UNIVERSITI PUTRA MALAYSIA

DEVELOPMENT OF TYPES OF MAGNETS INTERACTIVE MODULE BY USING LECTORA INSPIRE 18

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DEVELOPMENT OF TYPES OF MAGNETS INTERACTIVE MODULE BY USING LECTORA INSPIRE 18

By

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ABSTRACT

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Abstract

Interactive module becomes a pandemic alternative in educational systems of several countries, however, it is not widely implemented in Malaysia. This research is conducted to develop a Types of Magnet interactive module by using Lectora Inspire 18 as a learning media for a magnet course. First, a survey was conducted on the perceptions of undergraduate students in University Putra Malaysia towards interactive module by using the Likert scale. Most students responded with the mean scale (3) for undecided, hence, a Types of Magnet interactive module is developed. Graphics interchange formats (GIF) are used as pictorial displays of the interactive module. Then, a second survey was conducted on the feedback of students towards the interactive module. Most students had chosen with the mean scale (4) for agree on its content and presentation.

Keywords: Lectora Inspire 18 software; interactive module; magnet; Likert scale

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ABSTRAK

PEMBANGUNAN MODUL INTERAKTIF JENIS-JENIS MAGNET MENGGUNAKAN PERISIAN LECTORA INSPIRE 18

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Modul interaktif menjadi alternatif pandemik dalam sistem pendidikan beberapa negara, namun ia tidak dilaksanakan secara meluas di Malaysia. Penyelidikan ini dijalankan untuk membangunkan modul interaktif Jenis Magnet dengan menggunakan Lectora Inspire 18 sebagai media pembelajaran kursus magnet. Pertama, tinjauan telah dijalankan terhadap persepsi pelajar prasiswazah Universiti Putra Malaysia terhadap modul interaktif dengan menggunakan skala Likert. Kebanyakan pelajar respon dengan skala min (3) untuk tidak pasti, maka, modul interaktif Jenis Magnet dibangunkan. Format pertukaran grafik (GIF) digunakan sebagai paparan bergambar modul interaktif. Kemudian, tinjauan kedua telah dijalankan terhadap maklum balas pelajar terhadap modul interaktif. Kebanyakan pelajar telah memilih dengan skala min (4) untuk bersetuju dengan kandungan dan persembahannya.

Kata kunci: perisian Lectora Inspire 18; modul interaktif; magnet; skala Likert

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LIST OF ABBREVIATIONS

GIF	Graphics Interchange Format
UPM	University Putra Malaysia
COVID-19	Coronavirus-19
VR	Virtual Reality
CTPS	Critical Thinking in Problem Solving Skill
KK	Entrepreneurship Skill
MPI	Interactive Learning Media
AICC	Aviation Industry Computer-Based Training Committee
HTML	HyperText Markup Language
CD-ROM	Compact Disc Read-Only Memory
SCORM	Sharable Content Object Reference Model
LMS	Learning Management System
R&D	Research and Development
ADDIE	Analyse, Design, Develop, Implement, Evaluate

CHAPTER 1

INTRODUCTION

1.1 General Introduction

Educational systems in today's millennial perspectives have changed over the years and starts to value youngs' intellectual skills. Wijaya et al. (2019) stated that the quality of education is critical since it determines the quality of the nation's successor. When education is used as a motivator, the quality of human resources improves. If education has a system that is relevant to development and of high quality, educational aids will have meaning and purpose in escalating the resources. Educators currently focus on educational technology researches as it will become compulsory in the future pandemic or disastrous events that yet to come. For instance, educational module is a frequent educational studies before and until today, the inclusion of technological applications and devices to the material, an interactive module is created. In Malaysia, implementation of the materials are few compared to other countries. One particular course of interest for interactive module execution is PHY3208 (Magnetism and Magnetic Materials) course in Universiti Putra Malaysia (UPM).

1.2 Educational Technology

Assimilation of technology into education creates a new norm worldwide in using digital tools for educational contents. Educational researchers are enthusiastically implement this method into their teachings to achieve effective learning. Effective learning activities necessitate the use of media that facilitates the absorption of many different types of knowledge as feasible. As a way of obtaining information sources pertinent to the subject matter being taught, information

technology plays a significant role. The internet, like the traditional way, may also be present in real time using the teleconference application (Gedik et al., 2013, as cited in Lubis, 2020).

In addition, due to the unique qualities such as interpersonal and mass media, interactive, and permits synchronous, asynchronous, or delayed communication, the internet may be presumed to be a teaching media. In correlation with that, e-learning is a learning media that is based on information and communication technology, and its application in Indonesia has not been substantially developed and employed (Hew & Cheung, 2013, as cited in Lubis et al., 2020). Due to vast implementation in terms of education, many technological devices and applications utilized in teachings or self-learning in developing countries. This gives an additional point to combine education and technology for an advancement of pedagogical structure.

Other relevant mention is the development of skills from utilization of technological devices may help student to excel in future work environments. Reyna (2021) cited that students need to develop digital media literacies for successful careers, regardless of their discipline (Hobbs 2017; Ohler 2013). In teaching education, digital media provides students with the opportunity to reflect on their practices (Kearney and Schuck, 2003). Use of digital media has recently expanded to other disciplines, but there are few theoretical models for its implementation in the classroom (Hoban, Nielsen, and Shepherd 2015; Nielsen, Hoban, and Hyland 2017). Digital media assignments are intended to engage students in active learning while also encouraging teamwork (Coulson and Frawley 2017; Pirhonen and Rasi 2016). Graduate characteristics such as communication, time management, and planning abilities are cultivated (Frawley et al. 2015; Morel and Keahey 2016).

1.3 Pandemic Alternative

Universally, functionality of educational technology became common whether in developing countries and elite ones due to the Coronavirus-2019 (COVID-19) pandemic impact. A fast development has occurred in educational and clinical contexts to flatten the curve of COVID-19 distribution, including the closure of schools and educational institutions, broad adoption of social distance, and home quarantine (Robbins et al., 2020, as cited in Shyr et al., 2021). The COVID-19 epidemic has compelled colleges throughout the world to employ a variety of innovative online platform technologies as well as other teaching and learning aids. Educators have been pushed to use 3D virtual learning technologies in both instruction and evaluation procedures. This resulted in various research, for example, an investigation on how different instructional styles might aid in the implementation of online teaching in higher education (Mahmood, 2021, as cited in Shyr et al., 2021). Although a virtual reality (VR) is being used, the concepts of educational technology are still related thus logical to be applied during pandemic era.

Other than that, Shyr et al. (2021) cited that the COVID-19 epidemic, with its related lockdown and social distancing measures, has had a number of unwanted implications, including the abuse of e-learning resources (Torales et al., 2020). One important negative impact was most likely the ignorance and shame associated with the fear of getting infected (Brooks et al., 2020). New learning systems and instructional technologies have the potential to open up new educational opportunities (Lai and Hong, 2015; Thompson, 2013). Although some pointed out the credibility issue in online learning, this creates possibilities of better security in terms of health and originality of the materials as the world progresses.

1.4 Magnetism and Magnetic Materials Course (PHY3208)

Magnetism and Magnetic Materials Course (PHY3208) is an undergraduate course for Bachelor of Science in Materials Science with Honours in University of Putra Malaysia (UPM). Based on the latest course synopsis, the course consists both the fundamental and applied elements of magnetism. Furthermore, the formation and behaviour of magnetic characteristics are explained using quantum mechanics and the atomic description of magnetism. Moreover, the topics of magnetic resonance and domain magnetism are also covered. The techniques for measuring magnetic fields and magnetic characteristics will be reviewed, as well as uses of magnetic materials in devices and new developments. Briefly, the students may learn basic concepts of magnetism and required skills in order to master the course.

The learning outcomes are related to the Outcome-Based Education by using the Bloom's Learning Taxonomy, which are the cognitive and affective domain along with the soft skills. For the cognitive domain, students are required to achieve C4; analyzing skills. In addition, affective domain covers until A3; valuing skills while the soft skills are combination of Critical Thinking in Problem Solving (CTPS) and Entrepreneurial Skills (KK). Worth noting, the interactive module will emphasize on a chapter; Types of Magnets with thorough consideration on the learning outcomes.

1.5 Problem Statements

The main issues related to current pedagogical method are current conventional Types of Magnets teaching materials which are inefficient and less interactive, students are unable to understand the chapter due to: (1) complex comprehension writings used in literature of current

teaching materials; (2) less exploration or exposure of learning media by students and (3) unmotivated and unattached to the educational contents provided.

Wijaya et al. (2019) cited that one of the most significant components of the learning process is learning media. Lecturers' attention should be drawn to the usage of learning media. However, it does not vary, and the learning mediums employed are ineffective, resulting in a lack of enthusiasm in students to study (Wijaya & Sefriani, 2018). Furthermore, students' learning styles vary, which influences their ability to absorb knowledge. According to research, 80% of students said it was difficult to grasp physics coursework. This might be due to a lack of diversity in the media employed in the learning process (Resita & Ertikanto, 2018).

Therefore, educators need to create effective teaching materials such as interactive module. Today's generation of learners is way too different from the past generations. Most students are inert thus teachers need to inculcate knowledge in them effectively. The need for interactive modules is one strong defense for lecturers. One option is to modify an interactive multimedia programme to create an appealing learning environment. In a number of studies, previous research found that interactive multimedia improved the efficacy of the learning process (Ahmad et al., 2010, as cited in Rondillas & Buan, 2019). Various researches shown that the feasibility and validity of the interactive module content and presentation for learning materials with high percentage of acceptance and suitability. Therefore, inclusion of interactive module in teaching may be considered in future studies.

1.6 Objectives

The objectives of this research are as follow:

- To survey the perceptions of students on interactive module development for the Types of Magnet chapter.
- To develop an interactive module which improve student's understanding on types of magnets.
- To evaluate the interactive module by students' feedback on module's content and presentation.
- To enhance the conventional modules in obtaining student's attention during online learning and as pandemic alternatives.

1.7 Conclusion

In conclusion, the connection of educational technology is relevant in future studies of physics whether in UPM or other universities of interest. Educational technology in current pandemic situation forced educators to further change their way of teaching. PHY3208 is crucial for Bachelor of Science in Materials Science students to understand other subsequent prerequisite subjects in terms of content connections. Although Types of Magnet chapter seems basic to certain students, they were unable to explain in detailed and acceptable rubric answers. Therefore, production of interactive modules will enhance their learning capacities, instill better understanding of the course and Types of Magnets chapter specifically.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Interactive module can be thought as various definitions due to wide coverage of applications that can be implemented with it. It features the conducive learning environment for students and lecturers to be more engaged during class or self-learning when students individually studying. Numerous studies proven its qualities with relevant and credible analysis in terms of quantitative, qualitative or mixed research. Furthermore, the Blooms's taxonomy of verbs will guide this research to develop the interactive module according to the learning outcomes.

2.2 Interactive Modules

2.2.1 Definition

Interactive modules in recent researches show variety of definitions despite numerous studies. The main reason is the variety of its application in software used thus the exact meaning became less concrete. Although it might cause confusion, the reality states otherwise. Due to these wide range of definition, educators became more creative in developing the modules. A module is a comprehensive instructional unit that may be utilised by a teacher or a small group of students without the presence of an instructor (Smaldino et al., 2011, as cited in Resita & Ertikanto, 2018). The goal of this module is to help students study without constant monitoring. It can take the form of written, audiovisual, or computer-based resources or any combination of them (Resita & Ertikanto, 2018). Further definitions of interactive module will be given in next paragraphs.

Firstly, Wijaya et al. (2019) cited the definition interactive media as a type of learning media that encourages students to participate in active learning activities. Furthermore, students

may explore, discover, study, and develop their own learning concepts in the presence of interactive media. Also, students will be able to employ more interactive learning resources with computer learning (Wijaya Indra, 2016). Therefore, when the students interact with the media through any means of exploration of electronic devices, the media can be considered interactive.

Next, from similar research, interactive learning media are learning media that can stimulate students to carry out active learning activities. With the interactive media students can explore, discover, investigate and build their own learning concepts. Interactive media can provide feedback to students as well as provide them with an opportunity to interact with them (Wijaya et al., 2019). In addition, the interactive module also described in terms of interactive multimedia. Interactive multimedia is defined as multimedia that includes a user-operated controller that allows users to select what they want for the next step (Lubis et al., 2020). Both researches describe the ability of the learning media to instill self-learning for students as the material not require lecturer's response.

One study elaborates the interactive module in wider terms which is e-learning. E-Learning is an abbreviation for electronic learning, which is learning via the use of technology. Online learning refers to courses that are provided partially or entirely online. In this scenario, the situation of online learning differs from that of traditional classrooms. It is critical to note that online learning provides more effective delivery than traditional methods (Gedik et al., 2013; Lincoln & Guba, 1985, as cited in Lubis et al., 2020). Hence, whenever the interpretation is related to a novel and online usage, it can also be considered as interactive module. Briefly, it can be concluded that interactive module can be defined as any media that consists a chapter of a course that stimulate active response, encourage self-learning and in online circumstance.

2.2.2 Features

In this section, the features of interactive module from previous researches will be elaborated. Firstly, Wijaya et al. (2019) cited a suggestion from previous articles that the interactive media: (1) combines several media elements such as text, images, audio, and video; (2) able to accommodate user responses; (3) being independent, in the sense of providing ease and completeness of the content; and (4) Fulfill the function to strengthen user response as soon as possible (Wijaya & Tanjung, 2017). By containing the interactive elements, the media will capture user's attention with consideration on the usability and educational contents.

Next, in terms of creating and generating interactive modules, the following factors must be included in the module as criteria for judging the interactive module programme (Martin, 2013, as cited in Lubis et al., 2020): (1) simplicity of navigation, a software should be built to be as simple as feasible; (2) cognition content, the programme content must equip students with the required cognitive experience; (3) media integration, media must incorporate a variety of features as well as other abilities that must be mastered; (4) aesthetics, appealing features to media learners; and (5) overall function, the programme designed must deliver learning to students so that when a student completes running a programme, they feels they has learnt something. For instance, drills, tutorials, simulations, and games can be interactive computer-based multimedia learning approaches.

A quantitative survey made by Sari (2020) found that Students at Universitas Negeri Padang's scientific education department want a learning resource that has pictures and colours, offers comprehensive materials and worked examples, and stimulates students' thinking. The E-Module is a solution that provided to address one of the students' learning difficulties with periodic characteristics of elements (as cited in Sari et al., 2021).

2.2.3 Software of Interest - Lectora

Educators today have ranges of applications whether for face-to-face or online teachings. However, in this research, Lectora Inspire 18 will be used and detailed description will be given accordingly in this subsection and methodology chapter. Lectora is a computerized tool for creating E-learning or multimedia learning and presentations, often known as authoring. Lectora software may be utilised for both online and offline learning requirements that can be completed fast and efficiently. It is possible to use it to combine flash, record video, combine photos, and screen capture. Timothy Loudermik founded it in 1999 in Cincinnati, Ohio, America (Nur, 2014, as cited in Wijaya et al., 2019).

Other worth mention, Lectora is a simple tool for creating Interactive Multimedia Learning (MPI) material. Also, Lectora was the first Aviation Industry Computer-Based Training Committee (AICC)-certified writing system to hit the market in 2000. Trivantis has launched the lectora version at the start of each year since 2000, with at least 50 new features. Lectora software was developed to allow non-programmers to generate product e learning material (Wijaya et al., 2019).

Next, the following are some of the benefits of using Lectora software for Interactive Modules: (1) Lectora is used to create websites, interactive e-learning content, and presentations; (2) Lectora software content can be published to a variety of outputs such as HyperText Markup Language (HTML), single file executable, compact disc read-only memory (CD-ROM), or e-learning standards such as Sharable Content Object Reference Model (SCORM) and AICC; (3) Lectora is compatible with a variety of learning management systems (LMS); (4) Lectora is very simple to use; (5) It has a numerous functions that may be utilised for media production as desired; (6) Have a large number of templates; (7) Can make assessments easier and more enjoyable

compared to Flash and PowerPoint (Nur, 2014, as cited in Wijaya et al., 2019). Although there are other softwares of interest, Lectora simplifies the process significantly for educators' preferred teachings.

2.2.4 Benefits of Implementation

Interactive modules have been implemented before with various evidence of improvement in pedagogical systems. First, the students adopt multi-representation skills based on citation by Resita and Ertikanto (2018). The use of various representations to enable complementary processes based on the observation that even informationally equal representations differ in their computational features (Lasry & Aulls, 2007). The term "multi representation" refers to the process of re-presenting the same concepts in numerous formats such as verbal, visual, graphic, and mathematical (Waldrip et al., 2006). Multiple representational representations in a specific idea learning process allow for effective communication (Meltzer, 2005). The representation format of the problems influences students' success in addressing physical difficulties. Skilled students employ non-mathematical representation, whereas less skilled pupils use mathematical representation directly (Harper, 2006, as cited in Resita & Ertikanto, 2018).

Multiple representations can aid in the development of a more in-depth conceptual understanding (Mayer, 2003, as cited in Resita & Ertikanto, 2018). The use of diverse representations while explaining a subject allows pupils to comprehend the concept using their own unique talents. As computing technology advances, representations of multiple physical quantity interactions in a phenomenon may be displayed utilising dynamic forms such as animations and simulations (Zacharia & Anderson, 2003, as cited in Resita & Ertikanto, 2018).

Other than that, students can utilise the module as learning media on their own. It should continue to be integrated with face-to-face learning sessions with the teacher. Blended learning is a method of learning that combines several learning models in order to maximise the learning process (Brinkmann, 2005, as cited in Resita & Ertikanto, 2018). Students who employ the mixed learning technique outperform those who use the traditional way (Darmawan, 2014, as cited in Resita & Ertikanto, 2018). In addition, students may study whenever and wherever they wish, with or without an internet connection (Awad, 2014; Anshari et al., 2016; Darmaji et al., 2019, as cited in Sari et al., 2021). This method of presentation is made feasible by the advancement of e-module programmes or creators, which allow e-learning to be personalised to students' unique preferences (Darmaji et al., 2019, as cited in Sari et al., 2021).

Several studies have shown that using an e-Module in physics disciplines or courses is useful and practical. E-modules may assist students in coping with the never-ending technological progress in this 4.0 industrial revolution, in which they could utilise technology to learn, obtain information, and create knowledge anywhere and at any time. It might serve as an example of a paperless lifestyle and contribute to the "save our forest" campaign (Sari et al., 2021). Moreover, as a multimedia learning source, interactive media assists instructors and students in boosting learning interaction (Afify, 2018, as cited in Desriana et al., 2020). In order to increase thinking skills, computer-based learning sources are employed in the teaching and learning process (Danger et al., 2014, as cited in Desriana et al., 2020).

2.3 Types of Magnets

The importance of Types of Magnets chapter coincides with variety of applications in other courses. Students seems to argue that they understand the topic in the lecture, however, their ability

of answering questions can be subjected to memorizing rather than understanding. In addition, students commonly underestimated the chapter as simple theoretical concepts thus majority of students are confused when it applies to computational problems. The types of magnets can be divided to five main magnetism which are: (1) diamagnetism; (2) paramagnetism; (3) ferromagnetism; (4) antiferromagnetism; and (5) ferrimagnetism.

First, students grasp the basic concepts of the magnetic moments itself, however, the theory behind this are related to quantum mechanical concepts that students tend to avoid learning. Most undergraduate references provide the basic fundamentals of the course and it depends on the students itself to explore the materials. For example, the Langevin theory is not included in the syllabus although it is crucial in deriving the solutions for magnetism related to temperature. Therefore, students avoid any examples that need calculations due to lack of knowledge.

Other than that, some literature terms are too hard to be understood as the language barriers permits strong English language backgrounds. If a material had simple wordings and easy to understand sentences, students will be attracted to know more on the topic. For instance, some magnetism related books use complex words to show strength of scientific backgrounds which can only be read by postgraduate and higher level of academic achievements.

In terms of applications for the magnets, there are inadequate source if students only rely on the books. Furthermore, it is tedious for them to read passively without knowing that the information given is engaging. Transformers, for example, are crucial to be learned in the form of animation to depict the direction of magnetic fields and electric current interchanging. These circumstances can be solved by using interactive modules, however, the outcome-based education must be considered to ensure the contents are educational-wise.

2.4 Bloom's Taxonomy

In 1956, Benjamin Bloom created the Bloom's taxonomy which is a collection of three hierarchical frameworks used to categorise educational learning objectives according to their complexity and specificity. For this research, two domain of interest are included: (1) cognitive domain, starts from C1 until C6; and (2) affective domain, begins with A1 until A5.

For the cognitive domain, Remembering (C1), the taxonomy's lowest cognitive level, is described as remembering taught knowledge or recalling and retrieving learned material from longterm memory. Understanding (C2), as the second cognitive domain, entails determining the meaning of spoken, written, or pictorial content. The third domain, Applying (C3), relates to the application of previously learnt content in a new situation. Next, the capacity to examine a problem area and break it down into its separate constituents, finding the link between distinct pieces, is referred to as Analyzing (C4). Evaluating (C5) entails the capacity to make judgements based on criteria or to combine separate portions to create a new thought. As the highest level of the cognitive hierarchy, Creating (C6) includes aspects from all of the other categories, as well as the generation of ideas or unique ways of perceiving things (Anderson & Krathwohl, 2001, as cited in Baghaei et al., 2021).

For the affective domain, the receiving (A1) level is the first level of the emotional taxonomy. At this stage, the learner is aware of the topic, stimulus, event, or issue and is eager to learn about or respond to it. The second degree of reacting (A2) varies from voluntary cooperation to a sense of satisfaction in performing what is necessary. The third level is known as valuation (A3). At this stage, the learner deliberately exhibits behaviours that correspond to specific beliefs. The learner organises a collection of values into a value system that is utilised to respond to various situations at the fourth level of the taxonomy; organization (A4). The fifth and greatest level in the

emotional taxonomy hierarchy is characterization (A5) by a value or value set, which happens when a student's conduct is consistent and predictable, as if it has been embraced as a life style (Olatunji, 2013, as cited in Widayanto, 2013).

2.5 Conclusion

In conclusion, interactive module can be implemented with the support of reliable evidences stated. In consideration of the terms interactive, online and self-learning, interactive module can be defined and developed with respect to the Bloom's taxonomy of verbs. In addition, the taxonomy verbs of cognitive domain and affective domain cover until C4 and A3 respectively for the course of PHY3208. Hence, for further development of the interactive module, the taxonomy verbs will be the base of creating its content. Also, the use of surveying is heavily cited and utilized in most educational researches. Further elaborations on the survey and interactive module development methodologies will be elaborated in the next chapter.

CHAPTER 3

METHODOLOGY

3.1 Introduction

Interactive module has been implemented in various countries including Malaysia. However, the implementation not considered as wide scale due to the reliance of data that require a lot of time. In addition, the development of the interactive module will be easier if mastery in both education and computer science have been obtained. For this research, use both procedure suggested by Sugiyono (2014); Research and Development (R&D) method and Analyse, Design, Develop, Implement and Evaluate (ADDIE) development model with some modifications made. Sugiyono's research design process is made up of ten steps: (1) potentials and issues; (2) data collection; (3) product design; (4) design validation; (5) design improvements; (6) product trials; (7) product revisions; (8) use trials; (9) design revisions; and (10) mass production (Sugiyono, 2014, as cited in Resita & Ertikanto, 2018). The ADDIE method has five stages: analysis, design, development, implementation, and evaluation. This concept is already widely utilised in the development of teaching materials, whether in the form of learning materials, modules and e-modules, or student worksheets (Sari et al., 2021). Worth noting that the research only reach to design validation for R&D method while fully act all of the ADDIE model. Resita and Ertikanto (2018) state that because of the researchers' limited time and funds, design validation and product testing are not carried out until mass production.

3.2 Questionnaire Survey

3.2.1 Survey Backgrounds

The questionnaire survey is conducted at University Putra Malaysia Serdang campus only with about 100 expected respondents from students of Bachelor of Science in Materials Science with Honours. This is due to the PHY3208 course that only taken by this programme as core course. Two surveys will be given to students which are: (1) Pre-Implementation Survey and (2) Post-Implementation Survey. The pre-implementation Survey is conducted to investigate the students' perceptions on the interactive module implementation. This fulfilled the potentials and issues stage of R&D method and analysis of the ADDIE model. Then, the Post-Implementation Survey completed the ADDIE model and design validation steps of the R&D method. The last survey will inquire students' feedback on the interactive module.

3.2.4 Data Collection

For the data collection section, it completed the data collection steps of R&D method. All of the information collected during the survey will be kept in Google Forms. Google Forms is an excellent educational tool for data collecting and analysis. Google Forms is a free cloud-based document creation solution that allows users to collaborate on data collecting forms. It also has spreadsheet features that allow users to evaluate data in a variety of forms (Hsu & Wang, 2017). Moreover, only the Google Forms' user are able to log-in their account and made a survey out of it. The researcher's student google account is used during this research for the data collection. Furthermore, the data are secured confidentially through numbering of the students, for example, R1, R2, R3 and so on with RX format, where X is the integer numbering while R represents respondents. The redundancy of data also can be prevented using this method.

After the data have been collected, the analysis will be made based on both questionnaires by using the frequency percentage and mean. Both questionnaires used the Likert scale to represents the agreeability weightage for both pre-implementation survey and post-implementation survey. Anggraini et al (2018) state that a Likert scale is used to assess a person's attitudes, views, and perceptions of social phenomena. First, the data will be calculated in terms of frequency percentage as follows:

$$Frequency\ percentage = \frac{Number\ of\ students}{Total\ of\ students} \times 100$$

Equation 3.1. Equation for frequency percentage.

Then, the mean of the respondents will be computed as follows to prevent biases:

$$Mean = \frac{\Sigma f_i x_i}{\Sigma f_i}$$

Equation 3.2. Equation for mean.

3.2.2 Pre-Implementation Survey

The pre-implementation survey conducted on students of Bachelor of Science in Materials Science is Students' Perceptions on Interactive Module. There are three sections covered in the questionnaire which are: (1) Section A, Demographics; (2) Section B, Interactive Module Perceptions; and (3) Section C, Interactive Module Design. The purpose of the demographics is to collect background information on the students. Next, Section B enquired students' perceptions if the interactive module implemented in their study on the Type of Magnets chapter. Last, Section C gathered the students' expectations on the interactive module design.

3.2.5 Post-Implementation Survey

The post-implementation survey obtained data from the similar undergraduate program students on Students' Feedback on Interactive Module. This survey consists of three sections which are: (1) Section A, Demographics; (2) Section B, Interactive Module Content; and (3) Section C, Interactive Module Presentation. The objective of the demographics is to collect background information of the previous students who had conducted the pre-implementation survey. Then, students required to give response on the interactive module content in relation to the Types of Magnets chapter. Finally, they will be responded on the presentation of the interactive module.

3.3 Interactive Module Design

3.3.1 Lectora Inspire 18

For the interactive module design, an education-oriented application called as Lectora will be used. Lectora is a computerized tool for creating E-learning or multimedia learning and presentations, often known as authoring. Lectora software may be utilised for both online and offline learning requirements that can be completed fast and efficiently (Nur, 2014, as cited in Wijaya et al., 2019). Specifically, Lectora Inspire version 18 will be utilized for the module development as it is simpler than the current version. Although the current version has variety of functionalities such as virtual reality and gaming specifications, the previous versions are still able to provide the interactive term.

First, Lectora Inspire 18 have features similar to PowerPoint with some educational media development extensions. Starting at a blank page, there are seven sections which are: (1) File; (2) Home; (3) Design; (4) Insert; (5) Test & Survey; (6) Tools; and (7) View. In the File section you

may change the properties, saving and re-opening the document or interactive media. Next, Home section covers similar content in PowerPoint with Publish as an extra subsection. Publish is the tool for document conversion whether it will be output as html, SCORM, ReviewLink, etc. For the Test & Survey subsection, users are able to make survey questionnaire or test questions. The system is oriented to prevent redundancy, data collection and various choices organization can be made. Other section operates similar to PowerPoint, giving ease to educators for interactive media making.

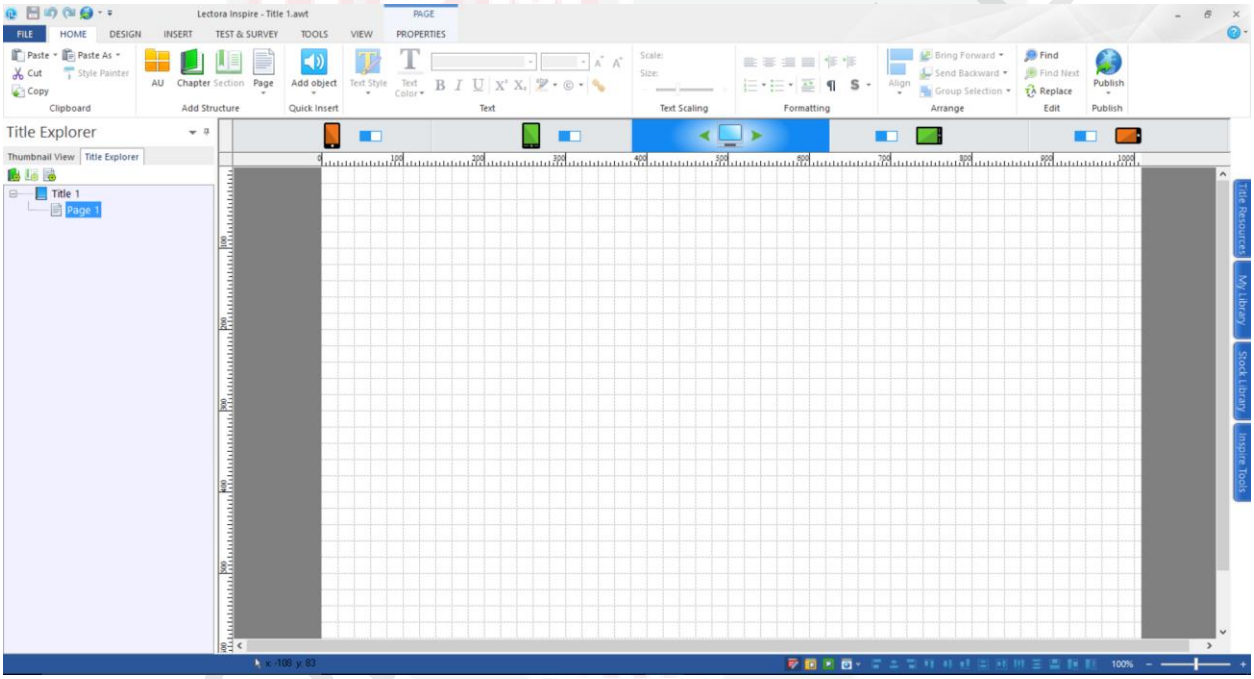


Figure 3.1. Lectora Inspire 18 interface.

3.3.2 Content Organization

The content organization will be divided by subchapters in Types of Magnets chapter which are diamagnetism, paramagnetism, ferromagnetism, antiferromagnetism and ferrimagnetism. The reference books that is used are: (1) Magnetic Materials Fundamentals and Applications by Nicola A. Spaldin; and (2) Materials Science and Engineering: An Introduction

by William D. Callister, Jr. and David G. Rethwisch. The main reason of using these books is the detailed elaboration and comprehendable contents. Both books complemented each other in a way that the first one provided extra information on magnetism while the second book explained in easier literature. Graphical display and animations will be provided in the interactive module with quizzes to enhance students' understanding of the learning materials. The font size and type will also be considered in clear, readable and suitable terms as the main criteria.

3.2.6 Flowchart of the Methodology

To summarize the main points given and systematically organized the flow of procedures, based on the Figure 3.2 in page 23. First, the pre-implementation survey will be conducted for the undergraduate students. Next, after knowing the elements and needs of the students, the development of the interactive module will proceed in consideration of the learning outcomes given in chapter two. The interactive module will be immediately implemented once the development ended. Then, the interactive module will be evaluated by the students that filled the first questionnaire. Finally, the survey will be analysed to better understand the capabilities and achievements based on the objectives of the interactive module.

3.6 Conclusion

In conclusion, the interactive module development procedures are progressed by both R&D method and ADDIE development model with some alterations. The pre-post implementation survey will provide strong background for the interactive module development. Then, the post-implementation survey will argue whether the interactive module is sufficient to be used as

learning media. Both survey based on students' perspectives to better understand their needs in studying Types of Magnets chapter. The results will be shown and discussed in the next chapter.

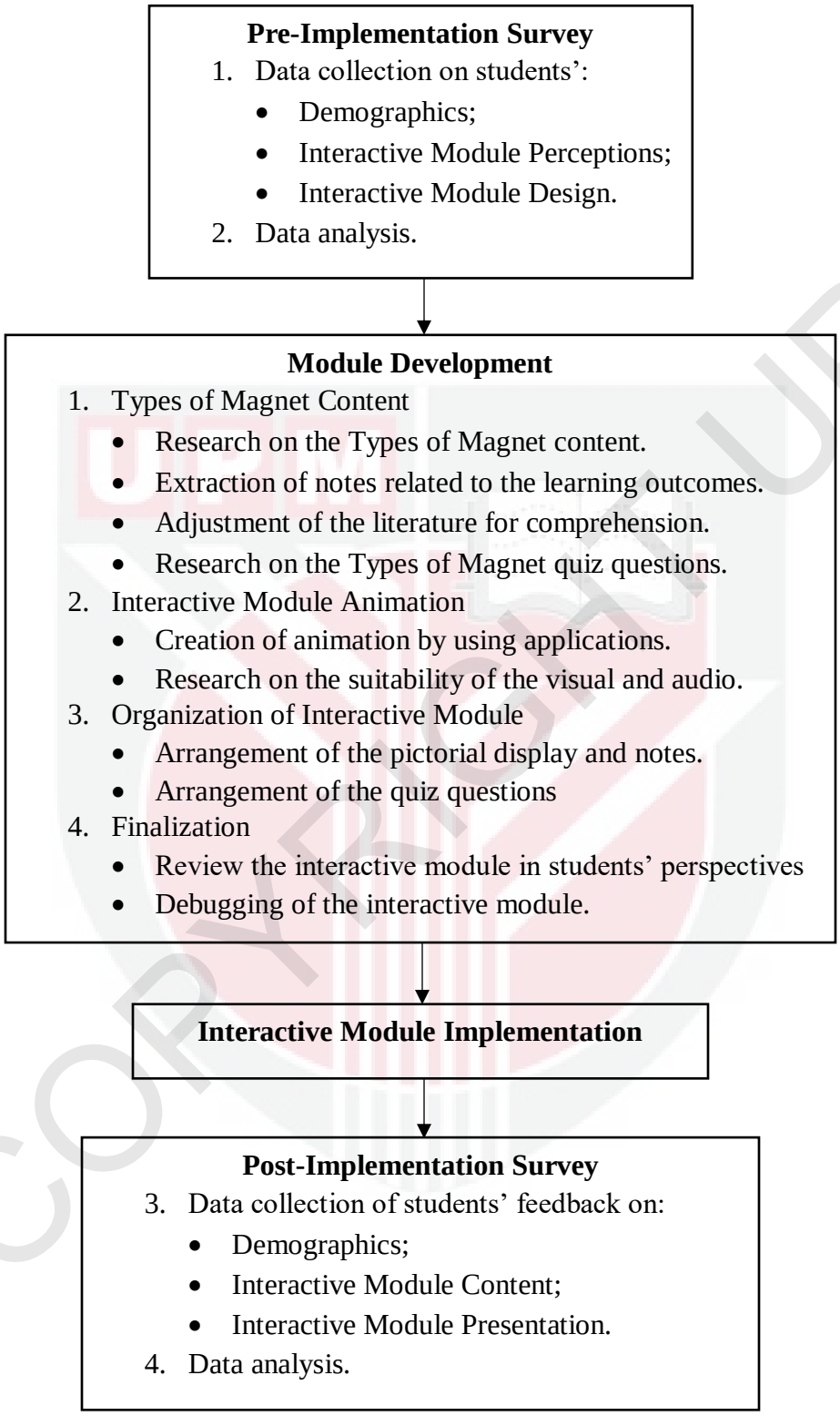


Figure 3.2. Flowchart of methodology section.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Introduction

In this chapter, the results of both surveys and the interactive module will be analysed and elaborated extensively. First, the explanation starts with the demographics of both surveys to ensure the data from the targeted respondents. Next, the students' perceptions on the interactive module survey will be analysed using the frequency distribution method where the percentage of 48 responses will be computed along with the mean. Then, the Types of Magnet interactive module will be presented and its features will also be described. Last but not least, the students' feedback on the interactive module questionnaire will be analysed by using the previous method stated.

4.2 Demographics of Students

Demographics is the background of respondents that made as variables for statistical analysis. For this research, both questionnaires which are: (1) Students' Perceptions on Interactive Module; and (2) Students' Feedback on Interactive module have the demographics survey. There are 48 out of 112 students of Bachelor of Science in Materials Science with Honours in UPM, responded to both survey, thus giving out 42.86%. The variables are as follow: (1) year of study; (2) study programme; and (3) completion of PHY3208 Course. In addition, the data will be presented in a form of table for better analysis.

First demographics that has been studied is the number of students responded based on the year of study. In reference to Table 4.1, first year, second year, third year, and fourth year have 10, 11, 11, and 16 students responded respectively. Most of the respondents are fourth year while the least are first year. Second year and third year students have the same number of respondents. The

frequency percentages of students responded from the total of 48 students given by each year, starting from first until fourth year are 20.83%, 22.92%, 22.92%, and 33.33% respectively.

Table 4.1. Number of students based on year of study.

Year of Study	Number of students
First year	10
Second year	11
Third year	11
Fourth year	16

Second variable is the study programme that taken by the students with respect to the number of students responded. Due to the PHY3208 course that can only be taken by Bachelor of Science in Materials Science with Honours undergraduate student, this question is crucial to filter the questionnaire from other study programme. In addition, the Google Forms has been set to immediately end the session if students choose Others as their option. The name of the study programme has been shortly modified to Material Science in the Table 4.2 for aesthetic value. There are 48 material science students and 0 from other programme responded with the frequency percentages of 100% and 0% respectively.

Table 4.2. Number of students based on study programme.

Study programme	Number of students
Material science	48
Others	0

Third variable consists of whether the students completed the PHY3208 course. Based on Table 4.3, 27 students have passed the course while 21 students have not yet taken the course. The

main reason is the PHY3208 course can only be taken at second year, second semester of studying materials science programme. In addition, the frequency percentage of students who passed, not passed, currently taking, and have not yet taken the course are 56.25%, 0%, 0%, and 43.75% respectively. Hence, it is proven that the half of the higher percentage of students are fourth year and third year, while the other half are second year and first year.

Table 4.3. Number of students based on PHY3208 course completion.

Completion of PHY3208 course	Number of students
Passed	27
Not passed	0
Currently taking	0
Have not taken	21

4.3 Students' Perceptions on Interactive Module

4.3.1 Interactive Module Perceptions

This part symbolizes the section B of the pre-implementation survey. Perceptions is self-opinion of an individual given to a subject of a study. The 48 students are required to choose based on the Likert scale of agreeability which are: (1) Strongly Disagree; (2) Disagree; (3) Undecided; (4) Agree; and (5) Strongly Disagree. Note that (3) is a neutral response while others define the degree of its bias. Furthermore, the variables of choices will be described based on the data obtained and presented in their respective tables.

First variable is to answer whether the students considered the PHY3208 as their favourite course. Based on Table 4.4, the number of students responded with respect to the scales of (1), (2),

(3), (4), and (5) are 0, 5, 27, 11, and 5 students respectively. Most students had chosen undecided and none picked strongly disagree. Furthermore, the frequency percentage of students responded based on the scales (1), (2), (3), (4), and (5) are 0%, 10.42%, 56.25%, 22.91%, and 10.42% respectively. This concludes that half of the students were unsure whether they like the subject.

Table 4.4. Agreeability in favouring PHY3208 course.

Scale	**Number of students**
Strongly disagree	0
Agree	5
Undecided	27
Agree	11
Strongly agree	5

Second variable shows whether the fundamental concepts of the PHY3208 course is easy to understand. Based on Table 4.5, the number of students responded with respect to the scales of (1), (2), (3), (4), and (5) are 0, 3, 18, 20, and 5 respectively. The highest number of students were agreed that the fundamental concepts of the course are easy to be understood while none states strong disagreement. Moreover, in terms of frequency percentage, the scale (1), (2), (3), (4), and (5) have 0%, 6.25%, 37.5%, 41.67%, and 14.58% respectively. The highest percentage of students agreed that the fundamental concepts are easy to comprehend, however, the second highest also claimed by undecided scale. Note that, there are students disagreed that the concepts are easy which means the subject might need a teaching aid material.

Table 4.5. Agreeability in ease of understanding PHY3208 course.

Scale	**Number of students**

Strongly disagree	0
Disagree	3
Undecided	18
Agree	20
Strongly agree	7

Next, students might want a learning media to understand the course, thus the third variable defines this issue. Based on Table 4.5, the scale (1), (2), (3), (4), and (5) obtained 0, 2, 12, 15, and 19 responses from 48 students respectively. By conversion to frequency percentage, the scale (1), (2), (3), (4), and (5) have 0%, 4.17%, 25%, 31.25%, and 39.58% respectively. Strongly agree has the highest percentage compared to other scales while strongly disagree is the lowest. Briefly, most students need a learning media to better understand the course.

Table 4.6. Agreeability in need of learning media for PHY3208 course.

Scale	**Number of students**
Strongly disagree	0
Disagree	2
Undecided	12
Agree	15
Strongly agree	19

Various learning media are present until today such as reference books, educational videos, game simulation, etc. However, books are conventional ways of learning and may instill passive learning. As cited by Resita and Ertikanto (2018), students who employ the mixed learning technique outperform those who use the traditional way (Darmawan, 2014). Therefore, the fourth

variable asked students whether they will be more engaged if the learning media in a form of other than printed materials. Based on Table 4.6, students responded with the scale of (1), (2), (3), (4), and (5) are 0, 1, 14, 19, and 14 respectively. In terms of frequency percentage, 0%, 2.08%, 29.17%, 39.58%, and 29.17% to that of the scale (1), (2), (3), (4), and (5) respectively. Most students agreed that learning media other than books are more engaging for learning compared to the lowest percentage on disagreement. Also, none is strongly disagreed with this variable statement.

Table 4.7. Agreeeability in learning media is more engaging than book.

Scale	**Number of students**
Strongly disagree	0
Disagree	1
Undecided	14
Agree	19
Strongly agree	14

Other important question is does the students know what is an interactive module? In order to implement this media, it is crucial to acknowledged whether interactive module is well-known among the students. Based on Table 4.7, the scale (1), (2), (3), (4), and (5) have 2, 7, 21, 13, and 5 students responded respectively. The frequency percentage of student accordance to the scale of (1), (2), (3), (4), and (5) are 4.17%, 14.58%, 43.75, 27.08%, and 10.42% respectively. These show that most students were unsure whether they had known an interactive module. Although the second majority agreed that they knew, some students disagreed on their acknowledgement. Therefore, it is important to introduce the interactive module for their study.

Table 4.8. Agreeability in knowing the presence of interactive module.

Scale	Number of students
Strongly disagree	2
Disagree	7
Undecided	21
Agree	13
Strongly agree	5

The sixth variable is to answer whether the students will accept the interactive module if it is implemented for the Types of Modules chapter. Based on Table 4.9, the scale (1), (2), (3), (4), and (5) consist 0, 2, 20, 19, and 7 students responded respectively. When converted to the frequency percentage, the scale (1), (2), (3), (4) and (5) have 0%, 4.17%, 41.67%, 39.58%, and 14.58 respectively. From the percentage values, most students inclined with the implementation of the interactive module. Although (3) has the highest percentage among each scales, the agreement biases when combined, will have higher percentage. No students strongly disagreed with the implementation.

Table 4.9. Agreeability in implementation of interactive module.

Scale	Number of students
Strongly disagree	0
Disagree	2
Undecided	20
Agree	19
Strongly agree	7

Last but not least, the variable of cognitive enhancement from the interactive module is questioned on the students. In addition, this is to clarify whether the students accept that the interactive module can increase their critical thinking in problem solving skills (CTPS), enhance cognitive domain (C1 to C4) and affective domain (A1 to A3). However, the terms are changed for the student to understand it better. Based on Table 4.10, the scale (1), (2), (3), (4), and (5) have 0, 1, 16, 20, and 11 students responded respectively. In terms of frequency percentage, the students' responses are 0%, 2.08%, 33.33%, 41.67%, 22.92% with the scale of (1), (2), (3), (4), and (5) respectively. These indicate that the students agreed on the interactive module capabilities of enhancing their CTPS, C and A domain for the Types of Magnet chapter.

Table 4.10. Agreeability in interactive module can facilitate in achieving learning outcomes.

Scale	**Number of students**
Strongly disagree	0
Disagree	1
Undecided	16
Agree	20
Strongly agree	11

After analyzing previous data, the mean will be computed for all variables to prevent biases and completes the frequency distribution analysis. Based on Table 4.11, we may conclude that the average of students' response inclined to range of (3) with one at (4) of the Likert scale. Students were unsure whether PHY3208 is their favourite course, they understand PHY3208 course, learning media other than book is engaging, they know the presence of interactive module, they want to learn Types of Magnets using interactive module. However, students agreed that learning

media can enhance their understanding to PHY3208 course. Therefore, an interactive electronic module will be developed to facilitate students in learning the Types of Magnets chapter.

Table 4.11. Mean of variables for interactive module's perceptions.

No.	Perceptions variable	Mean
1.	Favouring PHY3208 course	3.33
2.	Ease of understanding PHY3208 course	3.65
3.	Learning media can improve understanding on PHY3208 course	4.06
4.	Learning media other than, book are more engaging	3.96
5.	Knowing the presence of interactive module	3.25
6.	Learning Types of Magnets using interactive module	3.65
7.	Interactive module can enhance CTPS, C, and A domain	3.85

4.3.2 Interactive Module Design

In this subchapter, respondents are required to give their expectation towards the module based on the criteria of an interactive module. Also, section C of the questionnaire will be discussed here, from the Likert scale of the 48 students responded. The Likert scale format that has been used is the agreeability with (1), (2), (3), (4), and (5) as strongly disagree, disagree, undecided, agree, and strongly agree respectively. (3) represents a neutral answer while other scales define the degree of its bias. Furthermore, the data will be tabulated for clarity and ease of analysis.

First, the variable asked the respondents whether the interactive module should have animated pictorial display. Based on Table 4.12, the students responded with the scale of (1), (2), (3), (4), and (5) are 0, 0, 12, 9, and 27 respectively. Moreover, the frequency percentage of

students' response with the scale of (1), (2), (3), (4), and (5) are 0%, 0%, 25%, 18.75%, 56.25% respectively. Most students strongly agreed that the animated pictorial display present in the interactive module while zero percentage of students were undecided.

Table 4.12. Agreeability in allocation of pictorial display.

Scale	**Number of students**
Strongly disagree	0
Disagree	0
Undecided	12
Agree	9
Strongly agree	27

Second variable inquired if the interactive module should have several types of examples related to the Types of Magnets chapter. Based on Table 4.13, the students responded with the scale of (1), (2), (3), (4), and (5) are 0, 0, 7, 14, and 27 respectively. Moreover, the frequency percentage of students' response with the scale of (1), (2), (3), (4), and (5) are 0%, 0%, 14.58%, 29.17%, 56.25% respectively. Hence, most students were strongly agreed that several types of examples should be in the interactive module while none were disagreed.

Table 4.13. Agreeability in allocation of several examples.

Scale	**Number of students**
Strongly disagree	0
Disagree	0
Undecided	7
Agree	14

Strongly agree	27

Third variable involves the agreeability of students on the allocation of exercise questions and answers in the interactive module. Based on Table 4.14, the students responded with the scale of (1), (2), (3), (4), and (5) are 0, 1, 10, 9, and 28 respectively. Moreover, the frequency percentage of students' response with the scale of (1), (2), (3), (4), and (5) are 0%, 2.08%, 20.83%, 18.75%, 58.33% respectively. Hence, most students were strongly agreed that exercise questions with answers should be in the interactive module although low percentage of a student disagreed.

Table 4.14. Agreeability in allocation of exercise questions.

Scale	**Number of students**
Strongly disagree	0
Disagree	1
Undecided	10
Agree	9
Strongly agree	28

Fourth variable involves the agreeability of students on the allocation of summary or conclusion in the interactive module. Pricilia et al. (2020) states that the interactive module components that must be included include photos, videos, animations, topic information, internet links, and summaries. Based on Table 4.15, the students responded with the scale of (1), (2), (3), (4), and (5) are 0, 0, 11, 8, and 29 respectively. Moreover, the frequency percentage of students' response with the scale of (1), (2), (3), (4), and (5) are 0%, 0%, 22.91%, 16.67%, 60.42% respectively. Hence, most students were strongly agreed that summary or conclusion should be in the interactive module while none were disagreed.

Table 4.15. Agreeability in allocation of summary or conclusion.

Scale	Number of students
Strongly disagree	0
Disagree	0
Undecided	11
Agree	8
Strongly agree	29

Fifth variable asked on the complexity of understanding the literature in the interactive module. This is due to some reference books having complex scientific English terms that is hard to be comprehended by undergraduate students. Based on Table 4.16, the students responded with the scale of (1), (2), (3), (4), and (5) are 0, 0, 8, 8, and 32 respectively. Moreover, the frequency percentage of students' response with the scale of (1), (2), (3), (4), and (5) are 0%, 0%, 16.67%, 16.67%, 66.66% respectively. Hence, most students were agreed that the interactive module must have comprehensible literature while zero were disagreed.

Table 4.16. Agreeability in comprehensible literature.

Scale	Number of students
Strongly disagee	0
Disagree	0
Undecided	8
Agree	8
Strongly agree	32

Sixth variable inquired whether user's instructions should be included in the interactive module. User's instructions are any kind of presentations that guide the user in case of errors. Based on Table 4.17, the students responded with the scale of (1), (2), (3), (4), and (5) are 0, 0, 10, 11, and 27 respectively. Moreover, the frequency percentage of students' response with the scale of (1), (2), (3), (4), and (5) are 0%, 0%, 20.83%, 22.92%, 56.25% respectively. Hence, most students were agreed that the interactive module must have user's instruction while zero were disagreed.

Table 4.17. Agreeability in allocation of user's instruction.

Scale	**Number of students**
Strongly disagree	0
Disagree	0
Undecided	10
Agree	11
Strongly agree	27

Seventh variable related to the use of colour presentation in the module and in this case is vibrant colours. Vibrant colours such as red, yellow, and orange are proven to include the element of interactive in a learning media. Based on Table 4.18, the students responded with the scale of (1), (2), (3), (4), and (5) are 0, 1, 18, 9, and 20 respectively. Moreover, the frequency percentage of students' response with the scale of (1), (2), (3), (4), and (5) are 0%, 2.08%, 37.50%, 18.75%, 41.67% respectively. Hence, most students were agreed that the interactive module must have vibrant colours while a student was disagreed.

Table 4.18. Agreeability in the use of vibrant colours.

Scale	Number of students
Strongly disagree	0
Disagree	1
Undecided	18
Agree	9
Strongly agree	20

Eight variable involves the use of clear font types in the interactive module. Clear font types such as Arial, Verdana, and Tahoma encourage easy readings compared to cursive fonts. Based on Table 4.19, the students responded with the scale of (1), (2), (3), (4), and (5) are 0, 0, 9, 12, and 27 respectively. Moreover, the frequency percentage of students' response with the scale of (1), (2), (3), (4), and (5) are 0%, 0%, 18.75%, 25%, 56.25% respectively. Hence, most students were agreed that the interactive module must have clear font types while none were disagreed.

Table 4.19. Agreeability in the use of clear fonts.

Scale	Number of students
Strongly disagree	0
Disagree	0
Undecided	9
Agree	12
Strongly agree	27

After analyzing previous data, the mean will be computed for all variables to prevent biases and completes the frequency distribution analysis. Based on Table 4.20, we may conclude that the

average of students' response inclined to (4) of the Likert scale. Hence, the biases of the students were agreed on allocation of pictorial display, several types of examples, exercise questions with answers, summary or conclusion, and user's instructions, and usage of comprehensible literature, vibrant colours, and clear fonts.

Table 4.20. Mean of variables for interactive module's display expectations.

No.	Display variable	Mean
1.	Allocation of pictorial display	4.31
2.	Allocation of types of examples	4.42
3.	Allocation of exercise questions and answers	4.33
4.	Allocation of summary or conclusion	4.38
5.	Comprehensible literature	4.50
6.	Allocation of user's instructions	4.35
7.	Vibrant colours	4.00
8.	Clear fonts	4.38

4.4 Types of Magnet Interactive Module

For the development of the interactive module, the variables in the Section C of students' perceptions questionnaire are considered. Moreover, the variables will be described extensively on subsequent chapters while few navigations of the Types of Magnet interactive module will be explained in this section. Navigations is the interface of the interactive module that will make an action when being clicked.

Based on Figure 4.1, the interactive module front page shows some animated visualization with titles and clickable buttons. There are two top right buttons at the front page: (1) the question mark button that will direct the user to the user's instructions page; and (2) the cross button to close the program. On the middle right part is the buttons that will guide the user to each subchapter notes of the Types of Magnets as shown: Diamagnetism, Paramagnetism, Ferromagnetism, Antiferromagnetism, Ferrimagnetism. Other two buttons are the Quiz and Summary on the Types of Magnets chapter. Furthermore, at the bottom left of the page, the speaker button will either on or off the audio. Other features are unclickable such as the logo of UPM on the top left and the titles at the center top of the page.

Figure 4.1. Types of Magnets interactive module's front page.

4.4.1 Types of Magnet Pictorial Display

Pictorial display is any kind of images, pictures or presentation that can be observed by the students. In the interactive module, the researcher mainly used graphics interchange format (GIF) to explain the concepts through animations. GIF is a bitmap image format established by CompuServe in 1987 that has subsequently gained popularity on the World Wide Web due to its extensive support and mobility (Heim & Sinha, 2001; Ballard & McKenzie, 2002, as cited in Arvianto, 2020). In addition, the GIF is made by using Canva and Powtoon to achieve the term interactive animation for the module development.

Based on Figure 4.2, the notes of the subchapter is presented on the left side while the pictorial display is on the right side. The subsequent pages and other subchapters is displayed using this format. On the top right, the house button will appear and clickable to bring back the user to homepage. Moreover, the button with arrow to the right on the bottom left is the next page button.

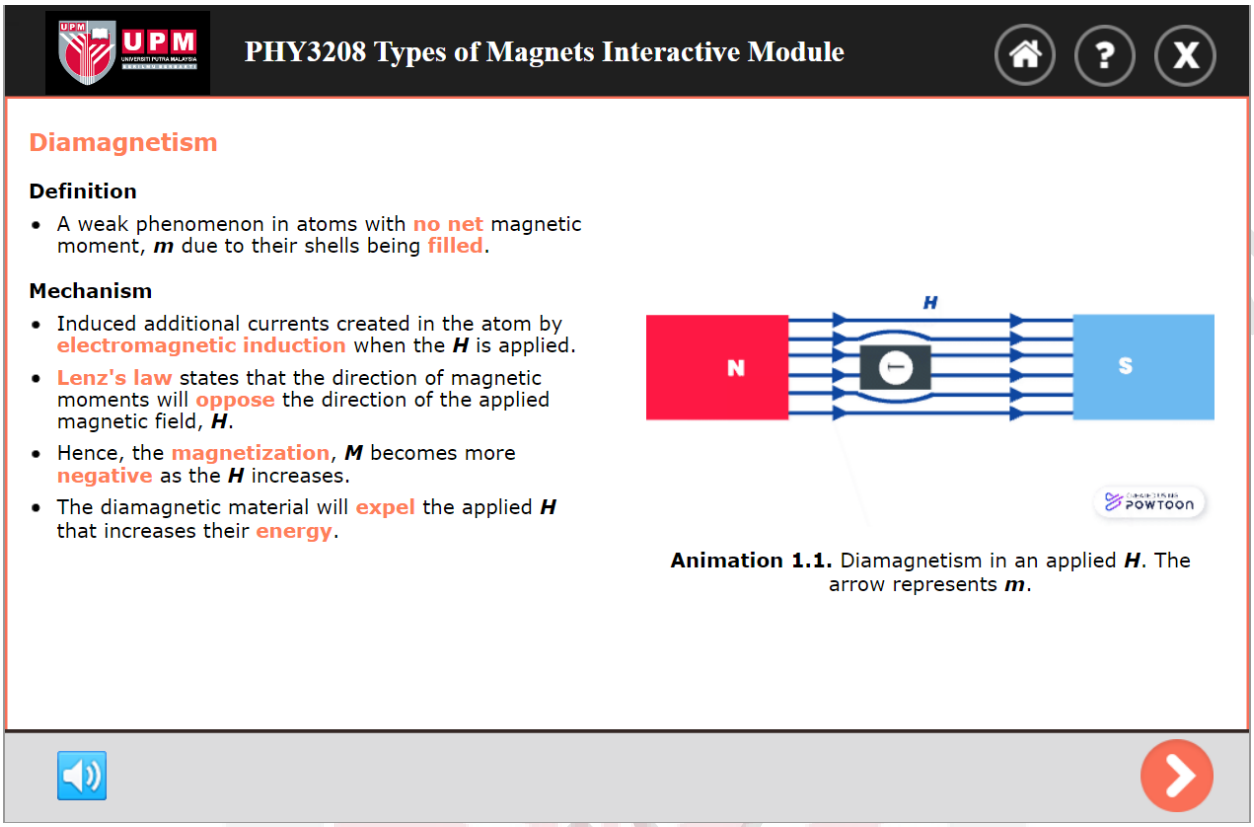


Figure 4.2. Pictorial display of Types of Magnets interactive module.

4.4.2 Types of Magnets Examples

In previous subsection, students responded that they want several types of examples given in the interactive module. For Diamagnetism subchapter, the examples given are various such as superconductors, noble gases and diatomic gases along with description. Furthermore, applications of diamagnetism are also included to give insights for students, the usage of the magnetic materials. These not only applies to the subchapter stated but also other subchapters. Note that when the user proceeds further to the next page, a back button will be provided to review back the previous page.

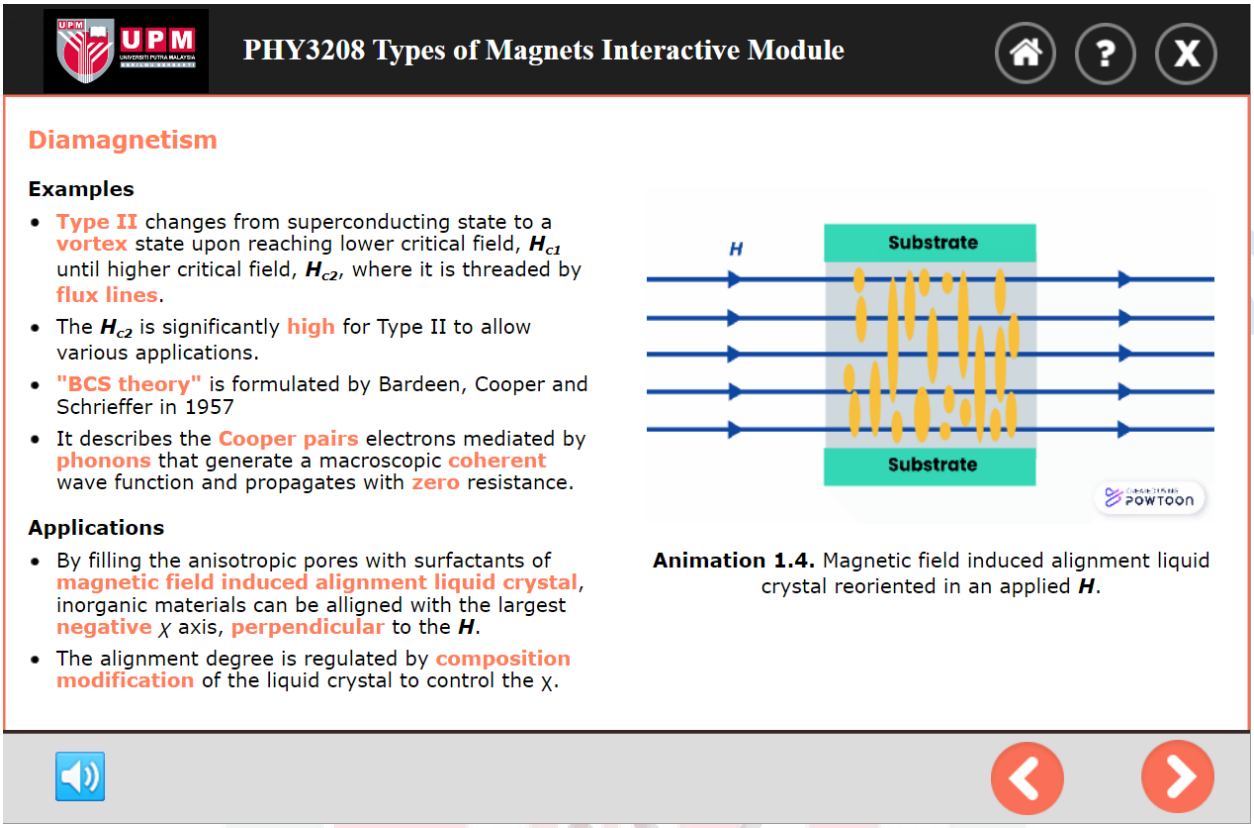


Figure 4.3. Examples of application in Types of Magnets interactive module.

4.4.3 Types of Magnets Quiz

In the pre-implementation survey, it is also mentioned that most students agreed on the inclusion of exercise questions and answers. The interactive module provided the questions with immediate statement on whether the student's answer is either correct or wrong. Typically, interactive multimedia programme are designed to immediately display specific results and offer feedback (Suwatra et al., 2018; Wulandari, 2016, as cited in Pricilia, 2020). Moreover, there are 20 questions provided and the total score for correct answers will be presented on the last page of the quiz. Commonly, a quiz will prevent the user from clicking the unnecessary buttons that will lead to cheating. Hence, the home, info and back button is excluded from the quiz and the user

need to close the module in order to open the notes. Also, the answered question will prevent the user from answering the question twice.

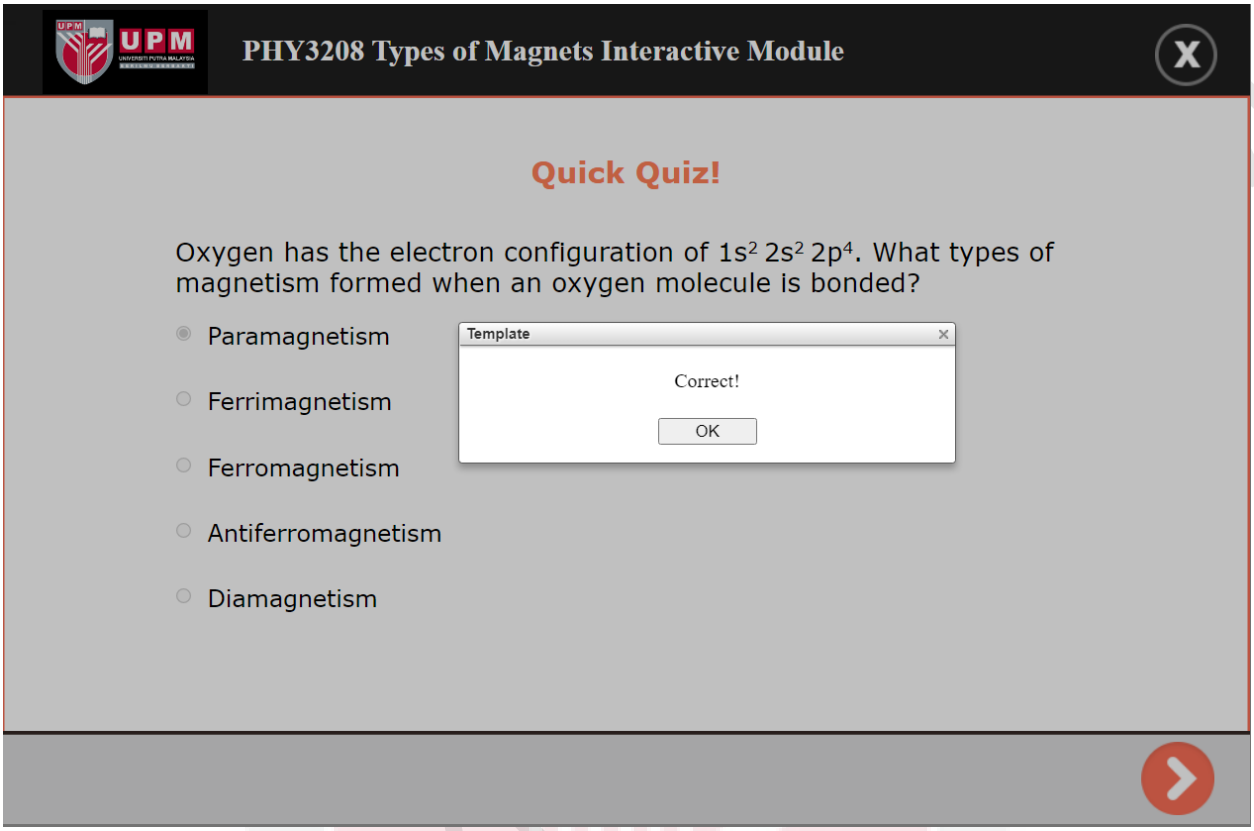
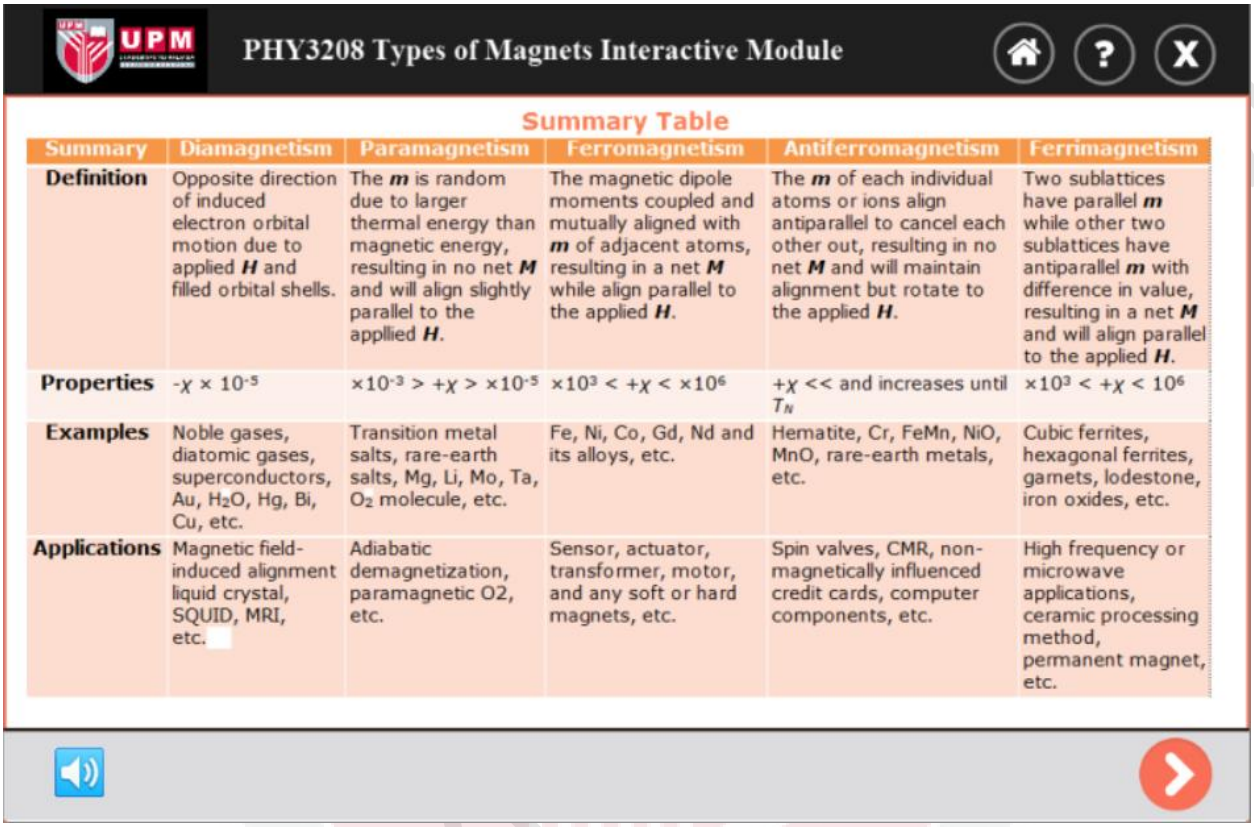


Figure 4.4. Exercise questions in Types of Magnets interactive module.

4.4.4 Types of Magnets Summary

Summary is where the main points of the magnetism stated in the interactive module. In this part, it is presented in the form of table to implement the C4 skills. The capacity to examine a problem area and break it down into its separate constituents, finding the link between distinct pieces, is referred to as Analyzing (C4) (Anderson & Krathwohl, 2001, as cited in Baghaei et al., 2021). Most students wanted the summary and conclusion when referred to the first questionnaire thus the summary is also made in the module. Furthermore, the important sections are the

definitions, properties, examples and applications as they are the core concepts of the Types of Magnets chapter. Therefore, Figure 4.25. shows the division of the table as follows.



Summary	Diamagnetism	Paramagnetism	Ferromagnetism	Antiferromagnetism	Ferrimagnetism
Definition	Opposite direction of induced electron orbital motion due to applied ***H*** and filled orbital shells.	The ***m*** is random due to larger thermal energy than magnetic energy, resulting in no net ***M*** and will align slightly parallel to the appllied ***H***.	The magnetic dipole moments coupled and mutually aligned with ***m*** of adjacent atoms, resulting in a net ***M*** while align parallel to the applied ***H***.	The ***m*** of each individual atoms or ions align antiparallel to cancel each other out, resulting in no net ***M*** and will maintain alignment but rotate to the applied ***H***.	Two sublattices have parallel ***m*** while other two sublattices have antiparallel ***m*** with difference in value, resulting in a net ***M*** and will align parallel to the applied ***H***.
Properties	$-\chi \times 10^{-5}$	$\times 10^{-3} > +\chi > \times 10^{-5}$	$\times 10^{3} < +\chi < \times 10^{6}$	$+\chi <<$ and increases until T_N	$\times 10^{3} < +\chi < 10^{6}$
Examples	Noble gases, diatomic gases, superconductors, Au, H_2O, Hg, Bi, Cu, etc.	Transition metal salts, rare-earth salts, Mg, Li, Mo, Ta, O_2 molecule, etc.	Fe, Ni, Co, Gd, Nd and its alloys, etc.	Hematite, Cr, FeMn, NiO, MnO, rare-earth metals, etc.	Cubic ferrites, hexagonal ferrites, garnets, lodestone, iron oxides, etc.
Applications	Magnetic field-induced alignment liquid crystal, SQUID, MRI, etc.	Adiabatic demagnetization, paramagnetic O2, etc.	Sensor, actuator, transformer, motor, and any soft or hard magnets, etc.	Spin valves, CMR, non-magnetically influenced credit cards, computer components, etc.	High frequency or microwave applications, ceramic processing method, permanent magnet, etc.

Figure 4.5. Summary in Types of Magnets interactive module.

4.4.5 User's Instructions

Based on Figure 4.6, the user's instructions page is presented with labels for each buttons. The instructions are simplified in terms of the words and sentences to ease understanding. Moreover, the allocation of this page is to avoid problems persist while using the interactive module. Furthermore, it can also be an introduction or a welcoming to the user if the user is not familiar with interactive electronic module. Hence, its button is prioritised throughout the module except in the quiz pages.

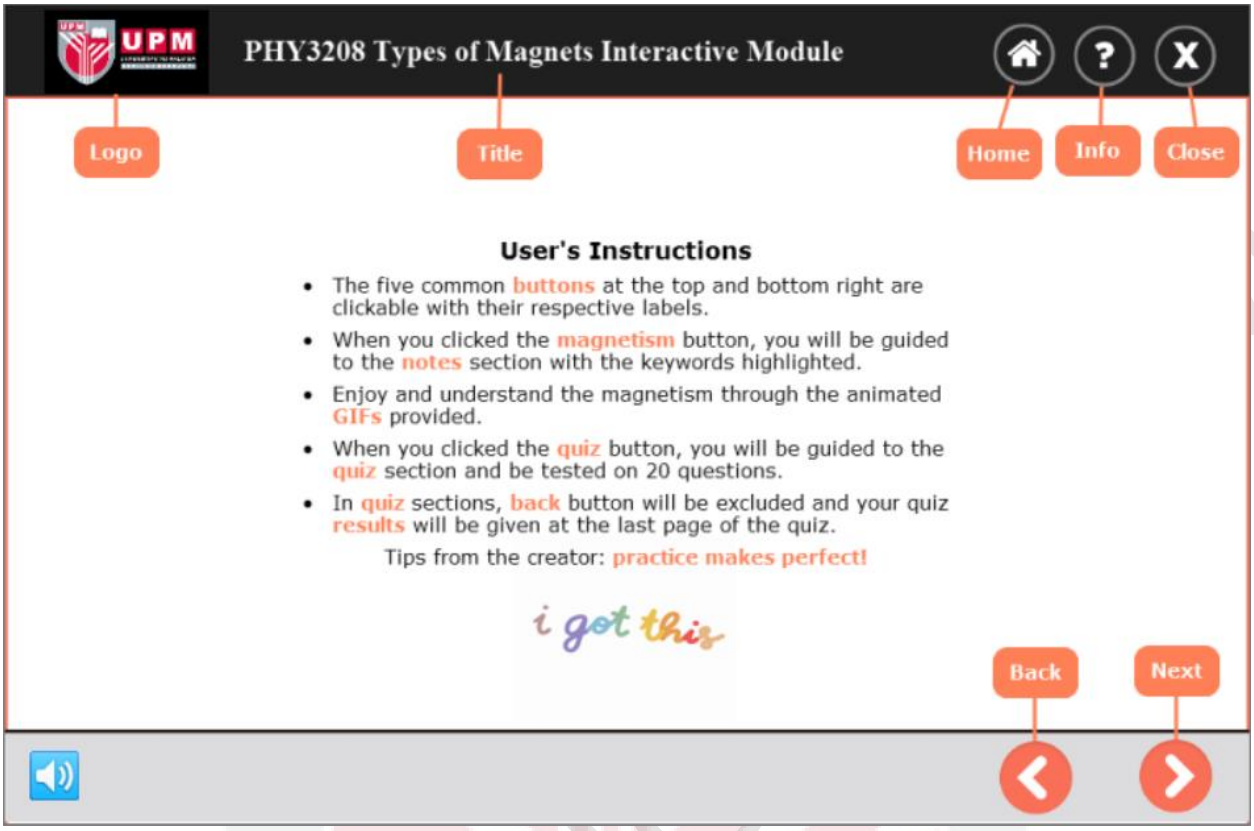


Figure 4.6. User's instructions in Types of Magnets interactive module.

4.4.3 Other Formats

For this section, the color composition, fonts and the literature used will be discussed. First, the vibrant colour chosen is orange with the combination of white and black. Moreover, the notes were also highlighted in orange colour to signify the importance of the keywords. Red and yellow are too bright to be kept into consideration and might cause dizziness and unclear writings. Other than that, the font types chosen was Verdana as it is large and clear even when the interactive module is being minimized. Cursive and gothic fonts are avoided as it is hard to read for academic writings purposes. The scientific literature can be hard to be simplified especially when involving quantum mechanics, electromagnetism and other tough courses. Therefore, the synonyms and paraphrase techniques are used to provide better understanding for students' learning.

4.5 Students' Feedback on Interactive Module

4.5.1 Interactive Module Content

Section B for the Students' Feedback on Interactive Module questionnaire will be discussed in this section. This also marks the post-implementation survey that values the Types of Magnets interactive module. By using the agreeability Likert scale, 48 students are required to answer the questions based on (1) Strongly Disagree, (2) Disagree, (3) Undecided, (4) Agree, and (5) Strongly Agree. Moreover, the results will be tabulated along with the variables and will be explained extensively.

First, a variable asked on whether the students understand the Types of Magnets notes from the interactive module. Based on Table 4.27, the students responded with the scale of (1), (2), (3), (4), and (5) with 0, 0, 3, 7, and 38 respectively. In addition, the frequency percentage of students' response with the scale of (1), (2), (3), (4), and (5) are 0%, 0%, 6.25%, 14.58%, 79.17% respectively. Hence, most students were strongly agreed that they understand the Types of Magnets when using the interactive module while none on the negative bias.

Table 4.21. Agreeability in understanding Types of Magnets interactive module notes.

Scale	Number of students
Strongly disagree	0
Disagree	0
Undecided	3
Agree	7
Strongly agree	38

Second variable inquired on the agreeability of students whether they can depict the Types of Magnets concepts based on the pictorial display. Based on Table 4.28, the students responded with the scale of (1), (2), (3), (4), and (5) with 0, 0, 4, 7, and 37 respectively. Furthermore, the frequency percentage of students' response with the scale of (1), (2), (3), (4), and (5) are 0%, 0%, 8.33%, 14.58%, 77.09% respectively. Hence, most students were strongly agreed that they were able to illustrate the Types of Magnets concepts after watching the pictorial display.

Table 4.22. Agreeability in illustrating Types of Magnets after using the pictorial display.

Scale	**Number of students**
Strongly disagree	0
Disagree	0
Undecided	4
Agree	7
Strongly agree	37

Third variable involves the agreeability to understand the application of Types of Magnets examples in daily life when using the interactive module. Based on Table 4.29, the students responded with the scale of (1), (2), (3), (4), and (5) with 0, 0, 2, 10, and 36 respectively. Moreover, the frequency percentage of students' response with the scale of (1), (2), (3), (4), and (5) are 0%, 0%, 4.17%, 20.83%, 75% respectively. Hence, most students were strongly agreed that they understand the application of Types of Magnets examples in daily life after using the interactive module.

Table 4.23. Agreeability understanding application of Types of Magnets examples.

Scale	**Number of students**

Strongly disagree	0
Disagree	0
Undecided	2
Agree	10
Strongly agree	36

Fourth variable asked the respondents on whether they can explain the Types of Magnets and answer the exercise questions correctly from the interactive module. Based on Table 4.30, the students responded with the scale of (1), (2), (3), (4), and (5) with 0, 0, 7, 10, and 31 respectively. In addition, the frequency percentage of students' response with the scale of (1), (2), (3), (4), and (5) are 0%, 0%, 14.58%, 20.83%, 64.59% respectively. Hence, most students were strongly agreed that they were able to explain the Types of Magnets and answer the interactive module's exercise questions correctly.

Table 4.24. Agreeability in explaining Types of Magnets and answering the exercise questions correctly.

Scale	**Number of students**
Strongly disagree	0
Disagree	0
Undecided	7
Agree	10
Strongly agree	31

Fifth variable inquired on whether the students able to classify the Types of Magnets better than reading the book. Also, the justification is made after the students used the interactive module.

Based on Table 4.31, the students responded with the scale of (1), (2), (3), (4), and (5) with 0, 0, 5, 11, and 32 respectively. Furthermore, the frequency percentage of students' response with the scale of (1), (2), (3), (4), and (5) are 0%, 0%, 10.42%, 22.92%, 66.67% respectively. Hence, most students were strongly agreed that they were able to classify the Types of Magnets by using the interactive module better than the book.

Table 4.25. Agreeability in classifying Types of Magnets better than using the book.

Scale	**Number of students**
Strongly disagree	0
Disagree	0
Undecided	5
Agree	11
Strongly agree	32

The last variable involves the question on whether the module made the students study interactively. Based on Table 4.32, the students responded with the scale of (1), (2), (3), (4), and (5) with 0, 0, 4, 11, and 33 respectively. Moreover, the frequency percentage of students' response with the scale of (1), (2), (3), (4), and (5) are 0%, 0%, 8.33%, 22.92%, 68.75% respectively. Hence, most students were strongly agreed that they can study the Types of Magnet chapter interactively by using the module.

Table 4.26. Agreeability in studying Types of Magnet interactive module interactively.

Scale	**Number of students**
Strongly disagree	0
Disagree	0

Undecided	4
Agree	11
Strongly agree	33

After analyzing the data, the mean will be computed for all variables to prevent biases and completes the frequency distribution analysis. Based on Table 4.33, we may conclude that the average of students' response for all variables inclined to the scale of (4). This proves that the interactive module's notes, pictorial displays, examples with applications, exercise questions, and classifications able to facilitate students to study interactively.

Table 4.27. Mean of variables for interactive module's contents.

No.	Content variable	Mean
1.	Understand the Types of Magnets from the interactive module	4.73
2.	Depict the Types of Magnets concepts by using the pictorial display	4.69
3.	Understand the Types of Magnets application examples in daily life	4.71
4.	Explain Types of Magnets and answer the exercise questions correctly	4.5
5.	Classify Types of Magnets better than reading the book	4.56
6.	Study interactively by using the module	4.60

4.5.2 Interactive Module Presentation

Section C for the Students' Feedback on Interactive Module questionnaire will be elaborated in this section. This also represents the post-implementation survey that values the Types of Magnets interactive module in terms of presentation. By using the agreeability Likert

scale, 48 students will answer the questions based on (1) Strongly Disagree, (2) Disagree, (3) Undecided, (4) Agree, and (5) Strongly Agree. Note that (3) represents a neutral response while other scales define the degree of its bias. Therefore, the results will be tabulated along with the variables and will be explained extensively.

First, the variable asked whether the students felt easy when using the interactive module. Based on Table 4.34, the students responded with the scale of (1), (2), (3), (4), and (5) with 0, 0, 3, 11, and 34 respectively. Moreover, the frequency percentage of students' response with the scale of (1), (2), (3), (4), and (5) are 0%, 0%, 6.25%, 22.92%, 70.83% respectively. Hence, most students strongly agreed that the interactive module is easy to use while none states the opposite bias.

Table 4.28. Agreeability in easiness of using the interactive module.

Scale	**Number of students**
Strongly disagree	0
Disagree	0
Undecided	3
Agree	11
Strongly agree	34

Second variable inquired on understanding the user's instructions' explanation. Based on Table 4.35, the students responded with the scale of (1), (2), (3), (4), and (5) with 0, 0, 5, 10, and 33 respectively. Moreover, the frequency percentage of students' response with the scale of (1), (2), (3), (4), and (5) are 0%, 0%, 10.42%, 20.83%, 68.75% respectively. Hence, most students strongly agreed that they can understand the user's instructions page while none states the opposite bias.

Table 4.29. Agreeability in understanding user's instructions explanation.

Scale	Number of students
Strongly disagree	0
Disagree	0
Undecided	5
Agree	10
Strongly agree	33

Third variable involves the the pictorial display related to the Types of Magnet chapter. This also includes the animation, colour, and interactive elements in the pictorial display. Based on Table 4.36, the students responded with the scale of (1), (2), (3), (4), and (5) with 0, 0, 4, 9, and 35 respectively. Moreover, the frequency percentage of students' response with the scale of (1), (2), (3), (4), and (5) are 0%, 0%, 8.33%, 18.75%, 72.92% respectively. Hence, most students strongly agreed that the pictorial display related to the Types of Magnets while none states the opposite bias.

Table 4.30. Agreeability in pictorial display related to Types of Magnets.

Scale	Number of students
Strongly disagree	0
Disagree	0
Undecided	4
Agree	9
Strongly agree	35

Fourth variable asked the attractiveness and suitability of colour composition in the interactive module. The color composition needs to be compatible with the content without causing any uncomfortable feelings through observation. Based on Table 4.37, the students responded with the scale of (1), (2), (3), (4), and (5) with 0, 1, 3, 7, and 37 respectively. Moreover, the frequency percentage of students' response with the scale of (1), (2), (3), (4), and (5) are 0%, 2.08%, 6.25%, 14.58%, 77.08% respectively. Hence, most students strongly agreed that the color composition is attractive and suitable while a student had chosen disagree scale.

Table 4.31. Agreeability in attractiveness and suitability of colour composition.

Scale	**Number of students**
Strongly disagree	0
Disagree	1
Undecided	3
Agree	7
Strongly agree	37

Fifth variable inquired on the suitability of pictorial display and font arrangement in the interactive module. This means that the position and alignment of the animation and writings are suitable for the interactive module or otherwise. Based on Table 4.38, the students responded with the scale of (1), (2), (3), (4), and (5) with 0, 0, 3, 9, and 36 respectively. Moreover, the frequency percentage of students' response with the scale of (1), (2), (3), (4), and (5) are 0%, 0%, 6.25%, 18.75%, 75% respectively. Hence, most students strongly agreed that the pictorial display and font arrangement are suitable while none states the opposite bias.

Table 4.32. Agreeability in pictorial display and font arrangement.

Scale	Number of students
Strongly disagree	0
Disagree	0
Undecided	3
Agree	9
Strongly agree	36

Sixth variable involves the font type and size being used in the interactive module. This means that the students can read the notes with clarity and not too big or too small when in term of size. Based on Table 4.39, the students responded with the scale of (1), (2), (3), (4), and (5) with 0, 0, 3, 10, and 35 respectively. Moreover, the frequency percentage of students' response with the scale of (1), (2), (3), (4), and (5) are 0%, 0%, 6.25%, 20.83%, 72.92% respectively. Hence, most students strongly agreed that the font type and size are readable while no student states the opposite bias.

Table 4.33. Agreeability in font type and size.

Scale	Number of students
Strongly disagree	0
Disagree	0
Undecided	3
Agree	10
Strongly agree	35

Seventh variable asked about the button usage consistency. Button usage consistency is crucial when using any online applications as it prevents confusion and error. Based on Table 4.40, the students responded with the scale of (1), (2), (3), (4), and (5) with 0, 0, 4, 8, and 36` respectively. Moreover, the frequency percentage of students' response with the scale of (1), (2), (3), (4), and (5) are 0%, 0%, 8.33%, 16.67%, 75% respectively. Hence, most students strongly agreed that the button usage is consistent throughout the interactive module while no student states the opposite bias.

Table 4.34. Agreeability in button usage consistency.

Scale	**Number of students**
Strongly disagree	0
Disagree	0
Undecided	4
Agree	8
Strongly agree	36

Eight variable inquired on the text efficiency in the interactive module. Text efficiency in the interactive module context is the ability for the students to understand the texts after being simplified and modified. Based on Table 4.41, the students responded with the scale of (1), (2), (3), (4), and (5) with 0, 0, 6, 7, and 35 respectively. Moreover, the frequency percentage of students' response with the scale of (1), (2), (3), (4), and (5) are 0%, 0%, 12.5%, 14.58%, 72.92% respectively. Hence, most students strongly agreed that the text is efficient in the interactive module while no student states the opposite bias.

Table 4.35. Agreeability in text efficiency.

Scale	Number of students
Strongly disagree	0
Disagree	0
Undecided	6
Agree	7
Strongly agree	35

After analyzing the data, the mean will be computed for all variables to prevent biases and completes the frequency distribution analysis. Based on Table 4.42, we may conclude that the average of students' response for all variables inclined to the scale of (4) agree. This proves that the interactive module can be accepted in terms of ease of use, explanation of user's instructions, pictorial display related to the Types of Magnet, color composition, arrangement of pictorial display and font, font type and size, consistency of button usage, and text efficiency.

Table 4.36. Mean of variables for interactive module's presentation.

No.	Presentation variable	Mean
1.	Ease of use	4.65
2.	Explanation of user's instruction	4.58
3.	Pictorial display related to the Types of Magnet	4.65
4.	Color composition	4.67
5.	Pictorial display and font arrangement	4.69
6.	Font type and size	4.67
7.	Consistency of button usage	4.67

8.	Text efficiency	4.60

4.6 Conclusion

In conclusion, the students were unsure on the interactive module implementation based on the Perceptions on Interactive Module questionnaire, however, after the implementation, students agreed and qualify the interactive module as Good. This proves that the interactive module able to improve students' learning for the Types of Magnet chapter. In addition, students rated averagely with (3) for undecided scale for their perceptions and combination of agree (4) and undecided (3) for their expectation towards interactive module. After the implementations of the interactive module, it obtained average scale of agree (4) in terms of the content and presentation. Therefore, the interactive module is able to facilitate students' learning in Types of Magnet chapter.

CHAPTER 5

CONCLUSION

5.1 General Conclusion

Interactive module has been proven in various education researches regarding its capabilities in enhancing students' learning and facilitating educators' teaching. Due to technological advances, numerous methods have been permitted in developing teaching materials. New form of teaching or learning also created during the processes. E-learning and m-learning are just a few examples of educational discoveries. These discoveries lead to creativity of teachers in using digital or online resources for assimilation with education. Hence, the educational technology term is found and filled potholes of the conventional education method. For instance, in seamless learning, where everyone can enjoy any kind of knowledge without boundaries. The implementation of the interactive module might not act globally yet educational researchers are curious to find its potential.

5.2 Recommendations

There are numerous challenges in developing an interactive module whether internal or external of a researcher. The main limitation is knowledge. An individual should have at least adequate information and skills to develop a digital or online applications. Without subtle grasp of the information technology or computer science background, they might loss in filling the educational content without considerations of the user. Furthermore, lacking in the educational contents might also drag the user from learning and interrupted with the animations only. Therefore, the educators should have adequate knowledge of both fields before producing the interactive module.

Other, crucial limitation is time allocation and consideration. Although the research seems doable in terms of module production, the quantitative method might be the biggest disadvantages. Two surveys need to be done in order to realize the interactive module. The first survey is to know the elements of the learning media while the second survey is to know whether the criteria are fulfilled. Some researcher might consider the correction phase which is improving the lacking elements, however, there are researchers stopped halfway due to the time constraints. Worth noting that not all of the elements must be included in the interactive module as the specifications of the software can be a limiting factor. Hence, the researcher might plan their works for better time management of the procedures. Briefly, if similar research will be done in the future, these two points are important to be reviewed.

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APPENDICES

APPENDIX A(I): STUDENTS' PERCEPTIONS ON INTERACTIVE MODULE QUESTIONNAIRE

Students' Perceptions on Interactive Module

Greetings, students. PHY3208 (Magnetism and Magnetic Materials) is an undergraduate course for Bachelor of Science in Materials Science with Honours in University Putra Malaysia. This questionnaire will be conducted to collect data on the perceptions of undergraduate students for the development of the PHY3208 Types of Magnets Interactive Module (IM).

The questionnaire consists of 3 sections which are: (A) Demographics, (B) IM Perceptions, and (C) IM Design. An approximation of 15 minutes is needed to complete this questionnaire and your allocation of time is well appreciated. Your e-mail address is required to prevent the redundancy of data. Moreover, your information given during the questionnaire was considered confidential and will be subjected to this research purposes only. Thank you for your participation.

* Required

1. Email *

Section A : Demographics

Demographics is the statistical study of responses information. For this matter, the participant's personal information will be collected in our research data collection. Thank you for your honest response.

2. Year of Study *

Mark only one oval.

- ◯ First Year
- ◯ Second Year
- ◯ Third Year
- ◯ Fourth Year

3. Study Programme *

Mark only one oval.

- ◯ Bachelor of Science in Materials Science with Honours
- ◯ Other

4. Completion of PHY3208 Course *

Mark only one oval.

- ◯ I have passed the PHY3208 course.
- ◯ I am currently taking the PHY3208 course.
- ◯ I have not passed the PHY3208 course.
- ◯ I have not taken the PHY3208 course.

Section B : Interactive Module Perceptions

In this section, you are required to value the importance of an interactive module (IM) for the "Types of Magnets", a subtopic in PHY3208 Magnetism and Magnetic Materials course. By using the Likert scale, you may choose based on the scale of:

1: "Strongly Disagree"
2: "Disagree"
3: "Undecided"
4: "Agree"
5: "Strongly Agree"

For your inquiries, the "Undecided" here refers to a neutral answer while others define the degree of its bias. Thank you for your honest response.

5. Magnetism and Magnetic Materials is my favourite course. *

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

6. The fundamental concepts of "Types of Magnets" is easy to understand. *

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

7. Teaching aid resources, such as learning media can help me to understand the course. *

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

8. Learning media approach can engage me closer compared to the book. *

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

9. I know about other learning media such as interactive modules (IM). *

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

10. I need IM to learn the PHY3208 Magnetism and Magnetic Materials course. *

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

11. IM engages students, raises their critical thinking skills, and, develop analytical reasoning skills. *

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

Section C : Interactive Module Design

In this section, you are required to depict and provide the answer for the interactive module (IM) design. By using the Likert scale, you may choose based on the scale of:

1: "Strongly Disagree"
2: "Disagree"
3: "Undecided"
4: "Agree"
5: "Strongly Agree"

For your inquiries, the "Undecided" here refers to neutral answer while others define the degree of its bias. Thank you for your honest response.

12. IM must provide animated pictorial display notes. *

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

13. IM must provide several "Types of Magnets" of examples. *

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

14. IM must provide exercise questions and answers. *

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

15. IM must have a summary or conclusion part. *

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

16. IM must be easy to read and understand. *

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

17. IM must have user's instructions. *

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

18. IM must have vibrant colours (e.g., Red, Orange, etc.). *

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

19. IM must have clear fonts (e.g., Arial, Verdana, etc.). *

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

APPENDIX A(II): STUDENTS' FEEDBACK ON INTERACTIVE MODULE QUESTIONNAIRE

Students' Feedback on Interactive Module

Greetings, students. PHY3208 (Magnetism and Magnetic Materials) is an undergraduate course for Bachelor of Science in Materials Science with Honours in University Putra Malaysia. This questionnaire will be conducted to collect data on students' feedback for the Types of Magnets Interactive Module (IM).

The questionnaire consists of 3 sections which are:
(A) Demographics,
(B) Module Content, and
(C) Module Presentation.

An approximation of 20 minutes is needed to complete this questionnaire and your allocation of time is well appreciated. Your e-mail address is required to prevent the redundancy of data. Moreover, your information given during the questionnaire was considered confidential and will be subjected to this research purposes only. Thank you for your participation.

* Required

1. Email *

Reminder

Respondents are required to use the IM given, before giving any response in this questionnaire. Thank you for your time.

Section A : Demographics

Demographics is the statistical study of responses information. For this matter, the participant's personal information will be collected in our research data collection. Thank you for your honest response.

2. Year of Study *

Mark only one oval.

- ◯ First Year
- ◯ Second Year
- ◯ Third Year
- ◯ Fourth Year

3. Study Programme *

Mark only one oval.

- ◯ Bachelor of Science in Materials Science with Honours
- ◯ Other

4. Completion of PHY3208 Course *

Mark only one oval.

- ◯ I have passed the PHY3208 course.
- ◯ I am currently taking the PHY3208 course.
- ◯ I have not passed the PHY3208 course.
- ◯ I have not taken the PHY3208 course.

Section B : Interactive Module Content

In this section, you will give a response on the Interactive Module (IM) Content related to "Types of Magnets", a subtopic in PHY3208 Magnetism and Magnetic Materials course. By using the Likert scale, you may choose based on the scale of:

1: "Strongly Disagree"
2: "Disagree"
3: "Undecided"
4: "Agree"
5: "Strongly Agree"

For your inquiries, the "Undecided" here refers to a neutral answer while others define the degree of its bias. Thank you for your honest response.

5. I can understand the "Types of Magnets" from the Interactive Module's (IM) notes. *

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

6. I can illustrate the fundamental concepts of magnetism from this IM's pictorial display. *

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

7. I can understand the application of the "Types of Magnets" examples in daily life based on this IM. *

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

8. I can explain the "Types of Magnets" accurately and answer the exercise questions provided in this IM. *

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

9. I can easily classify the "Types of Magnets" better than reading from the book. *

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

10. I can study interactively by using the IM's content. *

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

Section C : Interactive Module Presentation

In this section, you are required to value the Interactive Module (IM) presentation related to "Types of Magnets", a subtopic in PHY3208 Magnetism and Magnetic Materials course. By using the Likert scale, you may choose based on the scale of:

1: "Strongly Disagree"
2: "Disagree"
3: "Undecided"
4: "Agree"
5: "Strongly Agree"

For your enquiries, the "Undecided" here refers to neutral answer while others define the degree of its bias. Thank you for your honest response.

11. Ease of using the interactive module (IM). *

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

12. Explanation of user instructions in IM. *

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

13. Pictorial display in IM related to the "Types of Magnets". *

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

14. Attractiveness and suitability of color compositions in IM. *

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

15. Font and pictorial display arrangement in IM. *

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

16. Font type and size in IM. *

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

17. Consistency of button usage in IM. *

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

18. Text efficiency in IM. *

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

APPENDIX B: SOLVED EXAMPLE OF EQUATION 3.1 AND 3.2

$$Frequency\ percentage = \frac{Number\ of\ students}{Total\ of\ students} \times 100\% = \frac{27}{48} \times 100\% = 56.25\%$$

Solved example for scale of (3) from Table 4.4 for Equation 3.1.

$$Mean = \frac{\Sigma f_i x_i}{\Sigma f_i} = \frac{5(5) + 11(4) + 27(3) + 5(2) + 0(1)}{48} = 3.33$$

Solved example from Table 4.4 for Equation 3.1