement in science. In this study, the STEM Inspiration Module was developed to help promote the integration of STEM in science subjects. The aim is to increase student involvement in inquiry-guided activity-centered learning while implementing STEM Activities.

To study this situation in real life setting, we will look at parents' socio-economic status. These aspects need to be emphasized because The U.S. National Center for Educational Statistics in 2011 reported that students with families of Low Socioeconomic Status lack basic skills in Science, Technology, Engineering and Mathematics (Christensen, Knezek, & Tyler-Wood, 2014). However, students from families with high socio-economic status have achieved better academic achievements (Navarro, Flores & Worthington, 2007). Thus, in these studies, we will focus on parents' income, and their educational level on impacting students' achievement in STEM-based learning.

Good quality of life ensures the comfort of students to learn and live in their daily lives. However, almost 12% (767 thousand) of households in Malaysia earn RM2000 a month and below (Cahron, 2016). In 2007, the poverty rate in Sabah recorded the highest value of 16 per cent compared with Sarawak in second place with 4.2 per cent and lastly Peninsular Malaysia with the lowest percentage of 2.3 per cent. Understanding about family socio economic status is important in this study. This is because, the literature on achievement consistently has shown that parents' income is important in predicting children's achievement (Halle, Kurtz-Costes, Mahoney, 1997; Hak, 2004). This proves that the achievement gap exists between different pupils of socio-economic status. Thus, the researchers determine to study the impact of family socio economic background on students' achievements.

Findings

The main factor in the occurrence of dropouts is the socioeconomics of the family. influence of family socioeconomic background consisted of family income, parental occupation, parental education level, and family support (Zakari, Majid, & Hussin, 2022). In this study, the researchers focused on Table 1 parental education level and table 2 family income.

Table 1
Father Level of Education

	Treatment	Control	Sum
No	6	0	6
No School	12	19	31
UPSR	8	15	23
PMR	7	7	14
SPM	18	22	40
Diploma/STPM	9	3	12
Bachelor's Degree	8	2	10
Master's Degree	0	2	2
Sum	68	70	138

The results of the analysis of Table 1, the Father's Level of Education, showed that 23 people (16.7%) received the minimum education which is completion of Ujian Penilaian Sekolah Rendah (UPSR). A total of 14 people (10.1%) successfully obtained the certificate of Penilaian Menengah Rendah (PMR) and a total of 40 people (28.9%) successfully completed the Sijil Pelajaran Malaysia (SPM). There are also fathers who pursue higher education such as Diploma, Bachelor's Degree and Master's Degree which are 12 (8.7%), 10 (7.2%), and two (1.4%) respectively. The remaining 31 fathers (26.3%) not attends school and the remaining six (4.3%) were recorded as missing (divorced or deceased).

Table 2
Mother's Level of Education

	Treatment	Control	Sum
No	6	0	6
No School	8	20	28
UPSR	12	20	32
PMR	8	4	12
SPM	20	18	38
Diploma/STPM	1	4	5
Bachelor's Degree	13	3	16
Master's Degree	0	1	1
Sum	68	70	138

Further, the researchers examined the level of Mothers' Level of Education. The aim is due to the culture in Malaysia which demands that fathers serve as the main source of financial search while the responsibility of educating the child is left to the mother. A total of 32 people (23.2%) received minimum education Ujian Penilaian Sekolah Rendah (UPSR). A total of 12 people (8.7%) successfully obtained the of Penilaian Menengah Rendah (PMR) and 32 (23.2%) completed their Sijil Pelajaran Malaysia (SPM) education. Apart from that, there are also mothers who pursue higher education such as Diploma of five (3.6%), Bachelor's Degree of 14 (10.1%) and Master's Degree of one person (0.7%). The remaining 28 people (20.3%) not attends school and the remaining six (4.3%) were recorded as missing or divorced.

To investigate the parents' socio-economic status, the researchers profiled parents' income. The goal is to classify the study sample into a group of students with High Socio-economic Status (HSE), Moderate Socio-economic Status (MSE) or Low Socio-economic Status (LSE). The data for the amount of income is obtained in the form of raw data and then converted into scales. The following Table 3 is an analysis of socioeconomic status for the student's family.

Table 3
Number of participants by Socio-economic Status

	Treatment	Control	Sum
LSE	24	21	45
MSE	23	29	52
HSE	21	20	41
Total	68	70	138

According to Table 3, the results of the analysis showed that 45 (31.6%) of poor families were categorised with incomes of RM710 and below were categorized as LSE groups. Subsequently, a total of 52 (46.8%) families earned an income of RM711-RM1170 and were categorized in the MSE group. Moreover, 41 (12.7%) families were categorised as students of the High Socio-economic Status (HSE) group.

The researchers conducted a two-way ANOVA to test two independent variables. The first variable is type of group consisting of a treatment group that received lessons based on the STEM Inspiration Module and a control group that received traditional method lessons. The second independent variable is socio-economic status that can be divided into three groups namely High Socio-economic Status (HSE), Moderate Socio-economic Status (MSE), and Low Socio-economic Status (LSE). The mean score of the Post Science Test achievement is shown in Table 4.

Table 4
The mean score of Post Science Test Achievement by Socio-economic Status

Socio-economic	Group	x	p	n
LSE	Treatment	32.84	12.51	24
	Control	22.97	8.39	21
	Sum	28.24	11.78	45
MSE	Treatment	38.96	13.77	23
	Control	31.10	13.44	29
	Sum	34.58	14.02	52
HSE	Treatment	37.17	16.07	21
	Control	35.49	12.25	20
	Sum	36.35	14.18	41
Total	Treatment	36.25	14.14	68
	Control	29.92	12.62	70
	Total	33.04	13.72	138

Prior to the two-way ANOVA analysis, the researchers conducted a Levene test to test the variance homogeneity in the dependent variable (Post Science Test) against independent variables (group and SSE). Analysis of the Levene Test is shown in Table 5.

Table 5
Levene Test for Post-Science Test

F	df1	df2	p
2.65	5	132	.03

The Levene test in Table 5 shows, the Post-Science Test is insignificant to the group and SSE [$F(5, 132) = 2.65, p > 0.01$]. According to Field (2010), the assumption of variance homogeneity is observed because the value of the significance is above 0.01. Thus, the conditions of variance homogeneity are met and the bilateral ANOVA analysis can be continued.

Table 6
Bilateral ANOVA Test Results for Difference in Post Science Test Mean Score Between Treatment Group and Control Group Based on SSE Factor

Enabler Change	Sum squared Type III	min	Min squared	F	Itself.	Partial Eta Squared
Group	1421.40	1	1421.40	8.43	.004	.06
SSE	1826.23	2	913.11	5.42	.005	.08
Group* SSE	389.03	2	194.52	1.15	.320	.02

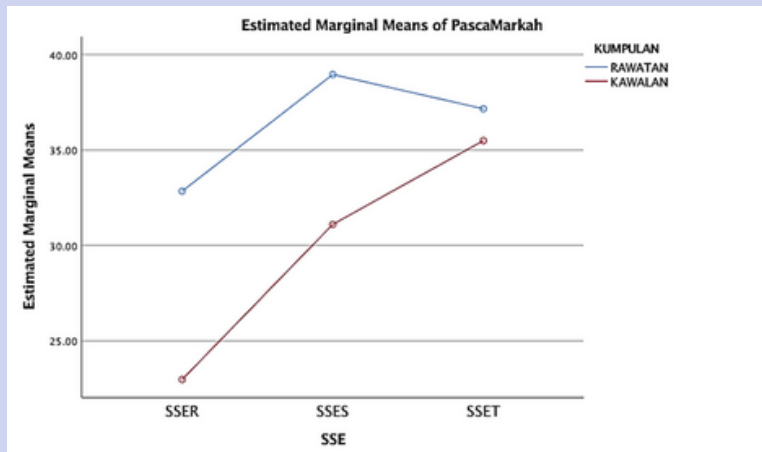
The results of the analysis in Table 6, show that there is a significant major effect ($p < .01$) on group-based variables on the mean score of the Post Science Test achievement, $F(1, 137) = 8.43, p < .01$; with a small size effect (partial eta squared = .06). Based on Cohen's report (1988) effect values size 0.2=small, 0.5=medium and 0.8=large.

When the effect of the SSE variable was ignored, the total mean score of the Post Science Test in the treatment group (min=36.25, $\sigma = 14.14$) and controls (min= 29.92, $\sigma=12.62$) showed significant differences. Analysis of these main effects found that Post Science Test scores increased when pupils were involved with the intervention. Thus, it can be concluded that students who engage in teaching and learning activities using the STEM Inspiration Module can increase science achievement higher than students who are exposed to conventional teaching approaches even though the effect is small.

Further, there was a significant major effect ($p < .01$) on variables based on SSE on the mean score of the Post Science Test achievement, $F(2, 136) = 5.42, p < .01$; with a small size effect (partial eta squared = .08). Based on the findings when not involving the group, the main effects of SSE showed significant differences. These findings show that HSE students will always achieve better science than MSE and LSE students regardless of the teaching approach implemented.

While the findings relating to the effects of the interaction between the Group and SSE in Table 5.14 were found to be no significant difference $F(2, 136) = 1.15, p > .01$; with a very small size effect (partial eta squared = .02). It is concluded that the H_0 hypothesis failed to be rejected, thus there was no significant interaction effect of the mean score of the Post Science Test between the group and SSE. These findings explain that the effect of the interaction of the two independent variables based on Group and SSE affects the individualized science achievement score. This means that the value of the pupil's science achievement score does not depend on the SSE of the different pupils in the group. Further, the researchers examined Figure 1 of the line graph for the mean score of the Post Science Test achievement for the control and treatment group students.

Figure 1
Graph of the achievement mean score line for the treatment group and control group



Analysis of the line graph Figure 1 showed that pupils involved with the teaching and learning activities intervention using the STEM Inspiration Module achieved better science achievement than the peers who remained exposed to conventional teaching approaches. Thus, the STEM Inspiration module is more effective in improving science achievement than conventional methods. In addition, students with HSE backgrounds achieved higher and significant science achievement compared to MSE and LSE students. Finally, the group's influence on the level of science achievement is not due to SSE or vice versa.

Discussion

The results of the analysis showed that 97 (70.29%) of families earned below RM1170 and were categorized in the MSE group and LSE. Due to money constraint, the parents have to allocate money for more important basic needs for continued survival. Thus, some parents are unable to send their children to school and do not care about the children's learning needs (Ganesan, 2013). Thus, leading to majorities of students absent from school days and dropout students were from low-income families (Institut Hal Ehwal Ekonomi dan Demokrasi Malaysia, IDEAS, 2017).

This result is in line with a report by the Jabatan Perangkaan Malaysia (2016), 39.6% of Malaysians living in urban areas only have SPM certificate, 11% have a diploma and 37% have an advanced degree. Parental educational background affects the level of children's ability to master learning (Sateesh & Sekher, 2014). This is because, low household income and uneducated parents may not be able to guide their children to get a better education (Zakari, Majid, & Hussin, 2022).

The findings showed that pupils from the treatment group involved with the intervention using the STEM Inspiration Module achieved better science than peers who remained exposed to conventional teaching approaches. Thus, the STEM Inspiration module is more effective in improving science achievement than conventional methods.

The findings showed that the mean score of the science achievement for the HSE group was significantly higher than the MSE and LSE groups. The findings of this study are in line with the reports of Stewart (2008), Navarro, Flores & Worthington (2007), and Hak (2004) which found that pupils from HSE families achieved high academic achievement. This statement is also supported by Arshat et al. (2002) who claimed that students from the low SSE group did not excel in school and had cognitive problems compared to students from the medium and high SSE group. This, in turn, indicates that financial resources influence student achievement in school (Hak, 2004).

Following the above discussion, it was found that the LSE group that received intervention using the STEM Inspiration Module achieved better than the LSE group that received conventional learning. This learning module

is developed based on the Guided Inquiry Approach. These findings support past studies that have found that investigative activities can improve pupil achievement and reduce the attainment gap for pupils from Low Socioeconomic Status families (Von Secker & Lissitz, 1999 in Degenhart 2007). This is because, through material manipulation activities, students can remember concepts and facts related to the material more effectively (Nurzatulshima, 2010).

To encourage the participation of students from Middle Income and Lower Income families, the materials and tools used in Inspirational STEM module were inexpensive and easy-to-find. This to ensure that students can easily find and prepared the materials, thus encourage them to participate in STEM-based activities. Thus, it also suitable for application in rural areas that have limitation in findings material resources for STEM activities.

Limitations

In this context, the researchers discussed some limitations that affect internal validity and external validity throughout the study. Ideally, the experiment is one with high internal and external validity. Internal validity matters much more than external validity because it can be assumed that the hypotheses are expected to be tested under highly specific and all-other-things-being-equal conditions (Guala & Mittone, 2005).

Among the threats identified was the exclusion of study participants. Pupils are excluded from this study if they do not attend all the tests, namely the Pre-Science Test, and the Post-Science Test. These threats known as mortality, which refers to the effects caused by the circumstances in which the study participants withdrew from continuing the study before the completion date of the study (Nasirun, Muhamad Noor, Yusoff & Othman, 2016). This due to some of the students participating in studies at the beginning of the school semester and then transferring to different school at the second of school semester.

In addition, pupils need to state the parental information such as education level, type of employment, and salary filled by pupils in the survey form. This also caused problems when five pupils were unable to provide accurate information about the parents' demographics and caused their set of answers to be isolated and not analyzed. The reduction in this sample of participants may affect the validity of the study (Kutch, 2011). This problem is solved by taking a large number of samples.

The Pre-test and Post-test is conducted by teachers who teach science subjects in those classes. This led to a threat to the collection of data by different teachers for each class involved in the study. In addition, the duration of the implementation of the Pre-test and the Post-test also affected the findings of the study. The Pre-test is implemented at the beginning of the school year compared to the Post-test. The implementation of the Pre-test at the beginning of the year gives teachers the time and space to administer it in an orderly manner. Compared to the post-test at the end of school year, the teacher needs to finish teaching the syllabus and do revision for final examination.

This eventually will cause historical effect which refers to events that arise between the start date and the deadline of the quasi-experimental process (Creswell, 2012). For this study, researchers have designed teaching and learning activities according to the school academic calendar. The academic calendar and schedule of work were presented to the teachers involved in the study. After that, quasi-experimental related procedures are also presented to teachers and the respondents. Since the start date and end date of the experiment are within the same school year, then the effect of the historically caused external factor can be reduced (Nasirun, Muhamad Noor, Yusoff & Othman, 2016).

Recommendations

Through the research findings, schools can take effective measures to help and provide students from Lower Income and Middle-Income group with learning aids at home. In addition, it is hoped that this report will enable parents to be more aware of their children's academic achievement and help them fulfill their learning needs. Implication of this research for teachers is to motivate them employing scaffolding method in integrated STEM science classroom.

Conclusion

This study was carried out to see the impact of STEM integration that applies the 5E Learning Cycle approach through the STEM Inspiration Module to science achievement. The study also has a mission to develop modules that are ready to be used and easy to control to help teachers carry out inquiry learning. The findings showed a significant difference in the mean score of Post Science Test achievement for the treatment group with the control group. However, the mean score of the Post Science Test achievement for the HSE group was significantly higher than the MSE and LSE groups. In addition, the HSE group given the treatment with the STEM Inspiration Module achieved better than the HSE group that received conventional learning. Therefore, module innovation can have a positive impact on the achievement of science.

References

- Arshat, Z., Baharudin, R., Juhari, R., & Kahar, R. (2002). Tingkah Laku Keibubapaan dan Penyesuaian Tingkah Laku Anak Dalam Keluarga Berisiko di Luar Bandar. *Pertanika Journal of Social Sciences & Humanities*, 10(2), 165-178. Diperolehi daripada http://psasir.upm.edu.my/id/eprint/3380/1/Tingkah_Laku_Keibubapaan_dan_Penyesuaian_Tingkah_Laku_Anak.pdf pada [20 Jun 2018].
- Becker, K., & Park, K. (2011). Effects of Integrative Approaches Among Science, Technology, Engineering, and Mathematics (STEM) Subjects on Students' Learning: A Preliminary Meta-Analysis. *Journal of STEM Education: Innovations and Research*, 12(5/6), 23. Diperolehi daripada www.proquest.com pada [22 Jun 2021].
- Cahron Wardini Mokhzani. 2016. Poverty and Household Income. Roundtable Conference: Issues and Challenges of Zakat Institutions in Malaysia. Organised by the International Institute of Islamic Higher Education (IAIS) Malaysia and lembaga Zakat Selangor (LZS). Khazanah Research Institute. Retrieved 22 May, 2017 from http://www.iais.org.my/e/attach/2016/03NOV2016_zakat_RT/s1s2.pdf
- Christensen, R., Knezek, G., & Tyler-Wood, T. (2014). Student perceptions of Science, Technology, Engineering and Mathematics (STEM) content and careers. *Computers in Human Behavior*, 34, 173-186. Retrieved 4 Jan, 2015 from https://www.researchgate.net/profile/Tandra_Tyler-Wood/publication/260367834
- Creswell, J. W. (2012). *Educational Research: Planning, Conducting, and Evaluating Quantitative and Qualitative Research*. Educational Research (Vol. 4). <http://doi.org/10.1017/CBO9781107415324.004>
- Degenhart, H. S. (2010). Relationship of inquiry-based learning elements on changes in middle school students' science, technology, engineering, and mathematics (stem) beliefs and interests (Doctoral dissertation, Texas A & M University). Retrieved from <https://oaktrust.library.tamu.edu/bitstream/handle/1969.1/ETD-TAMU-1225/DEGENHART-DISSERTATION.pdf?sequence=1&isAllowed=y> on [29 August 2015].
- Ganesan Kamoo. (2013), Pengaruh keluarga terhadap pencapaian akademik murid India di sekolah Menengah Rendah. Ph.D thesis, University of Malaya. <https://studentsrepo.um.edu.my>
- Halle, T. G., Kurtz-Costes, B., & Mahoney, J. L. (1997). Family influences on school achievement in low-income, African American children. *Journal of Educational Psychology*, 89(3), 527. Retrieved from https://www.researchgate.net/profile/Tamara_Halle/publication/232426657_Family_Influences_on_School_Achievement_in_Low-Income_African_American_Children/links/56a8e35008ae40c538a8ee68.pdf on [25 Jun 2017].
- Institut Hal Ehwat Ekonomi dan Demokrasi Malaysia (IDEAS). (2017). Laporan keciciran pelajar. Kuala Lumpur. Percetakan Nasional Berhad (PNB).
- Hak Ju Kim. (2004). Family resources and children academic performance. *Children and Youth Services Review*, Vol 26 (6), 529-536. Retrieved August 29, 2017 from <http://www.sciencedirect.com>.
- Jabatan Perangkaan Malaysia. (2016). Laporan penyiasatan pendapatan isi rumah dan kemudahan asas mengikut negeri dan daerah pentadbiran. Putrajaya: Jabatan Perangkaan Malaysia.
- Linacre. JM. (1994). Sample size and item calibration stability. *Rasch Measurement Transactions*. Retrived November 7, 2009 from <http://www.rasch.org/memo>
- Nasirun, N., Muhamad Noor, S., Yusoff, R. Z., & Othman, A. A. (2016). Isu kesahan dalaman terhadap kaedah penyelidikan kuasi eksperimen di dalam pendidikan keusahawanan. *ASEAN Entrepreneurship Journal (AEJ)*, 2(2), 90-97.
- Navarro, R. L., Flores, L. Y., & Worthington, R. L. (2007). Mexican American middle school students' goal intentions in mathematics and science: A test of social cognitive career theory. *Journal of Counseling Psychology*, 54(3), 320. Retrieved from https://www.researchgate.net/profile/Lisa_Flores/publication/232442641 from [2 Jan 2020].
- Nurzatulshima Kamarudin. (2010). Pengurusan Peralatan dan Bahan Amali Dalam Pengajaran Amali Fizik. Prosiding Seminar Kebangsaan Aplikasi Sains dan Matematik 2010. Johor Bahru. Retrieved from <http://www.fp.utm.my/ePusatSumber/listseminar/medc2012/pdf/92.pdf> pada [8 Mei 2021].
- Stewart, E. B. (2008). School Structural Characteristics, Students' Effort, Peer Associations, and Parental Environment: The Influence of School and Individual Level Factors on Academic Achievement. *Education and Urban City*, Vol 40 (2), 179-204.
- Stohlmann, M., Moore, T. J., & Roehrig, G. H. (2012). Considerations for teaching integrated STEM education. *Journal of Pre-College Engineering Education Research (J-PEER)*, 2(1), 4. <https://doi.org/10.5703/1288284314653>.
- Zakari, N. A., Majid, M. Z. A., & Hussin, M. (2022). Keciciran Murid Sekolah di Malaysia: Suatu Pemerhatian Awal. *Malaysian Journal of Social Sciences and Humanities (MJSSH)*, 7(2), e001288-e001288.

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