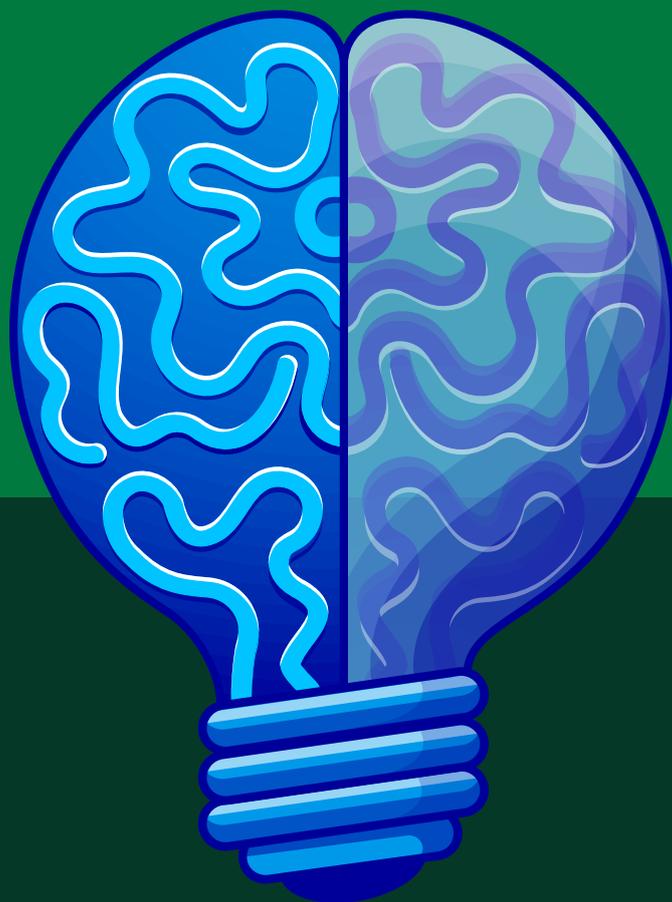


FACULTY OF
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UNIVERSITI TEKNOLOGI MARA
PERAK BRANCH

SCIENTIFIC PROJECT COLLOQUIUM 2025



BIOLOGY ~ CHEMISTRY ~ PHYSICS

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Preface

The Scientific Project Colloquium offers a platform for publishing Diploma Science final year projects (FYP). The objective is to effectively distribute research findings throughout all scientific disciplines. The primary objective of including final year projects into the course curriculum is to encourage students to put their theoretical knowledge into practical applications.

We would like to express our gratitude to our primary establishment, the Faculty of Applied Sciences and Universiti Teknologi MARA, Perak Branch, for their invaluable assistance.

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DISCOVERING THERMAL PHYSICS: MALE AND FEMALE PERSPECTIVES ON LEARNING THROUGH AN INTERACTIVE CALENDAR

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Abstract: Thermal physics is one of the main topics in physics, especially for those who study sciences and engineering. Due to the concepts and mathematics involved in the topic, students may find it difficult and finally lose interest in studying Thermal Physics. The major objective of this project is to create a tool that will aid students in better, more enjoyable ways of understanding thermal physics. Thermal Physics Interactive calendar that includes concepts, facts, quizzes, and experiments that can try at home. Having a calendar that includes interesting thermal physics concepts may help the students to learn and gain knowledge in that area. Thirty students of the Diploma in Science from Universiti Teknologi MARA (UiTM) are involved in providing feedback. Male students find thermal physics course to be less fascinating due to the mean score for interesting being less than 4. The Spearman Rho test, using the interactive calendar, demonstrates a strong correlation between 1) preference and 2) content, with a t value of +0.937. In addition, an independent t -test reveals that there are no further significant differences in grades for male and female students in the following categories: 1) preference ($t=0.437$, $p=0.666$); and 2) content ($t=0.280$, $p=0.782$).

Keywords: *Thermal physics, T-test, Interactive calendar, Spearman Rho test, Students*

INTRODUCTION

The growth rate of knowledge becomes faster and faster, and the skill update time becomes shorter and shorter (Sun et al., 2020). The amount of knowledge or information students can inhale in a classroom depends on their attitude toward learning. Students may find it difficult to learn physics because of the subject's complex concepts and mathematics. Teachers devote their all in the classroom to ensure that the students understand the content of the subject course. It is important to maintain the students' attention early on from the beginning of the semester by stimulating their interest to learn and proving the relevance of the subjects with real-life implications so that it would improve the students' learning satisfaction (Musa et al., 2018). Students will learn more if their interest in the subject is increased. The attention of the learners will also rise with the addition of fresh developments in teaching materials. The use and integration of technology should be directed by the educational needs to optimize the learning outcomes, where specific roles and objective prerequisites for optimal results can be determined (Tuma, 2021). The role of teachers also helps the students to overcome the challenges that might appear in the classroom. Therefore, flexibility in teaching is a must, where teachers applying training methods that involve two-way communications will enable you to make quick adjustments in processes and approaches (Senthamarai, 2018). This falls under the category of interactive learning. Thus, interactive learning is a special learning, during which there is interaction between the student and the teacher, as well as between the students themselves (Orshanskyi, 2020). A single method cannot meet all of our goals nor can a single method accommodate all learning styles at once (Palaniyammal, 2018). In contrast to using traditional bookish approaches, interactive calendars can be used as a learning tool to make content more engaging. The interactive calendar offers quizzes, games, facts, and experiments that you may explore at home. People in general need a calendar to remember dates and schedule upcoming events. A calendar with fascinating thermal physics concepts may aid students in learning and expanding their understanding of the subject.

METHODOLOGY

1) Preparation of the calendar

To prepare the calendar, we have to plan the topics of each month and also the activities that students can do throughout the month. Starting from January to December 2023, it covers all subtopics for thermal physics.

2) Survey Questionnaire

A sample of 30 students from the second semester of the Diploma in Science program—15 male and 15 females—volunteered to review and reflect on the desk calendar that had been provided to them. Several sections of the questionnaire were developed based on how the students felt about the thermal physics course and what they thought of the interactive calendar. The questionnaires included ratings of the students' satisfaction on a five-point Likert scale (1=Strongly disagree to 5=Agree).

3) Research Question

The following research questions were posed to guide this investigation.

1. How do students feel about the Thermal Physics course?
2. Is there any correlation between 2 categories, 1) Preference 2) Content?
3. Is there any significant difference in the mean score between male and female students towards the interactive calendar?

4) Research Hypothesis

The following research hypothesis was proposed to promote further research as shown in Table 1, besides the month from January to December. Each month has its own topics and activities that are attached in the calendar.

Table 1 Table of hypotheses for both category perspective towards the interactive calendar

Hypothesis	Category 1: Preference	Category 2: Content
Null Hypothesis, H_0	There is no significant difference between the 2 means of male and female students for preference	There is significant difference between 2 the means of male and female students for preference.
Alternative Hypothesis, H_1	There is no significant difference between the 2 means of male and female students for content.	There is significant difference between the 2 means of male and female students for content.

Table 2 The topic and activity for respective month

Month	Topics	Activities
January	Temperature	Learning the concept of temperature and games
February	Thermal Equilibrium	Learning the concept of thermal equilibrium and try the experiment at home
March	Thermometer	Learning about the thermometers and doing quizzes
April	Temperature Scale	Learning about the thermometer scale
May	Calorimetry	Learning the concept of calorimetry and trying the experiment at home
June	Heat	Learning the concept of heat and identifying objects that have higher kinetic energy.
July	Specific Heat Capacity	Learning the heat capacity equation and identifying the specific heat capacity of different substance
August	Latent Heat	Learning about the concept of Latent heat and equation involves.
September	Phase Change	Learning about the phase change and identify the process
October	Conduction	Learning about the conduction equation
November	Convection	Learning about the convection process
December	Radiation	Learning about the radiation equation.

FINDINGS

1) Survey on Thermal Physics Courses

Started with the survey of the thermal physics courses themselves. We need to know students' perspectives on the subject in order to identify the problem that students face in learning the subject. There are 4 main components which are: 1) Interesting 2) Challenging 3) Relevant and 4) Important. According to a Likert scale (1=Strongly Disagree to 5=Strongly Agree), the students will submit their input, and the results will be translated into mean and standard deviation form.

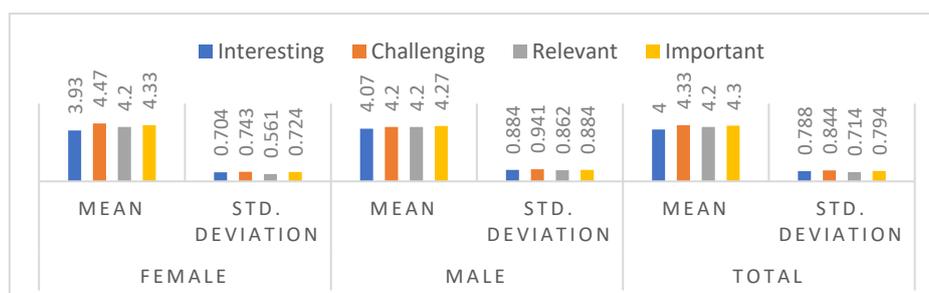


Figure 1 The graph for mean and standard deviation male and female based on interesting, challenging, relevant and important.

The mean value for male and female students is marginally different, according to the Figure 1 above. Given that female students scored higher on the challenging scale (M=4.47, SD=0.743) and male students scored similarly high (M=4.20, SD=0.941), both genders agree that the Thermal Physics course is difficult. Most likely because of how challenging it is for students to captivate the course-related concept and equation. The course is rated as the most important by male students (M=4.27, SD=0.884), on average. Male students may be more conscious of the significance of the course. Under the item interesting, both male and female students received the lowest mean scores (male M=4.07 and female M=3.93). As a result, both male and female students find this thermal physics course to be less fascinating. Hopefully, the students' perspective on thermal physics will change because of this research.

2) Survey on Thermal Physics Calendar

The same goes for the survey on the usage of the interactive calendar using the Likert Scale (1=Strongly Disagree to 5=Strongly Agree) for 9 different elements. The element is divided into two groups, which are 1) preference and 2) content of the calendar. Where the preference is based on design, quality, features, new invention and impression. While for content cover, it is usefulness, informative, interactive, and recommended.

a) Spearman Rho's Test

The correlation between these two categories, preference and content, can be calculated using Spearman's Rho. The result is as shown in Table 3.

Table 3 Table of correlations between 2 categories 1) Preference and 2) Content, in addition to the independent T-test for 2 categories for male and female students.

			Correlations	
			Preference	Content
Spearman's rho	Preference	Correlation Coefficient	1.000	.937**
		Sig. (2-tailed)	.	<.001
		N	30	30
	Content	Correlation Coefficient	.937**	1.000
		Sig. (2-tailed)	<.001	.
		N	30	30
**. Correlation is significant at the 0.01 level (2-tailed).				
			Preference	Content
			Equal variances not assumed	Equal variances not assumed
t-test for Equality of Means	T		.437	.280
		Df	24.104	23.490
	Significance	One-Sided p	.333	.391
		Two-Sided p	.666	.782
	Mean Difference		.12000	.08333
	Std. Error Difference		.27464	.29714
	95% Confidence Interval of the Difference	Lower	-.44670	-.53064
		Upper	.68670	.69731

Table 3 shows the significant level for both preference and content is $p < 0.001$ less than $p = 0.01$ means that the correlation is significant. Based on the result, the Spearman's rho correlation coefficient is +0.937. The value is positive therefore result in preference and content are both positively correlated. In addition, the value of the correlation coefficient is larger than 0.5, which means it is strongly correlated.

b) Dependent T-test

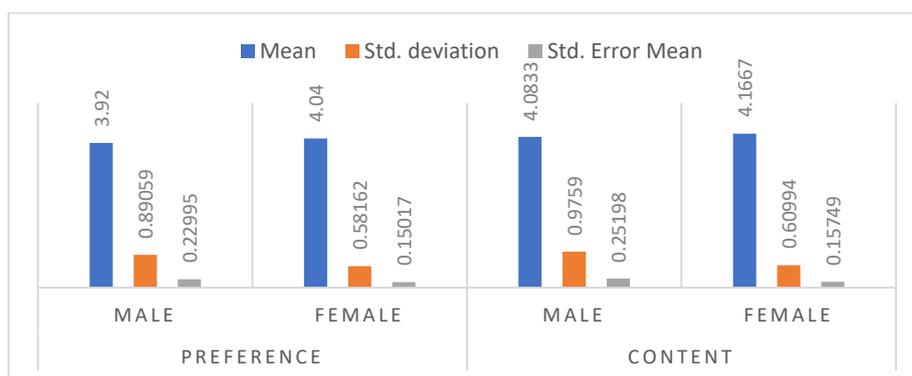


Figure 2 The Means and Standard Deviation for Male and Female students based on the 2 categories

Referring to Figure 2 above, the mean preference score for male students is $M=3.92$, $SD=0.89$, which is a little lower than the average preference score for female students, $M=4.04$, $SD=0.58$. In contrast, both male and female scores for content are above 4.00, with the female score being higher ($M=4.16$, $SD=0.61$) than the male score ($M=4.0833$ and 4.1667). Here, we can draw the conclusion that male students have higher standards to meet than female students do. For the content wise, both agree that the content is useful, informative, interactive and recommend to other students to use it. According to the independent t-test results in Table 2, there was no significant difference between male and female students for either category (preference: $t=0.437$; $p=0.666$; and content: $t=0.280$; $p=0.782$). Both categories have p-values greater than 0.05. The two null hypotheses for categories 1 and 2 are therefore retained. Which is there is no significant difference between marks for male and female students for preference as well as content.

CONCLUSIONS

Various technology applications have been used to enhance learners' engagement and higher participation in lectures and other group learning sessions where collaborative and continuous efforts are required to identify or create the appropriate technology tools for efficient education based on educational theories (Tuma, 2021). The main goal of the study is to create new methods of learning, which is using the interactive calendar method. The measurement of effectiveness of this method has been determined. Male students find this thermal physics course to be less fascinating due to the mean score for interesting being less than 4 for female students, slightly larger than 4. As for the interactive calendar that has been introduced to the students, the survey was divided into two categories. Both preference and content are strongly correlated according to the Spearman Rho test. Which means, both categories are crucial in designing the interactive calendar. Besides that, an independent t-test shows that there is no significant difference between marks for male and female students for preference as well as content. Thus, hopefully these studies will help to develop a new learning environment in thermal physics course. Further research can be conducted with different Physics course. Education in research can help to close the bridge between Physics education and physics academicians (Nandiyanto et al., 2020). Additional demonstration experiments are required to clarify the theoretical background of the observed phenomena to increase the students' understanding (Klein et al., 2021). However, in this 21st century, the technological capabilities have exponential growth that will increase the complexity of task, and it is essential to clearly articulate the purpose of the education in the future (Grayson, 2020). Using contextually relevant media can also help bring science closer to students' realities, make learning more meaningful, and promote pedagogical strategies that are better aligned with their ways of thinking (Sony Yunior Erlangga et al., 2025). Using contextually relevant media can also help bring science closer to students' realities, make learning more meaningful, and promote pedagogical strategies that are better aligned with their ways of thinking (Erlangga et al., 2025).

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Tarikh : 20 Januari 2023

Prof. Madya Dr. Nur Hisham Ibrahim
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Kelulusan daripada pihak tuan dalam perkara ini amat dihargai.

Sekian, terima kasih.

“BERKHIDMAT UNTUK NEGARA”

Saya yang menjalankan amanah,

SITI BASRIYAH SHAIK BAHARUDIN
Timbalan Ketua Pustakawan

nar

Setuju.

27.1.2023

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