LABORATORY-MODIFIED ARGUMENT DRIVEN INQUIRY (LAB-MADI) MODULE: CONTENT VALIDITY PROCESS

by Irene Lue Leh Ping

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ABSTRACT

This paper aims to determine the validity of the LAB-MADI module using the Content Validity Index (CVI) and Percentage Calculation Method (PCM). The survey was conducted through the evaluation of six experts via purposive sampling. The instrument used for the evaluation was content validity instrument. Based on the results of the analysis, the mean scores of CVI and PCM of the LAB-MADI module were 0.97 and 87.22%, respectively while the mean scores of CVI and PCM of eight practical activities based on the seven stages of the MADI model were 0.98 and 81.88% respectively. The results of the study indicate that the module has high validity in the six criteria assessed (suitability for target students, feasibility, time allocation and improving the dependent variables under study: argumentation skills, science process skills and concepts of diffusion and osmosis). Therefore, this module has great potential as a good module. This module is therefore recommended to be used and tested for its effectiveness. The module is also a form of alternative teaching method to guide biology teachers so that they can add value to students in terms of argumentation skills, science process skills and Biology concepts through practical work.

Keywords: Argument-Driven Inquiry, Content Validity, Practical Work, Argumentation, Inquiry-Based science Instruction

INTRODUCTION

Scientific argumentation is an important discourse to the habits of members of scientific research in order to develop the same opinion about science knowledge. Develop such a discourse in school science is necessary so that students would be able to mirror the habits of scientists. However, science learning is often executed in the form of students passively accepting information from the teacher, copying notes, doing drill and practice and 'cookbook style' practical activities (Peen & Arshad, 2013; Toplis, 2012). Such teaching and learning process does not promote students' potential(Osborne, 2014).Clearly, students would not fully understand the scientific knowledge taught if they are not given the opportunity to experience constructing and evaluating scientific argumentation themselves.

The last two decades have seen many empirical researches examining ways to promote argumentation in science classrooms and scaffolding students as they learn how to participate in argumentation. Many opportunities could be provided through the development of new pedagogical practices (Berland & Hammer, 2012; Gultepe & Kilic, 2015; Osborne et al., 2013; Osborne, 2014; Osborne et al., 2017), technology-enhanced learning environments(Clark et al., 2012; Wu & Pedersen, 2011; Yang, et al., 2015), innovative argumentation curriculum (McNeill, 2009) and laboratory environment (Chen et al., 2016; Grooms et al., 2014; Sampson & Gleim, 2009; Sampson et al., 2011; Sampson & Walker, 2012; Walker et al., 2011). These updated pedagogical practices can be used as a way for teachers to integrate argumentation into their teaching of science lessons.

Efforts have continued in designing science teaching processes as well as science inquiry to develop students' habit of constructing and communicating argumentation. Nonetheless, Sampson & Gleim (2009) argued that many science teachers are unclear of how to prepare lessons that would engage students in argument-driven inquiry in a way that would improve students' understanding of important science concepts and science practices including in biology. Scholars in science education believe that it is not enough for teachers to teach science as a process of inquiry; teachers also need to give their students the opportunity to engage in argumentation(Grooms et al., 2015; Osborne, 2012, 2013; Sampson & Blanchard, 2012; Walker et al., 2011). This is because argumentation is one of the most important processes of scientific inquiry (Gultepe & Kilic, 2015; Sampson et al., 2011). Therefore, constructing argumentation explicitly is a must so that students are guided when engaged in the inquiry process and this would ultimately to help them understand the science phenomenon better. It also act as a foundation for science teachers to prepare students for inquiry-based science instruction.

Teachers and students both play important roles in science teaching and learning process (Halim et al., 2014; Halim et al., 2012; McNeill & Knight, 2013). Often when discussions are used in science lessons they are 'teacher-led'. However, in an argumentation activity discussions should be 'student-led'. Argumentation is a specific form of discourse where claims made are backed by reasons and supported by data or evidence. The process of argumentation aims to demonstrate that scientific explanations are constantly evolving, and it is often the case that claims have to be revised in light of new data or further evidence becoming available. Thus, during argumentation sessions, students would express ideas, provide evaluation, discuss and further revise their ideas collaboratively. The student may act as a problem solver, an observer, a researcher or a direction follower depending on the teacher's role. The teacher's role is more than just a facilitator in inquiry-based science instruction (Walker et al., 2011); he or she also need to acts as motivator, mentor or coach (Llewellyn, 2007, 2013).

Studies on promotion of argumentation skills are relatively new in the Malaysian context. In their study, Foong & Daniel (2013) introduced skills of argumentation through socio-scientific issues for Form Two students in the Confucian learning environment. The findings revealed that the Confucian students were weak in constructing rebuttal in their argument. Such a finding is not surprising as the method of constructing argumentation based on socio-scientific issues is a new approach in science teaching in Malaysia. Hence, a more suitable approach in engaging students to communicate argumentation in scientific inquiry in the Malaysian secondary school science teaching context would be inquiry through the conduct of practical work.

Practical work could be used to show not only what we know but how we know and that ideas presented must be argued and supported (Halim, 2013; Llewellyn & Rajesh, 2011). Revision and modification have been made to traditional practical work so that traditional practical work is more inquiry and argument oriented(Llewellyn, 2007, 2013). However, the elements of argumentation in science need to be explicitly taught and involved in group-based argumentation sessions so that they could learn to justify their claim with evidence after the practical work sessions. By promoting the development of argumentation skills through practical work, students would be more confident and better prepared 50 in facing the challenges of the 21st century workforce as they would be able to practice essential skills such as higher order thinking skills (HOTs), communicate effectively, be more innovative, and solve problems through negotiation and collaboration (Halim, 2014; Henderson er al., 2017; Osman 32 et al., 2011; Osman et al., 2009; Osman et al., 2010; Zulirfan et al., 2018).

In this study, a practical work module named LAB-MADI was developed where the focus is on explicit instruction of scientific argument 49 in practical work to engage students in the development of argumentation through practical-based inquiry. "LAB-MADI" is a combination of two words; "LAB" is the acronym for "laboratory" and "MADI" is an acronym, for "Modified Argument-Driven Inquiry".

The MADI model in this study was supported by social constructivist theories of learning, cognitive constructivist theories of learning and cognitive load theory. The MADI model is used as the instructional model and the model was adapted from the original 37 Argument-Driven Inquiry (ADI) model (Sampson et al., 2014). This study used the 5E model (Bybee 2015) that systematically guided the steps in the ADI model. The 5E instructional model was chosen as the foundation in combination with the steps in the ADI model because it is widely used in the literature and in actual classrooms. The model is also recommended 48 by the

Malaysian Ministry of Education. The teaching and learning of biology with 5E instructional models is often used to improve achievement, knowledge, skills and attitudes(Balta & Sarac, 2016; Bybee, 2015). The LAB-MADI module was developed in order to find a more suitable approach to scientific inquiry in the context of teaching science to Malaysian secondary school students. The module is more of an inquiry-based approach in conducting practical work in the science classroom. The conceptual framework of this study is shown in the Figure 1.

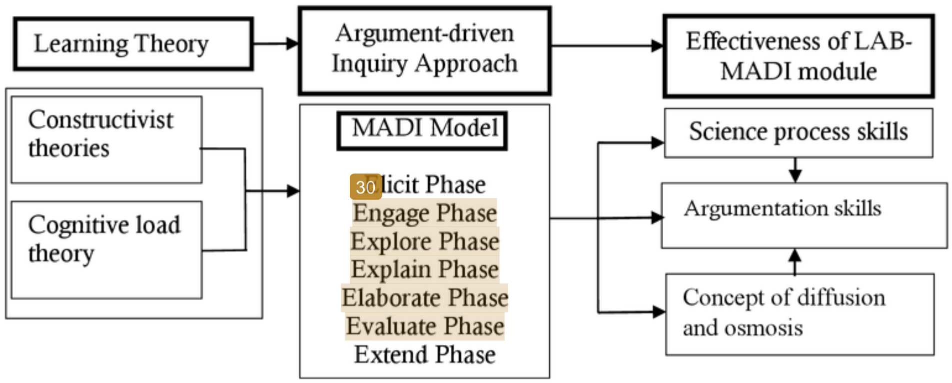

Figure 1. The conceptual framework of study with MADI model (Adaptation of 5E Model (Bybee, 2015) and ADI Model (Sampson et al., 2014))

The MADI model is an instructional model with seven phases and the phases are presented in Figure 1. The seven phases involve the (1) Elicit phase: Eliciting students' prior knowledge, (2) Engage phase: Identifying the problem statement and experimental planning, (3) Explore phase: Partaking in practical work experience where small groups of students have the opportunity to carry out experiments and collect data, (4) Explain phase: Producing tentative claim after data analysis on a subject matter among members of the same group, (5) Elaborate phase: Conducting the argumentation session where groups share their arguments and their explanations and are then critiqued by other group members, (6) Evaluate phase: Conducting a reflective discussion about the inquiry, (7) Extend phase: Carrying out application in practical assessment or experimental planning. In the 7E model, the engage phase in 5E is expanded into elicit and engage phases while the elaborate and evaluate phases in 5E are expanded into elaborate, evaluate and extend phases. The ultimate goal of the 7E learning cycle is to highlight the importance of arousing existing students' understanding during the elicit phase and transferring the concepts to a new context in the extend phase (Balta & Sarac, 2016). The MADI model enables teachers to integrate inquiry-based practical work experiences in biology with a way of developing students' important habits of mind and critical thinking skills by emphasizing the important role that argumentation plays in the generation and validation of scientific knowledge.

The module evaluation involved two fundamental features, i.e. the reliability and validity of the module which are two important features of a good research on the module development (Russell, 1974).

Reliability is concerned with the consistency or the dependability of the module in relation to the learner's performance. Therefore, a series of formative evaluation was conducted on the LAB-MADI module including small-group evaluation and pilot test during the field trial with target learners to collect data. These data were then used to identify problems with the instruction or opportunities to make the instruction better. To ascertain the reliability of the module, the initial draft of the LAB-MADI Module for laboratory investigation developed by the researcher was pilot tested in one of the schools. The pilot test involved twenty-two (n=22) Grade 10 students (aged 16 years) from a pure science class taking biology as an examination subject. The findings from the feasibility study of the LAB-MADI module during the pilot test with the target learners will be presented in another paper. After carrying out revisions, the developed module on the theme of Investigating Cells as A Unit of Life included the four topics. These are all listed in Table 1 together with the accompanying practical activities. The students' understanding of this theme in Biology subject is the prerequisite for their understanding of basic biological functions and its content can be easily modified to fit the argument-driven inquiry (Sampson et al., 2014).

Table 1. The theme and topics of the module along with its practical activities

No.	Theme	Topic	Practical Activities
1.	Investigating Cells as a Unit	1 - Introduction to Biology	Lab 1: Introduction to Biology: Applying Scientific Invetigation
2.	of Life	1 - Introduction to Biology	Lab 2: Energy: Determining the energy value in food samples
3.		2 - Cell Structure and Organisation	Lab 3: The structure of a plant cell and an animal cell
4.		3 - Movement of Substances across the Plasma Membrane	Lab 4: The permeability of the plasma membrane
5.		3 - Movement of Substances across the Plasma Membrane	Lab 5: Diffusion: The effect of TSV/V ratio on the rate of diffusion
6.		3 - Movement of Substances across the Plasma Membrane	Lab 6: Osmosis: The effect of hypotonic, hypertonic and isotonic solution on plant cells
7.		4 - Chemical Compositions of Cells	Lab 7: Enzyme: The effect of pH on the activities of amylase
8.		4 - Chemical Compositions of Cells	Lab 8: Enzyme: The effect of temperatue on the activities of amylase

The validity of the LAD-MADI module was then evaluated through expert judgement evaluation in order to determine if the LAB-MADI module met the desired level of quality. This step was the culmination of the designed module's evaluation because the objective of assessing validity is to see how accurate the relationship is between the measure and the underlying trait that it is trying to measure (Gaur & Gaur, 2009). Performing this evaluation is crucial as it determines whether the instruction in practical work actually works as intended in the expected context by content experts, learner specialists, or design specialists (Dick, Carey, & Carey, 2015). In this study, the process of evaluating the quality of the LAB-MADI module through the determination of content validity was conducted with content experts familiar with the characteristics of the argumentation content, the subject-matter and the target learners. Thus, the study's objective was to determine the validity of the module's content through expert evaluation. The research question is as follows: What is the content validity of the LAB-MADI module as measured from experts 'evaluation judgement data by using Content Validity Index (CVI) and Percentage Calculation Method (PCM)?

METHODS

In this study, the quantitative approach was selected, and a survey was used to collect data. This approach was chosen as analysis of all the data was performed quantitatively. The validity test process was conducted using one instrument which was adapted from Arip (2010) and Noah & Ahmad (2005). According to Dick et al. (2015), a questionnaire instrument is often used to evaluate expert's opinions of the materials in the form of quantitative data. Furthermore, in a descriptive research study, a questionnaire is often the main instrument used to collect data (Lodico et al., 2006) as descriptive research is primarily concerned about finding out typical research issues of "what is/are" as stated in the research questions of the study. Accordingly, the use of questionnaire as the research instrument to determine the validity of the LAB-MADI module is considered relevant and appropriate for this study.

The evaluation form consisted of three main parts: the first part – asked for the details and background of the experts, the second part – was on the evaluation of the module's content based on six criteria, and the third part – was on the evaluation of eight practical activities following the seven phases in the MADI model.

The experts were supplied with copies of all the LAB-MADI module materials including the introduction of the LAB-MADI module which contained the aims of the module and the learning objectives, the learning theory, the MADI model and the conceptual framework of the study, the LAB-MADI teacher module and the LAB-MADI student module. In the second part of the evaluation form, all experts were requested to judge the module according to six criteria: the suitability for target students, feasibility, time allocation, and improving the dependent variables under study: argumentation skills, science process skills and concepts in diffusion and osmosis. In the third part of the evaluation form, all the experts were asked to judge the sequence of the practical activities in the seven phases of the MADI model.

Noah and Ahmad (2005) recommended a minimum of three and a maximum of ten experts to avoid possible random consensus. Thus, the agreement reached was to invite seven independent experts for the expert judgment evaluation process. Out of the seven experts invited, only a total of six experts accepted the invitation to participate in this study. However, the total of six experts was considered an acceptable number In line with the recommendation by El-Den et al. (2018) and Shrotryia & Dhanda (2019). The selection of experts to determine the module's content validity was made purposively according to the expertise, qualifications, and academic publications of the experts. These experts were chosen based on their experiences and expert or specialist knowledge in the discipline of scientific argumentation research, subject-matter and development of module in practical biology in laboratory learning environment. For this module's evaluation, the panel of experts comprised of one expert in the field of scientific argumentation, three experts in the teaching of biology and two experts in intervention of development of biology teaching module.

An eleven-point ordinal Likert rating scale was used to evaluate the content validity of the LAB-MADI module. The eleven-point ordinal Likert rating scale was used because it increases scale sensitivity and is closer to normality; moreover, it can be easily understood (Leung, 2011). The six experts are highly educated, are knowledgeable in the fields they were asked to evaluate and would be able to make distinction among the points in the scale. The six experts were asked to rate the content validity of the module overall, and to rate each of the eight activities in relation to the tasks seen in the rating protocol. The scale was scored accordingly where 0 denotes mostly disagree up to 10 which denotes mostly agree. Results from the six experts' evaluation were then analyzed in the evaluation quantification stage.

In the data analysis stage, the first step involved performing the descriptive statistics for the sample. Next, the data were analyzed to address the objective of the study which was to determine the validity of the module based on the calculation of CVI and PCM.

As educational scholars, Gay et al. (2012) believe that content validity is determined by evaluation of the item and sample validity, and not by statistical means; however, methods have been proposed before this to quantify the process. Content Validity Index (CVI) is the most widely used index in quantitative evaluation and is a method of empirically determining the validity of the instruments used thorough analysis of the collected data. This method is easy to administer, is low-cost, saves time and is easy to implement. Dick et al. (2015) believe that data analysis procedures in the expert evaluation phase should be straightforward and the data should be summarized within the study questions for easy interpretation, including frequency counts. Therefore, many researchers in the field of education both locally and internationally use this method to validate the content of their modules such as in teen sexual education, mathematics education and counselling education of drug addicts (Ghani et al., 2014; Setambah et al., 2017; Noah & Ahmad, 2005). One method that is often practiced by the researchers in assessing content validity is based on the method proposed by Lynn (El-Den et al., 2018; Kadar et al., 2018; Polit & Beck, 2010). CVI is an index of the degree to which an instrument is content valid, based on aggregated ratings of a panel of experts (El-Den et al., 2018; Polit & Beck, 2010; Shrotryia & Dhanda, 2019). The scale, formula, procedure and range accepted for the CVI method (Setambah et al., 2017; Shrotryia & Dhanda, 2019) are illustrated in Table 2 below.

Table 2. The scale, formula, procedure and range accepted for the CVI method

No.	Details		
1.	Scale	Ordinal	
		Divide the ordinal scale into two groups for example scale 1, 2, 3, 4 so that 1 and 2 represent disagree and vice versa.	
2.	Formula	CVI = $\frac{n}{N}$	
		n – numbers of evaluators who agreed; N – sum of evaluators	
3.	Range accepted	N	CVI value
		2-5	1.00
		6	≥0.83
		7	≥0.86
		8-10	≥0.78
		Mean CVI is mean of all CVI for each item	

This analysis is important for researchers who want to determine the validity of the instrument in their study. This is to ensure the content validity of the instrument can be measured using methods or procedures that are accurate and correct. In this study, the researcher divided the ordinal scale into two groups, namely disagree (scale 0 to scale 5) which is equal to 0 and agree (scale 6 to scale 10) which is equal to 1 to calculate the CVI among the six experts following the example provided in Table 2. The results are presented in the Results and Discussion section.

Content validity is an important factor in identifying and determining whether the module's content is relevant or representative of the items or elements of an instrument. However, Setambah et al. (2017)argued that a single approach is insufficient. They suggested that the percentage value of a module that has been assessed by experts should be calculated. According to Noah & Ahmad (2005) and Ghani et al. (2014), content validity percentage can be calculated using the formula as below:

$$\text{The content validity percentage (PCM)} = \frac{\text{Total Experts'Score}}{\text{Total Maximum Score}} \text{ X } 100\%$$

Thus, two quantitative methods, i.e. the calculation of experts' content validity index (CVI) and percentage calculation method (PCM) were used with the LAB-MADI module to determine the validity of the module's content.

RESULTS AND DISCUSSION

The background of the experts engaged for expert judgement evaluation are listed in Table 4 below to show the coverage of expertise for the entire domain of the module (argumentation content, subject-matter expertise in biology and target leaners).

This is then followed by the presentation of the experts' scores for CVI (Content Validity Index) and experts' scores for PCM (Percentage Calculation Method) on the LAB-MADI Module based on the six criteria (suitability for target students, feasibility, time allocation, improving the dependent variables under study: argumentation skills, science process skills and concepts of diffusion and osmosis). Finally, the summary of the experts' scores for PCM (Percentage Calculation's Method) and CVI (Content Validity Index) on the eight practical work activities based on the seven phases in the MADI model are presented.

Table 3. Background of experts

Experts' Title/ Post	Institution	Expertise
E1: Associate Professor	University of Sultan Idris (UPSI), Perak, Malaysia.	Biology education, Science laboratory management, Module evaluator, Module developer
E2: Associate Professor	University of Technology Malaysia (UTM), Johor, Malaysia.	Chemistry education, Environmental Science, Scientific argumentation, Module evaluator, Module developer
E3: Senior lecturer	Sarawak Teachers Institute, Miri Sarawak, Malaysia.	Biology education, Module developer
E4: Practical teacher	Government secondary school in Sarikei, Sarawak, Malaysia.	Biology education, Teaching English Language
E5: Biology excellent teacher	Government secondary school in Kuching, Sarawak, Malaysia.	Biology education
E6: Biology excellent teacher	Government secondary school in Sibu, Sarawak, Malaysia.	Biology education

Table 3 presents information on the experts' background. Based on Table 3, the experts represented experts in scientific argumentation (n=1), subject-matter (n=3) and development of biology teaching module (n=2). Additionally, among the group of experts, two are biology excellent teachers (*Guru Cemerlang* or GC), one is a practical teacher (*Guru Amali* or GA), and three held PhDs, of whom two are associate professors in two local public universities and one a senior lecturer in a teacher training college. Each of the experts has more than 10 years of working experiences and all the lecturers, (PhD holders) though currently are teaching in university and teacher training college have had at least 5 years of teaching experience in secondary schools with students of the same level as the target learners of the module. All the experts have specialization in science and biology education.

Table 4. Descriptive statistics of experts' scores of CVI on the LAB-MADI Module

No.	Items	E1	E2	E3	E4	E5	E6	CVI
1.	The content of this module is suitable for the target students.	1	1	1	1	1	1	1.00
2.	The content of this module can be implemented perfectly.	1	1	1	1	1	1	1.00
3.	The content of this module corresponds to the time allocated.	1	1	0	1	1	1	0.83
4.	The content of this module can further improve argumentation skills.	1	1	1	1	1	1	1.00
5.	The content of this module can further improve science process skills.	1	1	1	1	1	1	1.00
6.	The content of this module can further improve the concepts of diffusion and osmosis.	1	1	1	1	1	1	1.00
	Total Score & Mean CVI	6	6	5	6	6	6	0.97

Remark: Disagree (0-5) = 0; Agree (6-10) = 1

Table 4 shows the descriptive statistics of experts' scores of CVI on the LAB-MADI module. The CVI for each item was computed as the number of experts giving a rating of 0 (disagreed) or 1 (agreed), divided by six (total number of experts). For example, the third item which was rated 1 by five out of the six experts has CVI of 0.83. Meanwhile the mean CVI which is also known as the average of CVI was computed by using the average CVI for six items. Table 4 shows all experts agreed that the content of this module is suitable for the target students, can be implemented perfectly, corresponds to the time allocated, can further improve argumentation skills, can further improve science process skills and can further improve the concept of diffusion and osmosis except for expert E3 who disagreed that the content of this module corresponds to the time allocated. Therefore, the result of CVI from the six experts' scoring was in the range of 0.83 to 1.00 while the result of the calculation of mean CVI from the six experts' scoring was 0.97. This shows that this module has high CVI in terms of content validity in the six criteria assessed (suitability for target students, feasibility, time allocation and improving the dependent variables under study: argumentation skills, science process skills and concepts of diffusion and osmosis). It is recommended that the minimum mean CVI should be 0.8 to reflect content validity (Shrotryia & Dhanda, 2019).

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Table 5. Descriptive statistics of experts' scores on the LAB-MADI Module based on PCM

No.	Items	E1	E2	E3	E4	E5	E6
1.	The content of this module is suitable for the target students.	9	9	10	10	9	8
2.	The content of this module can be implemented perfectly.	9	6	8	9	10	8
3.	The content of this module corresponds to the time allocated.	9	8	5	9	7	8
4.	The content of this module can further improve argumentation skills.	10	8	9	10	9	8
5.	The content of this module can further improve science process skills.	9	9	10	10	9	8
6.	The content of this module can further improve the concepts of diffusion and osmosis.	9	9	9	10	9	8
	Total Score	55	49	51	58	53	48
	PCM	91.67	81.67	85.00	96.67	88.33	80.00
	Mean PCM			87.22			

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Table 5 shows the descriptive statistics of experts 'scores on the LAB-MADI module based on percentage calculation method (PCM). The PCM for each expert 15 was computed as the total score of experts giving a rating of 0 to 10, divided by the maximum score of 60 then multiplied by 100%. For example, for expert E6, the content validity percentage calculated using PCM comes to 80% (total score of 48 divided by 60 and then multiplied by 100%). Meanwhile, the mean percentage of PCM which is also known as average of PCM was computed by using the average PCM for six experts. Table 5 shows the range of scores among the experts on the suitability of the module for the target students was between 8 and 10. The range of scores among the experts on the statement that the module can be implemented perfectly was between 6 and 10. The range of scores among the experts on the allocation of time for the module was between 5 and 9. The range of scores among the experts on the content of the module can further improve argumentation skills, science process skills, and the concepts of diffusion and osmosis was between 8 and 10. The range for the total scores among the experts for all the statements or items was between 48 and 58. Therefore, the result from the six experts' rating was in the range of 5 to 10 while the result of mean PCM from the six experts' scoring was 87.22%. This shows that this module has high content validity in the six criteria evaluated, i.e. suitability for the target students, feasibility, time allocation and improving the dependent variables under study: argumentation skills, science process skills and concepts of diffusion and osmosis). It is recommended that an overall PCM above 70% for reflecting an high level of content validity (Ghani et al., 2014; Noah & Ahmad, 2005).

Table 6. Summary of the descriptive statistics for experts' scores of mean CVI and mean PCM on the eight activities of practical work

No.	Practical Activities	Mean CVI	Mean PCM
1.	Lab 1: Introduction to Biology: Applying Scientific Investigation	0.98	83.33
2.	Lab 2: Energy: Determining the energy value in food samples	0.93	81.43
3.	Lab 3: The structure of a plant cell and an animal cell	0.90	76.90
4.	Lab 4: The permeability of the plasma membrane	0.95	79.52
5.	Lab 5: Diffusion: The effect of TSV/V ratio on the rate of diffusion	0.95	81.67
6.	Lab 6: Osmosis: The effect of hypotonic, hypertonic and isotonic solution on plant cells	0.98	85.00
7.	Lab 7: Enzyme: The effect of pH on the activities of amylase	0.98	84.76
8.	Lab 8: Enzyme: The effect of temperatue on the activities of amylase	0.98	83.57
	Mean Overall	0.98	81.88

Tables 6 shows the summary of descriptive statistics for experts' scores of mean CVI (Content Validity Index) and mean PCM (Percentage Calculation Method) on the eight activities of practical work. The CVI for the eight activities was computed as the number of experts giving a rating of 0 (disagreed) or 1 (agreed) for each activity, divided by six (total number of experts). The PCM for the eight activities was computed as the total score of experts giving a rating of 0 to 10 for each activity, divided by the maximum score of 60 and then multiplied by100%. The mean CVI and mean PCM was computed by using average CVI and average PCM for the six experts on the eight activities of practical work. In contrast the mean overall CVI and mean overall PCM for the whole practical work activities were computed by using average mean CVI and average mean PCM. Based on Table 6, the result of mean CVI from the six experts' scoring on the eight activities based on the MADI model was in the range of 0.90 to 0.98. Meanwhile the result of the calculation of mean PCM from the six experts' scoring on the eight activities based on the MADI model was in the range of 76.90% to 85.00%. Overall, the mean for the CVI and PCM for the eight practical activities based on the seven stages in the MADI model was 0.98 and 81.88%, respectively. This shows that the eight practical activities have high validity which is supported by the accepted value of CVI which is more than 0.83 (Shrotryia & Dhanda, 2019) and PCM which is more than 70% (Ghani et al., 2014; Noah & Ahmad, 2005).

Based on the analysis conducted, the mean scores of CVI (Table 4) and PCM (Table 5) for the LAB-MADI module were 0.97 and 87.22%, respectively. The mean overall scores of CVI and PCM (Table 6) for the eight practical activities based on the seven stages in the MADI model were 0.98 and 81.88%, respectively. Thus, the results demonstrate that the LAB-MADI module which was developed based on the MADI model has high construct validity. This leads the researcher to strongly belief that the LAB-MADI module can be used in the study with the target students to examine explicit instruction of scientific argument in practical work through argument-driven inquiry approach. Students' engagement in the skills of argumentation, science process and concepts in the topic of diffusion and osmosis through the use of this module is regarded as highly important and relevant. This is because these skills may help to ensure that the students are better prepared for the 21st century workforce and have a better future.

Content validity refers to the extent to which a measurement reflects the specific intended domain of content. As Gaur & Gaur (2009) stated, to establish content validity of a module, the researchers should first define the entire domain of the study (in this study, argumentation content, subject-matter in biology and target leaners) that needs to be covered by the experts and then assess if the module evaluated truly represents this domain. Subject-matter expert (SME) that can be employed as an SME is a person knowledgeable about a particular content area and is also known as a content specialist or subject-matter specialist. As shown in the information on the background of the experts in Table 3, the specialization of the experts covered the domain of this present study in terms of subject matter (content knowledge) and also pedagogical knowledge in evaluating the Lab-MADI module for teaching explicit scientific argument in practical biology.

There are few reminders that must be considered by every researcher during the validity testing process. This must be carried out so that the module constructed will perform according to the way that it is meant to perform during the actual conduct of the study. It is very important that a template for reviewing the materials should be included in the module domain including adequate materials for the given learners' needs, the designer's instructional strategy including the preinstructional information, content presentation, learner participation, and assessment, and transfer feasibility analysis about the instructional materials relating to their potential for transferability of knowledge and skills from the learning context to the real site (Dick et al., 2015). Among the consideration, the determination of the validity domain of the module should be carried out and this can be carried out by collecting data from the experts and calculating the content validity using CVI and PCM to determine the validity level of the module. In addition, the appointment of experts at the judgement evaluation stage is important to determine the module's effectiveness so that the final product can be improved until it reaches the desired level of quality.

CONCLUSION

The intent of this paper is to determine the validity of the LAB-MADI module. The LAB-MADI module was constructed as an effort to improve the ability of students to participate to develop scientific argumentation. The findings from this study shown that the LAB-MADI module seems to be a reasonably good module to implement for explicit scientific argument in practical biology. Findings from the analysis show that this module has very good validity based on rating of experts. Therefore, in the next stage of summative evaluation, a study on the effectiveness of this LAB-MADI module in developing students' argumentation skills, science process skills in relation to the concepts of diffusion and osmosis will be carried out in an actual field study. However, this module may be limited in its usage as it is specific to the Malaysian upper secondary school biology curriculum.

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