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A Need Analysis in Empowering Chemistry Teacher with Integrated Brain-STEM Instructional Approaches Module in The Acid-Base Topic

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Abstract: Acid-Base Topic within chemistry syllabus of education curriculum stands as a significant topic that deeply connected with real-life. The challenges caused by the complexities in learning abstract concepts in this topic make it difficult for the students to comprehend and relate it with real-life. A module that focuses on the integration of brain-based strategy with science, technology, engineering, and mathematics (STEM) domains has a big potential in solving these issues. The objectives of this study are to explore teachers' insight regard with Acid-Base Topic in Standard Secondary School Curriculum (KSSM) and to explore teachers' perspective regard with components to be incorporated in the Integrated Brain-STEM Instructional Approach Module. For this purpose, a need analysis was carried out through a qualitative study. The standard documents and semi-structure interview form were used as the data collection tools in the study. Purposive sampling was implied by the researchers to select five experienced chemistry teachers for conducting the interview. The interview data collected were transcribed and analysed by using thematic analysis approach. The data from the interviews were analysed based on four pre-determined themes, which are, (1) Acid-Base Topic Curriculum, (2) The Focus of The Integrated Brain-STEM Instructional Approach Module, (3) The Important Elements of The Integrated Brain-STEM Instructional Approach Module, and (4) The Strategies for Integrated Brain-STEM Instructional Approach Module. The results of this study found that a module is needed to empower chemistry teachers with the integrated Brain-STEM approach. It was also revealed that the respondents advocated a need for focusing of intervention in teaching acid-base part separately with salt. Based on the respondents' consensus, nine components such as STEM skills enhancement, active interaction, and hands-on learning should be included in the module development.

Keywords: Acid-Base Topic, Integrated Brain-STEM Instructional Approach Module, chemistry, brain, real-life

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INTRODUCTION

The shift of newly curriculum from the Integrated Secondary School Curriculum (KBSM) to Standard Secondary School Curriculum (KSSM) is align with the Malaysia Education Blueprint (PPPM) 2013-2025. Chemistry is one of the elective subjects that is offered to science major students in upper secondary level in Malaysia education curriculum (KPM, 2018). Among the contents covered in this subject is the acid-base part. Based on latest Form Four Chemistry subject under KSSM, the topics of Acids, Bases, and Salts are introduced in Chapter 6 (Salleh et al., 2023). According to Chemistry Dokumen Standard Kurikulum and

2024. Vol 4. No 4. pg 43-55. e-ISSN: 2805-4695

Pentaksiran (DSKP), the students need to acquire deeper understanding in this topic to apply the knowledges and skills about the mole concept, chemical formula, and equations (KPM, 2018). To attain high levels of understanding, the students need to be provided with effective instructional approach during the lesson.

Instead of focusing in attaining understanding during learning, the students' also need to be equipped with the competencies pertinent to the evolving global education. The demand for 21st century competencies required the integration of science, technology, engineering, and mathematics across the four STEM domains (Galadima et al., 2019). There is a need in enhancing STEM education to fulfil the government's policy through the Science, Technology and Innovation Policy and Vision 2020 (Idris et al., 2023). However, acquisition of skills in STEM domains indicated as a main challenge for high school students (Lavi et al., 2021). The Integrated Brain-STEM Instructional Approach Module has a big potential in guiding chemistry teacher to enhance students' understanding and develop their competencies in learning abstract and difficult concept in Acid-Base Topic. This module contains strategies that emphasize on linking all the STEM domains with the principle of Whole Brain Teaching (WBT). The importance principle that focused in WBT is enhance students' engagement in learning process (Biffle, 2013). The instructions deliver by the teacher emphasize on how it stimulates body gesture among students during the learning process which indirectly enhance the whole part of the brain to work and improve learning. Determining how the brain dealing with information and skill during learning is helpful to improve learning and enhance better learning (Fourie & Schlebusch, 2022; Biffle, 2013).

Problem Statement

Acid-Base Topic is found to have problem among chemistry students. Salleh et al. (2023) indicated that Malaysian's student struggles in learning this topic. Previously, it is reported by Aziz et al. (2019) that Form Four Malaysian students in secondary school level face difficulties in comprehending acid and base concepts. The similar situation also found to occur in other countries. For example, Dewi (2020) reported that the students in Madrasah Tsanawiyah (MTs) Indonesia have difficulty in learning concept related with acid and base. Elham & Dilmaghani (2019) in his study towards chemistry students in high school at Azerbaijan found that students have misconception related with the concept of acid and base. The identified problems and difficulties of learning contributed to the low achievements among students in this topic which potentially impact the overall performance in the subject of chemistry.

Learning abstract concepts can be difficult for students to understand and process (Harpaintner et al., 2018). Incorporating STEM domains into Acid-Base Topic potentially connect abstract contents with the students' real-life. However, past studies illustrated that teachers have problem in integrating the lesson in the classroom with STEM domains. Numerous Malaysia chemistry's teachers are lack sufficient preparation and support, hindering their ability to integrate STEM into their instruction effectively (Sethuramah et al., 2022). Besides, the issue of teacher which is focusing more on completeness of the syllabus is found to be among factors that hindering the transformation of teaching approaches. This situation necessitates a module to guide chemistry teacher in revising pedagogical approach from conventional approach to more effective approach to convey abstract concepts in teaching this topic.

REVIEW OF LITERATURE

Social Learning Theory (SLT) by Albert Bandura play an important framework in integrated Brain-STEM instructional approach. This theory explained on how the brain learns through social interaction and observation which influences the effectiveness in learning Acid-Base

2024. Vol 4. No 4. pg 43-55. e-ISSN: 2805-4695

Topic. McLeod (2024) advocated that SLT linked between behaviourism and cognitive theory. According to this theory, the crucial elements for learning to occurs are observing and modelling (Bandura, 1986). The students learn through selectively observe and remember the behaviour of teacher and members in the classroom which referred as a model. Teacher and members play an important role in the reinforcement by linking new experience with previous experience or through repetition of the experience. This experience can be fostered through the implementation of learning activities such as experiment, demonstration, and collaborative projects. The activities that are applicable and relevant to real life enhance students' brain to connect better with the concepts or information.

The implementation of Whole Brain Teaching (WBT) as a main principle in developing Brain-STEM instructional approaches help in improving student's involvement. The instructional approach seeks for students to be fully engaged in the classroom. Elfiky (2022) advocated that adoption of this approach in process of teaching and learning helped in boosting of student' interaction. Fully emphasize of social interaction in teaching and learning process stimulate brain activities. This is because, students' brain learn more effectively when they observe others and modeling their behaviours. The effectiveness in integrating STEM domains in teaching based on how it can connect the content in Acid-Base Topic with students' real life. The integration of STEM into teaching and learning process serves as mechanism to cultivate enthusiasm in STEM related careers, break the boundaries of among STEM domains which can be applied to solve real life problems Sethuramah et al. (2022). Teaching and learning process that emphasizes in connecting fundamental concepts with the context of real life have a great potential to improve students' learning outcomes in chemistry King (2012).

Research Objective

1. To explore teachers' insight regard with Acid-Base Topic in Standard Secondary School Curriculum (KSSM).
2. To explore teachers' perspective regard with components to be incorporated in the Integrated Brain-STEM Instructional Approach Module.

METHODOLOGY

Before collecting the qualitative data of interview from the respondents, the researchers analysed current students' achievement in Chemistry. The analysis was purposefully to get an insight regard with Acid-Base Topic that uncovered in SPM examination. The data collected based on the standard documents that were published by the Malaysian Examinations Council (LPM-Lembaga Peperiksaan Malaysia). Then, the researchers conduct the semi structured-interview to attain the data from chemistry teachers regard the insight of Acid-Base Topic in KSSM and their perspective of the components to be incorporated in Integrated Brain-STEM Instructional Approach Module. The items of the interview questions are validated by two chemistry teachers' expert that has more than 15 years teaching experience in chemistry. After refining the questionnaire items based on feedback provided, the researchers proceed with interview. Purposive sampling was implied in choosing 5 experienced chemistry teachers in Penang state for conducting the interview. The interview data collected were transcribed and analysed by using thematic analysis approach. The respondents were coded in the form of R1CT, R2CT, R3CT, R4CT, and R5CT based on order of the interview. Table 1 indicated the respondents' information.

2024. Vol 4. No 4. pg 43-55. e-ISSN: 2805-4695

Table 1. Respondents interview information

Respondent	Respondent Profile	Respondent Code	Institution	Teaching experience
1	Chemistry Teacher	R1CT	School A	20
2	Chemistry Teacher	R2CT	School B	15
3	Chemistry Teacher	R3CT	School C	15
4	Chemistry Teacher	R4CT	School D	17
5	Chemistry Teacher	R5CT	School E	15

RESULTS AND DISCUSSION

Firstly, the researchers analysed the current achievement status of chemistry students in comparison with other elective science subject included Biology and Physic. The data is needed in providing an overview of current status for students achievement in Chemistry subject. LPM provided the analysis of subject comparison and students' answer in Sijil Pelajaran Malaysia (SPM) Examination. Table 2 illustrate comparison of elective science subjects' achievement during SPM for year of 2021, 2022, and 2023 (KPM, 2024).

Table 2. Elective science subjects' achievement for SPM (KPM, 2024)

	Subject Average Grade (GPMP)			Percentages of Failure (%)		
Subject	**2021**	**2022**	**2023**	**2021**	**2022**	**2023**
Biology	4.55	4.51	4.33	3.6	3.4	0.9
Chemistry	5.08	5.00	4.89	1.7	1.1	3.6
Physic	4.40	4.37	4.15	0.8	1.0	0.6

By comparison, chemistry students exhibit poorer achievement based on Subject Average Grade (GPMP) compared to other elective science subjects, Biology and Physic for three consecutive years of 2021, 2022, and 2023 (KPM, 2024). The percentage of failures for Chemistry subject is also higher compared to Biology and Physic. This status illustrated as an indicator for intervention in instructional approach in Chemistry subject.

As the researchers intended to answer the research questions for this study, the insight from chemistry teachers need to be collected and analyse. The data from the interviews were analysed based on four pre-determined themes. Theme 1 was developed by the researchers to answer Research Question 1. To answer Research Question 2, three themes represented by Theme 2, 3, 4 with three components each. Movsisyan et al. (2019) stated that adaptation is implied when purposeful modification of an intervention is done to fit another context. The themes were adapted from the previous study by Ismail et al. (2022). Its were chosen for adaptation based on of its highly relevant to the present study that addressed integrated of STEM domains into science elective subject included Chemistry in the context of upper secondary students. The emerging themes from the study by Ismail et al. (2022) are the results from interview data of six scientist and six experience science teachers that teaching elective STEM subjects which are Chemistry, Biology, and Physics in secondary school. The adapted themes for the present study were as Table 3.

2024. Vol 4. No 4. pg 43-55. e-ISSN: 2805-4695

Table 3. The themes for present study

Research Question 1. What is teachers' insight regard with Acid-Base Topic in Secondary School Standard Curriculum (KSSM)?
Theme 1: Acid-Base Topic Curriculum
Research Question 2. What are the the teachers' perspective regard with components to be incorporated in the Integrated Brain-STEM Instructional Approach Module.
Theme 2: The Focus of The Integrated Brain-STEM Instructional Approach Module a) The connecting concepts b) STEM skills enhancement c) Applications of the STEM knowledge
Theme 3: The Important Elements of The Integrated Brain-STEM Instructional Approach Module a) Authentic context b) Active interaction c) Collaborative experience
Theme 4: The Strategies for Integrated Brain-STEM Instructional Approach Module a) Students-centered approach b) Inquiry-based activities c) Hands-on learning

Theme 1. Acid-Base Topic Curriculum

For the context of the present study, the researchers defined Acid-Base Topic as a topic in chemistry curriculum excluded the part of the salt. From the interview data, the respondents arise the concern regarding Acid-Base Topic in latest chemistry curriculum, KSSM. The combination of acid, base, and salt into one big topic have various view among respondents. R1CT, R2CT, R3CT, and R5CT clearly indicated the preference of the study purpose for only being focused on the part of Acid-Base. R1CT stated Acid-Base as a big topic: "*... it is a big topic".* R2CT stated Acid-Base part is already wide and complex: "*... because the Acid-Base part is wide and complex".* R3CT stated by separating acid-base with salt make the students more focus on the topic: *"...so students can focus more on mastering this Acid-Base Topic".* R5CT advocated that Acid-Base Topic among difficult topic in chemistry syllabus: "*... one of the most difficult topics in chemistry".* R4CT stated the preference to combine of the two topics because there is continuation between acid-base and salt. However, R4CT mentioned that the combination of two parts influence students' perception because make the topic become difficult and too long. The excerpts are as follows:

> R4CT: "*It is suitable to combine Acid-Base and Salt topics because these two are related. It is just that the combination becomes long and affects the student's perception, making it seems more difficult".*

2024. Vol 4. No 4. pg 43-55. e-ISSN: 2805-4695

Based on the insight given by the respondents, it was found that Acid-Base Topic is one of the arguably complex topic in chemistry that faced by the students. It is found that the difficulties among chemistry students in learning this topic related with mastering the basic and abstract concepts (Salleh et al., 2023; Mat Napes & Mohamad Sharif, 2022). With the identified complexities and difficulties, to attain higher achievement for this topic, the students must acquire three level of understanding in chemistry learning that have been proposed by (Johnstone, 1991). This level known as are macro level represented by observable part, and sub micro level and symbolic level that represented by abstract concept. The focus of this part can make the students gain deeper understanding for the basic and abstract concepts of acid-base. The researchers found that it is essential to focus on acid-base part and excluded for salt part for the present study.

To support respondents' insights regarded Acid-Base Topic curriculum, the researchers analyse the questions from previous SPM examination. Based on the latest KSSM format, the students are required to take three examination papers for Chemistry (Paper 1, 2, and 3). Paper 1 is multple choice questions, Paper 2 structure and essay question, while Paper 3 is practical question. There are limited access for the researchers to attain the full questions' paper since all the paper are considered as confidential exam paper. Thus, the researchers are only manage to get the analysis based on the document that provided by ministry of education in the official websiste of Malaysia Examinations Board. It is indicated that Acid-Base Topic among topics that have been addressed during the examination. Based on the questions, it is crucial for students to have deeper understanding in learning this topic instead of just rely on memorization. This is because the concepts are applicable to solve other questions. Table 4 indicated the analysis of few questions from SPM in years of 2021 and 2022 that related with Acid-Base Topic (KPM, 2023). However, the researchers do not managed to access 2023 questions because still unavailable in the official website.

Table 4. Analysis of Paper 1 and Paper 2 Questions related with Acid-Base Topic

SPM Year	Question	Analyse
2022	Paper 1, Question 24	The question seeks for students' understanding to answer on how the difference in heat released between acid X and acid Z. The students need to acquire basic concepts of acid and alkali to answer this question. The students also need to understand the concept of basicity of acid.
	Paper 1, Question 33	The question seeks for students' understanding in applying the formula to find pH value of the solution.
	Paper 2, Question 3(a)(ii)	The question seeks for student to write chemical equation involving provided chemical substances related with neutralisation reaction.
	Paper 2, Question 7(b)	The question applies on what they have learnt on acid-base topic to suggest the solution which referred to weak acid and alkali to be added into latex and explain the difference in observation.
2021	Paper 1, Question 1	The question seeks for students understanding on how to apply the formula to find pH value of the solution.
	Paper 1, Question 32	The questions seek for students understanding on how to apply the formula that related with concentration in finding the pH value.

2024. Vol 4. No 4. pg 43-55. e-ISSN: 2805-4695

Theme 2. The Focus of The Integrated Brain-STEM Instructional Approach Module

This theme reflected on the focus in the implementation of the integrated Brain-STEM instructional approach. Based on interview data, the focuses of the approach had been analysed into three categories. There are (1) connecting the learning concept of Acid-Base with real life, (2) STEM skills enhancement, and (3) STEM application. From the excerpts given, the researchers concluded that the components were consistently supported by all respondents. The data indicated that the focus suggested in integrated STEM approach has great potential in making connection for Acid-Base Topic with students' real-life. In connecting this topic with students' real-life, teachers can emphasize the implementation of hands-on activities that familiar with the students real-life and not only focused on the materials or apparatus provided in the laboratory. This is because chemistry students' better in expressing their curiosity when their collaborative learning process involves with the use of familiar materials (Kibga et al., 2021). R5CT highlighted the implementation of hands-on activities and experiment in connecting the concepts they learned in Acid-Base Topic. *"... a more hands-on and experimental approach".*

R2CT mentioned to start the lesson of this topic by implementing activities that can connect with students' real life: "*Indeed, we have to start teaching by doing activities that are related to their lives".* R3CT focused to the students' exposure with real life situation: *"Give students exposure with real life situations".* R4CT stated need to provide with the alternative situations because certain examples given in textbooks such as fertilizer is not familiar with student's life: *"... fertilizer is not so familiar among students".*

However, R1CT is concerned that it is difficult for students to connect this topic with their daily life. The following excerpt showed the respondent's concern: *"It is difficult to relate that something is acid or base or alkali".* Thus, teachers need to ensure that the students acquire three levels of chemistry understanding which are macroscopic, submicroscopic, and symbolic levels in the classroom. Safo-Adu (2020) stated that understanding these levels of representation is essential to attain holistic chemistry education.

STEM skill is another focus to be embedded in this instructional approach. All respondents agreed that it is important to enhance students with STEM skills. Lacking proficiency in these skills would significantly impede students' capacity to face real-world challenges, particularly in problem-solving (Ismai et al., 2022). The respondents have diverse view in enhancing STEM skills among students. R1CT stated that the students need to explore the knowledge in STEM skills that related with aspect of science, technology, engineering, and mathematic: *"Students will explore the knowledge related with science, technology, engineering, and mathematics aspects".* R2CT mentioned that STEM skills related with field of science, technology, engineering, and mathematic: *"... those skills must be related to science, technology, engineering, and mathematics".* R4CT stated that it involved higher order thinking skills (HOTS) and 21st century skills: "*... involve HOTS, 21st century skills and must involve existing skills in science, technology, engineering, mathematics".* R3CT mentioned that STEM skills uncovered the field of science, mathematics, and vocational: "*When I hear STEM skills, what I imagine is science, mathematics, which also includes TVET".* While R5CT emphasized the skill must related with 21st century and involve with the integration of science, technology, and robotic: "*... many relate this to 21st century skills and STEM skills combines all skills such as skills in science, technology, robotics".*

Based on data, all respondents stated that they implied the application of the domains in STEM to cultivated STEM learning among students. The application of STEM in teaching chemistry captivate students in comprehending and functioning as a transformative educational tools (Do Hong et al., 2021). It is revealed that the respondents do not have extensive information on

2024. Vol 4. No 4. pg 43-55. e-ISSN: 2805-4695

application of STEM that can be related with Acid-Base Topic. However, most of the respondents focused on mathematics' domain in advocated about STEM applications. R3CT stated that mathematic domain has been implied in teaching this topic which involving calculation part and for analysis regarding qualitative and quantitative in chemical equations: *"Calculation using math in STEM", "applying STEM when involving qualitative and quantitative analysis of chemical equations".* R4CT and R5CT also focused on mathematic domain which related with the part of calculation. The excerpt is as follows:

R4CT: "Calculations relate to math".
R5CT: "It is applied in class, even mathematics has calculations".

Theme 3. The Important Elements of Integrated Brain-STEM Instructional Approach Module

The data obtained for this theme were analyzed based on three components which are authentic context, active interaction, and collaborative learning. In authentic context, the respondent agreed that learning activity in Acid-Base Topic should enhance real-life relevance. The respondents stated they implemented activities that can make the learning of Acid-Base Topic to be valuable. The topic and authentic context perceived by the students as valuable if the teachers manage to make it become interesting and relevant (Broman et al., 2022). From interview data, all the respondents practiced different ways to create authentic context in the classroom.

Inquiry-based learning helps learners make their own connections about what they learn. R1CT stated preference in implementing inquiry by enhancing the students to discover during learning to create authentic context: "*I like the concept of discovery inquiry in which students themselves explore".* Inquiry learning is potential of fostering the student in making their own connections to what they have learnt because it enhances their critical skills. The implementation of inquiry during the lesson promotes students' critical thinking skills (Wale & Bishaw, 2020). This creates the learning context becomes more engaging, meaningful, and relevance to the real-life. Engaging learning environment enhance the full potential of used whole brain area (Biffle, 2013). This potentially make the learning becomes more comprehensive. R4CT also highlighted the emphasizing of student-centered approach that can enhance inquiry learning to create authentic context. "*Student-centered if want to involve inquiry learning".* While R2CT emphasized the 21st century learning in creating authentic context during lesson: *"... apply 21st century learning".* R3CT highlighted the development of students' self-confidence in creating authentic context such as provide the students' opportunities to implement the activity and practical by their own: "*An approach that can increase self-confidence and can carry out activities or practicals by ownself".* R5CT stated the need for real objects that can be observed and touched during the learning process. *"Let them see and touch".*

The second component in this theme is active interaction. Through active interactions, the students can attain deeper understanding in their learning by meaningful discussions. The engagement among students during active learning enhances them to make connection between new information with prior information which indirectly fosters deeper understanding of the content (Trigwell et al., 1999). In creating learning that can engage students, teachers need to create an interesting learning environment. It is a challenging task for chemistry teachers in making learning environment to become interesting (Priyambodo et al., 2021). Based on the interview data, all the respondents advocated the importance of this component in teaching and learning process. R1CT stated that the interaction must include between students and teacher-students: "*... teacher interaction with students and students with students themselves".* R2CT

2024. Vol 4. No 4. pg 43-55. e-ISSN: 2805-4695

also mentioned that always make the students have active interaction in the classroom. "*I always make sure students have active interaction during class".*

Based on analysis, the researchers found that three ways advocated by the respondents in enhancing active interaction among students in learning this topic. There are:

1) Implementing various teaching approaches – R3CT: *"... have diversity methods to be able to engage with students".*

2) start the lesson with problem solving – R4CT: *"... start with problem solving".*

3) utilize tangible objects in instruction – R5CT: "*The materials are close to them and they can see it".*

Thirdly, all five respondents agreed that they implemented collaborative experience among students in this topic. Collaboration in learning serves as an effective instructional medium (Jeong & Chi, 1997). This component is also emphasized during implementing of whole brain teaching (WBT) in classroom (Biffle, 2013). The approach that capable in integrating active interaction among students through collaborative learning can make the students to be actively participate and work together in the classroom. Hidayah and Dasna (2022) emphasized that through collaborative learning, the teacher creates an environment in which students can learn, teach materials they are discussing, support each other, and collaborate on group tasks. This enables active construction of knowledge in Acid-Base Topic as well as development of various skills that need in 21st century learning skills.

To enhance this experience, R1CT mentioned to increase group that need collaboration among students: "*... teachers should increase group activities that require collaboration between students".* R5CT also mentioned implementing group activities: *"... there must be group activities".* While R2CT emphasized the practice of collaborative because the students can explore the idea that they do not know through their members. *"... practice collaborative learning because the students will get ideas to explore concepts they don't know with friends".* R3CT advocated that collaborative experience gave benefit to the students because they usually preferred to ask questions to their members: "*Students feel more open to ask friends, they can use the language they like".* While R4CT mentioned that the collaborative learning implemented during the questions and problem-solving sessions: "*When solving a problem or question, students can do it via collaborative learning".*

Theme 4. The Strategies for Integrated Brain-STEM Instructional Approach Module

Based on interviewed data, there are consensuses that have been identified regarding the strategies. The researchers analyse respondents interview based on three components under this theme namely students-cantered approach, inquiry-based activities, and hands-on learning. The primary characteristic of these subcategories based on how it emphasizes the active engagement among students. This is in align with the principles of Whole Brain Teaching (WBT) approach. WBT emphasizes students' engagement in learning that indirectly activate the whole brain areas (Biffle, 2013).

The incorporation of students-cantered approaches in integrated Brain-STEM instructional approach focused on how student attain freedom in gain knowledge in Acid-Base Topic. Through this approach, students can explore and attain deep knowledge in which indirectly improve their quality (Marpaung & Azzajjad, 2020). All the respondents highlighted that the students-cantered approach as important component in instructional approach in teaching this topic. The following excerpt showed the participants concerns:

2024. Vol 4. No 4. pg 43-55. e-ISSN: 2805-4695

R1CT: "*... change from teacher-centered to student-centered*".
R2CT: "*... encouraging my students to learn in a student-centered way".*
R3CT: "*... apply the concept of independent learning, student-centered learning".*
R4CT: "*… focus on student-centered learning approach".*
R5CT: "*The the teacher must start with question to enhance student-centered".*

The second component under this theme is inquiry-based activity. Previous study has indicated that, secondary science teacher often confuse between inquiry-based learning with hands-on activity (Xaba & Sondlo, 2022). However, there are differences between these two approaches. The inquiry-based activities seek for students to gain the process of discovery and investigation, while hands-on learning focus on implementation physical task or experiment. Hands-on learning does not always have a critical thinking component that has been indicated in inquiry learning (Barnes & Foley, 1999). Based on the interview data, all the respondents indicated to implement teaching approach that enhanced inquiry activity among students.

R1CT implemented a lot of question and answer (Q&A) session with the students: "*More question and answer sessions".* R2CT emphasized to form the mixed achievement level in a grouping during inquiry-based activity: "*... have to mix several level of achievements in one group".* R3CT advocated the preference to enhance student explore by their own during the lesson to find the information in this topic: "*… students can explore on their own because they use lots of materials in their life".* R4CT advocated the important of using the materials that more relatable with students' life: "*... they use lots of things that are closely related to them".* While R5CT emphasized on photos and videos that related with students' life to enhance inquiry activity among them: "*use lots of images, and also videos because I want to emphasize on inquiry concept".*

For the last category, all the respondents emphasized the needs to implement hands-on activities in Acid-Base Topic. R1CT stated materials that used during the lesson focused on what the students can bring from home so that they can explored by themselves: "*… use things that can be taken from home. Then, I ask them to explore on their own".* R2CT stated that Acid-Base Topic contained a lot of practical activities and experiment that can be carried out by the students: "*Really have to do lots of activities and experiment focusing on this topic".* R3CT stated when students doing activities or experiments by their own, it boosts their self-confidence and positive impact to them: "*...carry out activities or practicals by themself". "...increasing students' self-confidence and giving a better impact to students".* R4CT also stated preference for students to conduct the activities by their own and important for them to enhance their thinking: "*... if they can do it themselves, then they can think".* While R5CT advocated the role of teacher' creativity in assign inquiry activity: "*... have to assign activities and teachers have to be creative in creating activities".*

CONCLUSION

In conclusion from the results mentioned above, respondents' insight indicated that Acid-Base Topic in the latest chemistry curriculum requires intervention and advocated their preference that this part shoud not be combined with the part of the Salt. This is due to the difficulty and complexity students face in learning abstract concepts in this topic. It can be concluded that all the respondents agreed with the nine (9) components that need to be incorporated for the module development. The integration of Whole Brain Teaching (WBT) approach with the STEM instruction have a big potential in solving the issues faced by the students in learning this topic. The components that have been explored enhace students' engagement and

2024. Vol 4. No 4. pg 43-55. e-ISSN: 2805-4695

emphasize students' gesture in learning which are among the principles emphasized in WBT. The inadequate achievement levels among chemistry students seek for instructional transformation in teaching chemistry, specifically Acid-Base Topic. Thus, the components under the analysed themes were expected to be integrated in the module development to help in solving students' problems related with abstract and difficult content of Acid-Base Topic. The lack of module to guide chemistry teachers in implementing integrated STEM approach is further reinforces the need for the development of the Integrated Brain-STEM Instructional Approaches Module. It is suggests in the future to examine teachers' view in integrating brain-based teaching approach with STEM domains in others topics in latest chemistry curriculum.

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