ปริภูมิควอไซจิเนอรัลไลซ์วีคซัม: ปริภูมิ-q_S
Quasi Generalized Weak Sum Space: q_S - Space

สัจจารักษ์ ลาดสูงเนิน
Sajjarak Ladsungnern

สาขาวิชาคณิตศาสตร์ คณะครุศาสตร์ มหาวิทยาลัยราชภัฏชัยภูมิ จังหวัดชัยภูมิ 36000
Department of Mathematics, Faculty of Education, Chaiyaphum Rajabhat University,
Chaiyaphum 36000, Thailand
Corresponding Author, E-mail: Ladsungnern@gmail.com

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บทคัดย่อ

การวิจัยครั้งนี้มีวัตถุประสงค์เพื่อแนะนำปริภูมิควอไซจิเนอรัลไลซ์วีคซัม (เรียกสั้น ๆ ว่าปริภูมิ -q_S) ซึ่งเป็นการขยายจากปริภูมิควอไซจิเนอรัลไลซ์วีคแล้วทำการศึกษาสมบัติเชิงคุณภาพพื้นฐานภายในปริภูมิ-q_S นี้ในรูปของเซตภายใน-q_S เซตส่วนปิดคลุม-q_S และเซตแก่นกลาง-q_S ที่ได้นิยามขึ้นมา ซึ่งจากการศึกษาพบว่าการดำเนินการพื้นฐานของเซตเหล่านี้ทำให้ได้สมบัติต่างๆภายใต้การดำเนินการนั้น ๆ ในแต่ละอย่างที่แตกต่างกันไปและยิ่งกว่านั้นเราจะพบว่ามีเพียงเซตภายใน-q_S เท่านั้นที่บรรจุในยูเนียนใด ๆ ของการอินเตอร์เซกของเซต ภายใน-q_i ของเซต A ใด ๆ กับเซต X_i บนปริภูมิ (X_i,q_i), ทุก $i\in I$ ในขณะที่เซตส่วนปิดคลุม-q_S และเซตแก่นกลาง-q_S นั้นจะบรรจุยูเนียนใดๆของการอินเตอร์เซกของเซตส่วนปิดคลุม-q_i (เซตแก่นกลาง -q_i ตามลำดับ) ของเซต A ใด ๆ กับเซต X_i บนปริภูมิ (X_i,q_i), ทุก $i\in I$

คำสำคัญ : ปริภูมิ-q_S เซตเปิด-q_S เซตปิด-q_S เซตภายใน-q_S เซตส่วนปิดคลุม-q_S และเซตแก่นกลาง-q_S

Abstract

The purpose of this research was to introduce a generalized of quasi generalized weak space called quasi generalized weak sum space (as Known briefly as, q_S-space), and to study the intrinsic qualitative fundamental properties in term of q_S- interior, q_S-closure and q_S-kernel. The results found that these sets are working on q_S-space and gives various fundamental properties under defined by the definition of them and basic operations on sets on q_S-space. Furthermore, it was found that only the q_S-interior set is contained in the arbitrary union of intersection of q_i-interior for any set A and X_i on the space (X_i,q_i), $\forall i\in I$, but contrary for q_S-closure, and q_S-kernel. They demonstrates the union of intersection of q_i-closure and q_i-kernel for any set A and X_i respectively, on the space $(X_i, q_i), \forall i \in I$.

Keywords: q_S-space, q_S-open, q_S-closed, q_S-interior, q_S- closure, q_S-kernel

1. Introduction

The extension of the space was very important way to generalized concept for researcher to study and investigate especially topological space. Zvina (Zvina, 2011) introduced the notion of generalized topological space (gt-space). Generalized topology of gt-space has the structure of frame and is closed under arbitrary union and finite intersection modulo subsets. The family of small subsets of a gt-space forms an ideal that is compatible with the generalized topology. Császár (Császár, 2012) was the first who introduced the notion of generalized topological space called the weak structure. After that, Ávila (Ávila, 2012) extended the weak structure to generalized weak structure briefly, GWS. Recently, Janrongkam (Janrongkam, 2019) extend GWS to quasi generalized weak structure briefly. QGWS and Thongpan (Thongpan, 2019) extend the last space to bi-quasi generalized weak space.

In this paper, we introduced the concepts of generalized of quasi generalized weak structure namely quasi generalized weak sum space briefly, q_S-space and to study some fundamental of qualitative intrinsic properties on this space.

2. Preliminaries

In this section, we presented some basic concepts of quasi generalized weak space. All results were presented by Janrongkam (2019).

Definition 2.1 A quasi generalized weak structure (briefly QGWS) on the nonempty set X, is a nonempty collection q of subsets of X satisfying the property: $U \cap V \in q$ for any $U, V \in q$. A quasi generalized weak space consists of two objects: a nonempty set X and a quasi-generalized weak structure q on X and is denoted by (X, q). Each member of q is called a q-open set in X (briefly q-open set) and the complement of q-open set is said to be q-closed set in X (briefly, q - closed set).

It is important to note that each topology is a QGWS, and each QGWS is a GWS as shown in the diagram below: topology $\Rightarrow$ QGWS $\Rightarrow$ GWS .

Definition 2.2 Let q be a QGWS on X and $A \subset X$.

1. The q-interior of A. denoted by $i_q(A)$ and is defined by

$$i_q(A) = \cup\{U : U \in q \text{ and } U \subset A\},$$

2. The q-closure of A, denoted by $c_q(A)$, and is defined by

$c_q(A) = \cap\{F : F \in q$ is q-closed and $A \subset F\}$. Each element of $i_q(A)$ is said to be a q-interior (respectively, q-adherent) point of A.

3. Main Results

In this section, we shall be present about a generalized of quasi generalized weak spaces, called quasi generalized weak sum space and study to its qualitative intrinsic properties.

3.1 Quasi Generalized Weak Sum Space

First of all, we shall give an important theorem as its useful for our work.

Theorem 3.1.3 Let $\{(X_i, q_S) : i \in I\}$ be any collection of pairwise disjoint quasi generalized weak spaces. Let $\bigoplus_{i\in I} X_i = \bigcup_{i\in I} X_i$ and q_S be a collection of subset of $\bigoplus_{i\in I} X_i$ defined as follow:

$q_S = \left\{U : U \subseteq \bigoplus_{i\in I} X_i \text{ and } U \cap X_i \in q_i\right\}$. Then q_S is a quasi-generalized weak structure for $\bigoplus_{i\in I} X_i$

Proof Let $U, V \in q_S$, we shall show that q_S is a quasi-generalized weak structure for $\bigoplus_{i\in I} X_i$. Since $U, V \in q_S$, we have $U \cap X_i \in q_i$ and $V \cap X_i \in q_i$ for all $i \in I$. Hence, so we have $U \cap V \in q_S$. Therefore q_S is a quasi-generalized weak structure for $\bigoplus_{i\in I} X_i$.

Definition 3.1.4 By Theorem3.1.1, the pair $\left(\bigoplus_{i\in I} X_i, q_S\right)$ is called the quasi generalized weak sum space of the space $\{(X_i, q_S) : i \in I\}$ and briefly q_S-space. Each element of q_S is said to be q_S-open and the complement of q_S-open is called q_S-closed sets.

Example 3.1.5 Let $I = \{1,2\}$, $X_1 = \{a,b\}$, $q_1 = \{\{a\},\{a,b\}\}$.

$X_2 = \{c,d,e\}$, $q_2 = \{\{c\},\{c,d\},\{c,d,e\}\}$.

We obtained $\bigoplus_{i\in I} X_i = \{a,b,c,d,e\}$ and

$q_S = \{\{a,c\},\{a,b,c,\},\{a,c,d\},\{a,c,d,e\},\{a,b,c,d\},\{a,b,c,d,e\}\}$.

The q_S- closed are: $\varnothing,\{e\},\{b\},\{b,e\},\{d,e\},\{b,d,e\}$.

Throughout this paper, there are the symbols for use as follow:

1. $\left(\bigoplus_{i\in I} X_i, q_S\right)$ denoted by a q_S-space of the space $\{(X_i, q_S) : i \in I\}$,
2. $q_S\text{-}O\left(\bigoplus_{i\in I} X_i\right)$ denoted by the collection of all q_S- open sets on $\bigoplus_{i\in I} X_i$,

3. $q_S\text{-}C\left(\underset{i\in I}{\oplus}X_i\right)$ denoted by the collection of all q_S- closed sets on $\underset{i\in I}{\oplus}X_i$.

Theorem 3.1.6 Let $\left(\underset{i\in I}{\oplus}X_i, q_S\right)$ be a q_S-space, and $A\subseteq\underset{i\in I}{\oplus}X_i$ be a q_S-open set if $A=\underset{i\in I}{\cup}(A\cap X_i)$.

Proof Let $A\in q_S\text{-}O\left(\underset{i\in I}{\oplus}X_i\right)$ we want to show that $A=\underset{i\in I}{\cup}(A\cap X_i)$.

Since $A\cap X_i\subseteq A$, so that $\underset{i\in I}{\cup}(A\cap X_i)\subseteq A$. ... (1)

Since $A\in q_S\text{-}O\left(\underset{i\in I}{\oplus}X_i\right)$, we have $A\cap X_i\in q_i\ \forall i\in I$.

That is, $x\in A\Rightarrow x\in A\wedge x\in X_i\ \forall i\in I$.

$\Rightarrow x\in A\wedge x\in X_i\ \exists i\in I$.

So $A\subseteq\underset{i\in I}{\cup}(A\cap X_i)$. . (2)

By (1), (2) we obtained $A=\underset{i\subset I}{\cup}(A\cap X_i)$.

Conversely, let $A=\underset{i\in I}{\cup}(A\cap X_i)$ we want to show that A is q_S- open set.

By Definition 3.1.4, $A\cap X_i\in q_i\ \forall i\in I\Leftrightarrow A\in q_s$. Therefore $\underset{i\in I}{\cup}(A\cap X_i)=A\in q_s$. #.

Note 3.1.7 From Definition 3.1.4 and Theorem 3.1.6. We have :

If $G\in q_S\text{-}O\left(\underset{i\in I}{\oplus}X_i\right)$ then $G=\underset{i\in I}{\cup}(G_i)$ when $G_i\in q_i\text{-}O(X_i)\ i\in I$.

If $F\in q_S\text{-}C\left(\underset{i\in I}{\oplus}X_i\right)$ then $F=\underset{i\in I}{\cup}(F_i)$ when $F_i\in q_i\text{-}C(X_i)$, $i\in I$.

Theorem 3.1.8 Let $\left(\underset{i\in I}{\oplus}X_i, q_S\right)$ be a q_S-space, and A, B are q_S-open sets. Then

1. $A\cup B$ is a q_S-open set,
2. $A\cap B$ is a q_S-open set.

Proof : 1. Since A, B are q_S-open sets.

We have, $A\subseteq\underset{i\in I}{\oplus}X_i$ and $A\cap X_i\in q_i\ \ \forall i\in I$,

$B\subseteq\underset{i\in I}{\oplus}X_i$ and $B\cap X_i\in q_i\ \ \forall i\in I$.

Then $A\cup B\subseteq\underset{i\in I}{\oplus}X_i$ and $(A\cap X_i)\cup(B\cap X_i)\in q_i$.

$\Rightarrow\left[(A\cup B)\cap X\in qi\right]$.

Therefore $A\cup B$ is a q_S-open set. #.

2. similarly 1. #.

Remark 3.1.9 The converse of Theorem 3.1.8 1. not be true, see Example 3.1.5. Let $A=\{a\}$, $B=\{c\}$, we have $A\cup B=\{a,c\}$ is q_S- open, but A, B are not q_S-open sets.

Theorem 3.1.10 Let $\left(\underset{i\in I}{\oplus} X_i, q_S\right)$ be a q_S- space, and A, B are q_S- closed sets.

Then 1. $A\cup B$ is q_S-closed set,

2. $A\cap B$ is q_S-closed set.

Proof Since A, B are q_S-closed sets, so we have A^c, B^c are q_S-open sets. Since $(A\cup B)^C = A^c \cap B^c$ and $(A\cap B)^C = A^c \cup B^c$ and by Theorem 3.1.8, we obtained the results.

Remark 3.1.11 For a q_S- space $\left(\underset{i\in I}{\oplus} X_i, q_S\right)$, then $\varnothing, \underset{i\in I}{\oplus} X_i$ be not necessary q_S-open or q_S-closed sets.

3.2 q_S-Interior

Definition 3.2.12 Let $\left(\underset{i\in I}{\oplus} X_i, q_S\right)$ be a q_S-space and $A\subseteq \underset{i\in I}{\oplus} X_i$. The set of all q_S-interior of A denoted by $\mathrm{i}_{q_S}(A)$ defined by

$$\mathrm{i}_{q_S}(A) = \cup\left\{U \in q_S\text{-}O\left(\underset{i\in I}{\oplus} X_i\right) : U\subseteq A\right\}.$$

In other word, a point $x\in A$ is said to be q_S-interior point of A if there exist are q_S-open set U on $\underset{i\in I}{\oplus} X_i$ such that $x\in U\subseteq A$.

Example 3.2.13 Let $I=\{1,2,3\}$, $X_1=\{a,b\}$, $X_2=\{c,d\}$, $X_3=\{e\}$, $q_1=\{\{a\},\{a,b\}\}$, $q_2=\{\{d\},\{c,d\}\}$, $q_3=\{\{e\}\}$.. We have $\underset{i\in I}{\oplus} X_i =\{a,b,c,d,e\}$ and $q_S=\{\{a,d,e\},\{a,c,d,e\},\{a,b,d,e\},\{a,b,c,d,e\}\}$.

$= q_S\text{-}O\left(\underset{i\in I}{\oplus} X_i\right)$. Then $q_S\text{-}C\left(\underset{i\in I}{\oplus} X_i\right)$ are $\{c,b\},\{b\},\{c\},\varnothing$. Let $A = \{a,b\}$, then $\mathrm{i}_{q_S}(A)=\cup\{\ \}=\varnothing$.

Note 3.2.14 By Definition 3.2.12, let $A\in X_i$, $i\in I$. Then

1. $\mathrm{i}_{qi}(A) = \cup\{V\in q_i\text{-}O(X_i) : V\subseteq A\}$,
2. $\mathrm{i}_{q_S}(A)\subseteq \underset{i\in I}{\cup}\mathrm{i}_{qi}(A)$,
3. $A\in q_i\text{-}O(X_i)$ then $\mathrm{i}_{q_i}(A)=A$.

Example 3.2.15 From Example 3.2.13, let $A=\{a,b\}\subseteq X_1$, we have

$\mathrm{i}_{q_1}(A) = \cup\{V\in q_1\text{-}O(X_1) : V\subseteq A\}$.

$=\cup\{\{a,b\}\}=\{a,b\}$.

But $\mathrm{i}_{q_S}(A)=\varnothing$ so we have $\mathrm{i}_{q_S}(A)=\underset{i\in I}{\cup}\mathrm{i}_{qi}(A)$.

Since $A=\{a,b\}\in q_1\text{-}O(X_1)$, then by (1) $\mathrm{i}_{q_S}(A)=\{a,b\}=A$.

In this following, we discuss to some properties of q_S-interior of any set on q_S- space.

Theorem 3.2.16 Let $\left(\underset{i\in I}{\oplus} X_i, q_S\right)$ be a q_S- space and $A, B \subseteq \underset{i\in I}{\oplus} X_i$. Then

1. $\mathrm{i}_{q_S}(\varnothing)=\varnothing$,
2. $\mathrm{i}_{q_S}\left(\underset{i\in I}{\oplus} X_i\right) \subseteq \underset{i\in I}{\oplus} X_i$,
3. $\mathrm{i}_{q_S}(A) = A$,
4. If $A \subseteq B$ then $\mathrm{i}_{q_S}(A) \subseteq \mathrm{i}_{q_S}(B)$,
5. $\mathrm{i}_{q_S}(A)$ is a q_S-open set,
6. $\mathrm{i}_{q_S}(A)$ is the largest q_S-open set contained in A.

Proof 1. Let $x \in \mathrm{i}_{q_S}(\varnothing) \Leftrightarrow \exists U \in q_s\text{-}O\left(\underset{i\in I}{\oplus} X_i\right)$ such that $x \in U \subseteq \varnothing$ ... (*)

Right side (*) is true, when $U=\varnothing$, so we have $\mathrm{i}_{q_S}(\varnothing)=\varnothing$. #.

2. and 3. , holds from Definition 3.2.12. #.

4. Let $A \subseteq B$, we have

$$\cup\left\{U \in q_S\text{-}O\left(\underset{i\in I}{\oplus} X_i\right) : U \subseteq A\right\} \subseteq \cup\left\{U \in q_S\text{-}O\left(\underset{i\in I}{\oplus} X_i\right) : U \subseteq B\right\}$$

Therefore $\mathrm{i}_{q_S}(A) \subseteq \mathrm{i}_{q_S}(B)$. #.

5. By Definition 3.2.12. #.

6. From 5, we have $\mathrm{i}_{q_S}(A)$ be q_S- open sets, and $\mathrm{i}_{q_S}(A) \subseteq A$. Let $U \subseteq A$ be q_S-open set, we want to show that $U \subseteq \mathrm{i}_{q_s}(A)$ From Definition 3.2.12, we result desired.

Remark 3.2.17 From Theorem 3.2.16 2., be not necessary to equal of two side. See Example 3.2.18.

Example 3.2.18 Let $I=\{1,2\}$, $X_1=\{a,b\}$, $X_2=\{c,d\}$, $q_1=\{\{a\}\}$, $q_2=\{\{c\},\{c,d\}\}$.

We have $\underset{i\in I}{\oplus} X_i = =\{a,b,c,d\}$,

$$q_s = \{\{a,c\},\{a,c,d\}\} = q_S\text{-}O\left(\underset{i\in I}{\oplus} X_i\right),$$

$$\mathrm{i}_{q_S}\left(\underset{i\in I}{\oplus} X_i\right) = \cup\left\{U \in q_S\text{-}O\left(\underset{i\in I}{\oplus} X_i\right) : U \subseteq \underset{i\in I}{\oplus} X_i\right\}.$$

$$= \cup\{\{a,c\},\{a,c,d\}\}.$$

$$= \{a,c,d\} \neq \underset{i\in I}{\oplus} X_i.$$

Theorem 3.2.19 Let $\left(\underset{i\in I}{\oplus} X_i, q_S\right)$ be a q_S- space, and $A \subseteq \left(\underset{i\in I}{\oplus} X_i\right)$. Then

1. $A \in q_S\text{-}O\left(\underset{i\in I}{\oplus} X_i\right)$ if and only if $A = \mathrm{i}_{q_S}(A)$,
2. $\mathrm{i}_{q_S}\left(\mathrm{i}_{q_S}(A)\right) = \mathrm{i}_{q_S}(A)$.

Proof 1. By Theorem 3.2.16, we have $\mathrm{i}_{q_S}(A) \subseteq A$,since $A \in q_S\text{-}o\left(\underset{i\in I}{\oplus} X_i\right)$, and $A \subseteq A$. By Definition 3.2.12, let $x \in A \Rightarrow x \in \mathrm{i}_{q_S}(A)$, hence $A \subseteq \mathrm{i}_{q_S}(A)$.

Therefore $A = \mathrm{i}_{q_S}(A)$.

Conversely, let $A = \mathrm{i}_{q_S}(A)$.

$$= \cup\left\{U \in q_S\text{-}o\left(\underset{i\in I}{\oplus} X_i\right) : U \subseteq A\right\}.$$

So, we have $A = U$ is q_S-open set. #.

2. Since $\mathrm{i}_{q_S}(A) \in q_S\text{-}o\left(\underset{i\in I}{\oplus} X_i\right)$ and by (1) we get as desired. #.

Theorem 3.2.20 Let $\left(\underset{i\in I}{\oplus} X_i, q_S\right)$ be a q_S-space, $A \subseteq \underset{i\in I}{\oplus} X_i$. Then

$\mathrm{i}_{q_S}(A) \subseteq \underset{i\in I}{\cup} \mathrm{i}_{qi}(A \cap X_i)$.

Proof Let $A \subseteq \underset{i\in I}{\oplus} X_i$, and let $x \in \mathrm{i}_{q_S}(A) \Rightarrow x \in U \subseteq A$ where $U \in q_s\text{-}o\left(\underset{i\in I}{\oplus} X_i\right)$.

$$\Rightarrow x \in U \cap X_i \subseteq A \cap X_i, U \cap X_i \in q_i, i \in I.$$
$$\Rightarrow x \in \mathrm{i}_{qi}(A \cap X_i), i \in I.$$
$$\Rightarrow x \in \underset{i\in I}{\cup} \mathrm{i}_{qi}(A \cap X_i).$$

Hence, $\mathrm{i}_{q_S}(A) \subseteq \underset{i\in I}{\cup} \mathrm{i}_{qi}(A \cap X_i)$. #.

Example 3.2.21 Let $I=\{1,2\}$, $X_1=\{a,b\}$, $X_2=\{c,d\}$, $\underset{i\in I}{\oplus} X_i=\{a,b,c,d\}$

$q_1=\{\{a\},\{a,b\}\}$, $q_2=\{\{d\},\{c,d\}\}$,

$$q_S = \{\{a,d\},\{a,c,d\},\{a,b,\mathrm{d}\},\{a,b,c,d\}\}$$
$$= q_S\text{-}o\left(\underset{i\in I}{\oplus} X_i\right).$$

Let $A=\{c,d\}$, we have $\mathrm{i}_{q_S}(A) = \varnothing$ and $\underset{i\in I}{\cup} \mathrm{i}_{qi}(A \cap X_i) = \{c,d\}$.

Remark 3.2.22 From Theorem 3.2.20, if $A \in q_s\text{-}o\left(\underset{i\in I}{\oplus} X_i\right)$, then $\mathrm{i}_{q_S}(A) = \underset{i\in I}{\cup} \mathrm{i}_{qi}(A \cap X_i)$. Since for $i \in I$,

$$A \cap X_i \subseteq A \Rightarrow \underset{i\in I}{\cup}(A \cap X_i) \subseteq A = \mathrm{i}_{q_S}(A).$$

So, we have $\mathrm{i}_{q_S}(A) = \underset{i\in I}{\cup} \mathrm{i}_{qi}(A \cap X_i)$.

Theorem 3.2.23 Let $\left(\underset{i\in I}{\oplus} X_i, q_S\right)$ be a q_S-space, and $A, B \subseteq \underset{i\in I}{\oplus} X_i$. Then

1. $\mathrm{i}_{q_S}(A) \cup \mathrm{i}_{q_S}(B) \subseteq \mathrm{i}_{q_S}(A \cup B)$,
2. $\mathrm{i}_{q_S}(A \cap B) = \mathrm{i}_{q_S}(A) \cap \mathrm{i}_{q_S}(B)$.

Proof: 1. Since $A \subseteq A \cup B$, $B \subseteq A \cup B$ by Theorem 3.2.16 4. , we have

$\mathrm{i}_{q_S}(A)\subseteq \mathrm{i}_{q_S}(A\cup B)$ and $\mathrm{i}_{q_S}(B)\subseteq \mathrm{i}_{q_S}(A\cup B)$.

Hence, $\mathrm{i}_{q_S}(A)\cup \mathrm{i}_{q_S}(B)\subseteq \mathrm{i}_{q_S}(A\cup B)$. #.

2. Since $A\cup B\subseteq A$ and $A\cup B\subseteq B$.

We have $\mathrm{i}_{q_S}(A\cap B)\subseteq \mathrm{i}_{q_S}(A)\cap \mathrm{i}_{q_S}(B)$. ... (*)

By Theorem 3.2.16 6. and $\mathrm{i}_{q_s}(A),\mathrm{i}_{q_s}(B)$ are q_S-open sets, we have

$\mathrm{i}_{q_S}(A)\cap \mathrm{i}_{q_S}(B)\subseteq \mathrm{i}_{q_S}(A\cap B)$. ... (*)

By (*), (**), we have $\mathrm{i}_{q_S}(A\cap B)=\mathrm{i}_{q_S}(A)\cap \mathrm{i}_{q_S}(B)$. #.

Remark 3.2.24 On Theorem 3.2.23 1. not necessary equal to two side, see Example 3.2.13, Let $A=\{a,d\}$, $B=\{e\}$. We have $\mathrm{i}_{qs}(A)=\varnothing=\mathrm{i}_{qs}(B)=\mathrm{i}_{qs}(A)\cup \mathrm{i}_{qs}(B)=\varnothing$, but $\mathrm{i}_{q_S}(A\cup B)=\mathrm{i}_{q_S}\{a,d,e\}=\{a,d,e\}$.

3.3 q_S- closure

Definition 3.3.25 Let $\left(\underset{i\in I}{\oplus}X_i,q_S\right)$ be a q_S-space, and $A\subseteq \underset{i\in I}{\oplus}X_i$. The q_S- closure of A, denoted by $c_{q_s}(A)$, is defined by $c_{qs}(A)=\cap\left\{F\in q_S\text{-}C\left(\underset{i\in I}{\oplus}X_i\right): A\subseteq F\right\}$.

Note 3.3.26 By Definition3.3.25, we see that $c_{qi}(A)=\cap\{F\in q_i\text{-}C(X_i), i\in I: A\subseteq F\}\subseteq c_{qs}(A)$. By Note 3.1.7, we have $F\in q_i\text{-}C\left(\underset{i\in I}{\oplus}X_i\right), F=\underset{i\in I}{\cup}F_i$ where $F\in q_i\text{-}C(X_i), i\in I$,so that $\underset{i\in I}{\cup}c_{qi}(A)\subseteq c_{qs}(A)$.

Example 3.3.27 See Example 3.2.13, let $A=\{a,b\}\subseteq X_1$. We have

$c_{q1}(A)=\cap\{\ \}=\{a,b\}$ and $c_{qs}(A)=\cap\{\ \}=\{a,b,c,d,e\}$.

hence $c_{q1}(A)\subseteq c_{qs}(A)$. In this following, we discuss to some properties of q_S-closure of any set on q_S- space.

Theorem 3.3.28 Let $\left(\underset{i\in I}{\oplus}X_i,q_S\right)$ be a q_S-space, and $A,B\subseteq \underset{i\in I}{\oplus}X_i$ .Then

1. $c_{qs}\left(\underset{i\in I}{\oplus}X_i\right)\subseteq \underset{i\in I}{\oplus}X_i$,
2. $c_{qs}(A)=A$,
3. If $A\subseteq B$ then $c_{qs}(A)\subseteq c_{qs}(B)$,
4. $c_{qs}(A)$ is a q_S- closed set ,
5. $c_{qs}(A)$ is the smallest q_S- closed set containing A, and
6. $A\in q_s\text{-}C\left(\underset{i\in I}{\oplus}X_i\right)$ if and only if $c_{qs}(A)=A$.

Proof 1. By Definition 3.3.25,

we have $c_{qs}\left(\underset{i\in I}{\oplus}X_i\right)\subseteq \left\{F\in q_s\text{-}C\left(\underset{i\in I}{\oplus}X_i\right):\underset{i\in I}{\oplus}X_i\subseteq F\right\}$,

this statement is true when $F\subseteq\underset{i\in I}{\oplus}X_i$.

Hence $c_{qs}\left(\underset{i\in I}{\oplus}X_i\right)=\cap\left\{\underset{i\in I}{\oplus}X_i\right\}=\underset{i\in I}{\oplus}X_i$. #.

2. let $x\in A$, we want to show that $x\in c_{qs}(A)$. By definition of q_S- closure of A, if $x\in A$ then $x\in F$, therefore $x\in\cap\left\{F:F\in q_s\text{-}C\left(\underset{i\in I}{\oplus}X_i\right)\right\}=c_{qs}(A)$. Hence $A\subseteq c_{qs}(A)$. #.

3. If $A\subseteq B$, by Definition 3.3.25 , we have

$\cap\left\{F\in q_s\text{-}C\left(\underset{i\in I}{\oplus}X_i\right):A\subseteq F\right\}\subseteq\left\{F\in q_s\text{-}C\left(\underset{i\in I}{\oplus}X_i\right):B\subseteq F\right\}$.

Therefore $c_{qs}(A)\subseteq c_{qs}(B)$. #.

4. Since $\left\{F\in q_s\text{-}C\left(\underset{i\in I}{\oplus}X_i\right):A\subseteq F\right\}$ be a q_S- closed set, by Theorem 3.1.10 we have $\cap\left\{F\in q_s\text{-}C\left(\underset{i\in I}{\oplus}X_i\right):A\subseteq F\right\}=c_{qs}(A)$ is closed. #.

5. From 2. , 4., we have $A\subseteq c_{qs}(A)$. Let $F\in q_s\text{-}C\left(\underset{i\in I}{\oplus}X_i\right)$ such that $A\subseteq F$. We shall show that $c_{qs}(A)\subseteq F$. Let $x\in c_{qs}(A)$ by Definition 3.3.25, we have $x\in F$ .Hence $c_{qs}(A)\subseteq F$, therefore $c_{qs}(A)$ is the smallest q_S- closed set containing A. . #.

6. Let A be q_S-closed set, we want to prove that $A=c_{qs}(A)$. By Definition 3.3.25, we let give $A=F$, so $c_{qs}(A)\subseteq A$ ... (i), and

from 2. , we set $A\subseteq c_{qs}(A)$ ... (ii)

Hence $A\subseteq c_{qs}(A)$ by (i) , (ii). #.

Theorem 3.3.29 Let $\left(\underset{i\in I}{\oplus}X_i,q_S\right)$ be a q_S- space, and $A,B\subseteq\underset{i\in I}{\oplus}X_i$. Then

1. $c_{qs}(A)\cup c_{qs}(B)=c_{qs}(A\cup B)$,
2. $c_{qs}(A\cap B)\subseteq c_{qs}(A)\cup c_{qs}(B)$.

Proof 1. Since $A\subseteq A\cup B$ and $B\subseteq A\cup B$, by Theorem 3.3.28 3., we have

$$(A)\cup c_{qs}(B)\subseteq c_{qs}(A\cup B) \quad \text{... (i).}$$

Since $c_{qs}(A)\cup c_{qs}(B)$ is a q_S- closed set containing $A\cup B$ and also $c_{qs}(A\cup B)$ is a q_S- closed set containing $A\cup B$.

Hence by Theorem 3.3.28 5. $c_{qs}(A\cup B)\subseteq c_{qs}(A)\cup c_{qs}(B)$ ... (ii).

Therefore $c_{qs}(A)\cup c_{qs}(B)\subseteq c_{qs}(A\cup B)$ by (i), (ii). #.

2. Since $A \cap B \subseteq A$ and $A \cap B \subseteq B$, by Theorem 3.3.28 2. , we have
$c_{qs}(A \cap B) \subseteq c_{qs}(A) \cup c_{qs}(B)$. #.

The quality of Theorem 3.3.29 2. need not be true, see that following Example 3.3.30

Example 3.3.30 Let $I=\{1,2\}$, $X_1=\{a,b\}$, $X_2=\{c,d\}$, $q_1=\{\{a\},\{a,b\}\}$, $q_2=\{\{d\},\{\ \}\}$. We have $\underset{i\in I}{\oplus} X_i = \underset{i\in I}{\cup} X_i = \{a,b,c,d\}$, $q_s=\{\{a,d\},\{a,b,d\},\{a\},\{a,b\}\}$,

$q_s\text{-}C\left(\underset{i\in I}{\oplus} X_i\right) =. \{c,d\},\{c\},\{b,c,d\},\{c,d\}$.

Let $A=\{a,b,c\}$, $B=\{c\}$, we have $A \cap B = \{c\} \Rightarrow c_{qs}(A \cap B) = \{c\}$,
$c_{qs}(A) = \varnothing, c_{qs}(B) = \{c\}$.

We have $c_{qs}(A) \cap c_{qs}(B) = \varnothing$.

Theorem 3.3.31 Let $\left(\underset{i\subset I}{\oplus} X_i, q_S\right)$ be a q_S-space, and $A \subseteq \underset{i\in I}{\oplus} X_i$. Then

1. $\left[\mathrm{i}_{q_S}(A)\right]^C = c_{qs}(A)^C$,
2. $c_{qs}(A)^C = \left[\mathrm{i}_{q_S}(A)\right]^C$.

Proof 1. By definition of $\mathrm{i}_{q_S}(A)$ we have

$$\mathrm{i}_{q_S}(A) = \cup\left\{V : V \in q_s\text{-}O\left(\underset{i\in I}{\oplus} X_i\right) \text{ and } V \subseteq A\right\}.$$

So, $\left[\mathrm{i}_{q_S}(A)\right]^C = \left\{\cup\left\{V : V \in q_s\text{-}O\left(\underset{i\in I}{\oplus} X_i\right) \text{ and } V \subseteq A\right\}\right\}^C$,

$$= \cup\left\{V : V \in q_s\text{-}O\left(\underset{i\in I}{\oplus} X_i\right) \text{ and } V \subseteq A\right\}^C,$$
$$= \cup\left\{V^C : V \in q_s\text{-}O\left(\underset{i\in I}{\oplus} X_i\right) \text{ and } V \subseteq A\right\},$$
$$= \cup\left\{V^C : V^C \in q_s\text{-}C\left(\underset{i\in I}{\oplus} X_i\right) \text{ and } A^C \subseteq V^C\right\},$$
$$= \cup\left\{F : F \in q_s\text{-}C\left(\underset{i\in I}{\oplus} X_i\right) \text{ and } A^C \subseteq F\right\},$$
$$= c_{qs}(A).$$ #.

2. By definition of $c_{q_s}(A)$, we have

$$c_{qs}(A) = \cup\left\{F \in q_s\text{-}C\left(\underset{i\in I}{\oplus} X_i\right) : A \subseteq F\right\}.$$

So, $\left[\mathrm{i}_{q_S}(A)\right]^C = \left[\cup\left\{F \in q_s\text{-}C\left(\underset{i\in I}{\oplus} X_i\right) : A \subseteq F\right\}\right]^C$,

$$= \cup\left\{F^C \in q_s\text{-}C\left(\underset{i\in I}{\oplus} X_i\right) : F^C \subseteq A^C\right\},$$
$$= \cup\left\{V \in q_s\text{-}C\left(\underset{i\in I}{\oplus} X_i\right) : V \subseteq A^C\right\},$$
$$= \mathrm{i}_{q_S}(A^C).$$ #.

Theorem 3.3.32 Let $\left(\underset{i\in I}{\oplus}X_i,q_S\right)$ be a q_S- space, and $A\subseteq\underset{i\in I}{\oplus}X_i$.Then

$$\underset{i\in I}{\cup}c_{qi}(A\cap X_i)\subseteq c_{qs}(A).$$

Proof For $A\subseteq\underset{i\in I}{\oplus}X_i$, since $A\cap X_i\subseteq A,i\in I$.

We have $\underset{i\in I}{\cup}c_{qi}(A\cap X_i)\subseteq c_{qi}(A)$ By Note 3.3.26,

we have $\underset{i\in I}{\cup}c_{qi}(A\cap X_i)\subseteq\underset{i\in I}{\cup}c_{qi}(A)\subseteq c_{qs}(A)$. #.

Example 3.3.33 Let $I=\{1,2\}$, $X_1=\{a,b\}$, $X_2=\{c,d\}$, $q_1=\{\{a\},\{a,b\}\}$, $q_2=\{\{c\}\}$, $q_s=\{\{a,c\},\{a,b,c\}\}$. Let $A=\{a,b\}$,we have $\underset{i\in I}{\cup}c_{qs}(A\cap X_i)=\{a,b,d\}$ $\subseteq c_{qs}(A)=\{a,b,c,d\}$.

Remark 3.3.34 From Theorem 3.3.32, if A is q_S-closed set in $\underset{i\in I}{\oplus}X_i$, we have $c_{qs}(A)=\underset{i\in I}{\cup}(A\cap X_i)$.

Theorem 3.3.35 Let $\left(\underset{i\in I}{\oplus}X_i,q_S\right)$ be a q_S- space, and $Y\subseteq\underset{i\in I}{\oplus}X_i$. Then the collection $q_{SY}=\{G\cap Y:G\in q_s\}$ is a q_S- space on Y.

Proof Let $G\in q_s\text{-}o\left(\underset{i\in I}{\oplus}X_i\right)$ be arbitrary and $Y\subseteq\underset{i\in I}{\oplus}X_i$. Since $G\cap Y=G\cap X_i\subseteq X_i=Y$, by Definition 3.1.4, we have $G\cap X_i\subseteq q_i$ $\forall i\in I$ that is $G\cap Y=q_{SY}$. Therefore q_{SY} be a quasi-generalized weak structure for Y generated by q_S #.

Definition 3.3.36 Let $\left(\underset{i\in I}{\oplus}X_i,q_S\right)$ be a q_S- space , $Y\subseteq\underset{i\in I}{\oplus}X_i$ and the collection q_{SY} from Theorem 3.3.35 we called (Y,q_{SY})be a q_S- subspace of the space $\left(\underset{i\in I}{\oplus}X_i,q_S\right)$. The element of q_{SY} be called q_{SY}-open sets and complement of q_{SY}- open sets, it called q_{SY}-closed sets.

Example 3.3.37 Let $I=\{a,b,c\}$, $X_a=\{1,2\}$, $X_b=\{3,4\}$, $X_c=\{5,6\}$, $q_a=\{\{1\},\{1,2\}\}$, $q_b=\{\{3\}\}$, $q_c=\{\{5\},\{5,6\}\}$. We have $\underset{i\in I}{\oplus}X_i=\{1,2,3,4,5,6\}$ and $q_s=\{\{1,3,6\},\{1,3,5,6\},\{1,2,3,6\},\{1,2,3,5,6\}\}$.

Let 1. $Y=\{1,3,5\}$ we have

q_{SY} = $\{\{1,3\},\{1,3,5\}\}$ and

q_{SY}-closed sets are: $\varnothing$,$\{5\}$.

2. $Z=\{1,3,6\}$ we have $q_{SZ}=\{\{1,3,6\}\}$ and q_{SZ}- closed set is $\varnothing$.

Note 3.3.38 Let $A\subseteq Y\subseteq\underset{i\in I}{\oplus}X_i$,

1. If A is q_{SY} - open in Y and Y is q_S- open in $\bigoplus_{i\in I} X_i$, then A is q_S-open in $\bigoplus_{i\in I} X_i$.

2. The q_{SY} did not necessary a subset of q_S.

Corollary 3.3.39 Let $\left(\bigoplus_{i\in I} X_i, q_S\right)$ be a q_S-space and $X \subseteq \bigoplus_{i\in I} X_i$ then $\{(X_i, q_i) : i \in I\} = \left\{\left(X_i, q_{SX_i}\right) : i \in I\right\}$ be a collection of q_S-subspace of $\left(\bigoplus_{i\in I} X_i, q_s\right)$.

Proof Obvious by Theorem 3.3.35.

Theorem 3.3.40 Let (X_i, q_i) be q_S-subspace of $\left(\bigoplus_{i\in I} X_i, q_s\right)$ and $A \subseteq X_i$ is q_S- closed set if and only if there exist a set $F \in q_s\text{-}C\left(\bigoplus_{i\in I} X_i\right)$ such that $A = F \cap X_i$.

Proof A is q_S-closed set in X_i

$\Leftrightarrow X_i - A$ is q_S-open set in X_i,

$\Leftrightarrow X_i - A = G \cap X_i \ \exists G \in q_s\text{-}C\left(\bigoplus_{i\in I} X_i\right)$,

$\Leftrightarrow A = X_i - (G \cap X_i) = (X_i - G) \cup (X_i - X_i)$,

$\Leftrightarrow A = X_i - G$,

$\Leftrightarrow A = X_i \cap G^C$ where $G^C \in q_S\text{- } C\left(\bigoplus_{i\in I} X_i\right)$,

$\Leftrightarrow A = X_i \cap F$, where $F = G^C$. #.

Theorem 3.3.41 Let (X_i, q_i) be a q_S-subspace of $\left(\bigoplus_{i\in I} X_i q_s\right)$ and $A \subseteq X_i$ then $c_{qsX_i}(A) = c_{qs}(A) \cap X_i$.

Proof By Definition 3.3.25,

$$\begin{aligned} c_{qsX_i}(A) &= \cap\left\{F \in q_s\text{-}C\left(\bigoplus_{i\in I} X_i\right) : A \subseteq F\right\}, \\ &= \cap\left\{F \cap X_i : F \in q_s\text{-}C\left(\bigoplus_{i\in I} X_i\right) \text{ and } A \subseteq F \cap X_i\right\}, \\ &= \cap\left\{F \cap X_i : F \in q_s\text{-}C\left(\bigoplus_{i\in I} X_i\right) \text{ and } A \subseteq F\right\}, \\ &= \cap\left\{F \cap X_i : F \in q_s\text{-}C\left(\bigoplus_{i\in I} X_i\right) \text{ and } A \subseteq F\right\} \cap X_i, \\ &= c_{qs}(A) \cap X_i. \end{aligned}$$

#.

3.4 q_S- kernel

Definition 3.4.42 Let $\left(\bigoplus_{i\in I} X_i, q_S\right)$ be a q_S-space and $A \subseteq \bigoplus_{i\in I} X_i$. The q_S- kernel of A denoted as K_{qs}, is defined by $K_{qs}(A) = \cap\left\{V : A \subseteq V \text{ and } V \in q_s\text{-}O\left(\bigoplus_{i\in I} X_i\right)\right\}$.

Example 3.4.43 Let $I=\{a,b\}$, $X_a=\{1,3\}$, $X_b=\{2,4\}$, $q_a=\{\{3\},\{1,3\}\}$, $q_b=\{\{2\},\{2,4\}\}$. We have $\underset{i\in I}{\oplus}X_i=\{1,2,3,4\}$, $q_s=\{\{2,3\},\{2,3,4\},\{1,2,3\},\{1,2,3,4\}\}$.

Then 1. $K_{qs}(\{2,3\}) = \cap\{V:\{2,3\}\subseteq V$ and $V\in q_s\text{-}O(\underset{i\in I}{\oplus}X_i)\}$

$=\cap\{\{2,3\},\{2,3,4\},\{1,2,3\},\{1,2,3,4\}\}$.

$=\{2,3\}$.

2. $K_{qs}(\varnothing)=\{2,3\}$.

3. $K_{qs}(\{1,2,3,4\})=\{1,2,3,4\}$.

Note 3.4.44 Let $(\underset{i\in I}{\oplus}X_i,q_S)$ be a q_S- space and $A\subseteq\underset{i\in I}{\oplus}X_i$. Then

1. $K_{qs}(A)\in q_s\text{-}O\left(\bigoplus_{i\in I}X_i\right)$,

2. $K_{qs}\left(\bigoplus_{i\in I}X_i\right)=\bigoplus_{i\in I}X_i$.

Theorem 3.4.45 Let $(\underset{i\in I}{\oplus}X_i,q_S)$ be a q_S-space and A, B are nonempty subset of $\underset{i\in I}{\oplus}X_i$. Then

1. $A\subseteq K_{qs}(A)$,

2. $A\in q_s\text{-}O\left(\bigoplus_{i\in I}X_i\right)$ then $A=K_{qs}(A)$,

3. $K_{qs}(K_{qs}(A))=K_{qs}(A)$,

4. $A\subseteq B$ then $K_{qs}(A)\subseteq K_{qs}(B)$,

5. $K_{qs}(A\cup B)=K_{qs}(A)\cup K_{qs}(B)$,

6. $K_{qs}(A\cap B)=K_{qs}(A)\cap K_{qs}(B)$.

Proof 1. Obviously by Definition 3.4.42 and we can say, $K_{qs}(A)$ is the smallest q_S-open set containing A. #.

2. Suppose A is q_S- open set. We want to prove $A=K_{qs}(A)$.

By 1. , we have $A\subseteq K_{qs}(A)$. ...(i).

We shall show that $K_{qs}(A)\subseteq A$.

Let $x\in K_{qs}(A)\Rightarrow x\in\cap V, A\subseteq V, V\in q_s\text{-}O\left(\bigoplus_{i\in I}X_i\right)$

Since A is q_S- open, we have $x\in\cap V=A$.

Hence $K_{qs}(A)\subseteq A$. ...(ii).

From (i). , (ii). we have $A=K_{qs}(A)$.

Conversely, suppose $A = K_{qs}(A)$, we have A is q_S- open set, since $K_{qs}(A)$ is q_S-open. #.

3. Since, $K_{qs}(A)$ be q_S-open set by 2. We have $K_{qs}(K_{qs}(A)) = K_{qs}(A)$. #.

4. By 1. we have $A \subseteq K_{qs}(A)$ and $B \subseteq K_{qs}(B)$.

Since, $A \subseteq B \Rightarrow A \subseteq K_{qs}(B)$ and by 1.

We obtained $K_{qs}(A) \subseteq K_{qs}(B)$. #.

5. By Definition 3.4.42, we have

$$x \in K_{qs}(A \cup B) \Leftrightarrow x \in \cap\left\{V : A \cup B \subseteq V, V \in q_s\text{-}O\left(\bigoplus_{i\in I} X_i\right)\right\}.$$

$$\Leftrightarrow x \in \cap\left\{V : A \subseteq V, V \in q_s\text{-}O\left(\bigoplus_{i\in I} X_i\right)\right\} \vee x \in \cap\left\{V : B \subseteq V, V \in q_s\text{-}O\left(\bigoplus_{i\in I} X_i\right)\right\}.$$

$$\Leftrightarrow x \in \cap K_{qs}(A) \cup K_{qs}(B).$$

Hence $K_{q_s}(A) = K_{qs}(A) \cup K_{qs}(B)$. #.

6. We can prove it by Definition 3.4.42 as same as 5.

Theorem 3.4.46 Let $\left(\bigoplus_{i\in I} X_i, q_S\right)$ be a q_S- space and $A \subseteq \bigoplus_{i\in I} X_i$. Then

$$\bigcup_{i\in I} K_{qi}(A \cap X_i) \subseteq K_{qs}(A).$$

Proof Since $A \cap X_i \in q_i$ and $A \cap X_i \subseteq A \ \forall i \in I$, so that $A \in q_s$

Let $x \in K_{qs}(A) \Rightarrow x \in \cap\left\{V : A \subseteq V, V \in q_i\text{-}O\left(\bigoplus_{i\in I} X_i\right)\right\}$

$$\Rightarrow x \in \cap\left\{V : A \cap X_i \subseteq V, V \in q_i\text{-}O\left(\bigoplus_{i\in I} X_i\right)\right\},$$

$$\Rightarrow x \in K_{qi}(A \cap X_i).$$

Hence $\bigcup_{i\in I} K_{qi}(A \cap X_i) \subseteq K_{qs}(A)$. #.

Example 3.4.47 By Example 3.3.30, let $A = \{a, c\}$,we have

$$\bigcup_{i\in I} K_{qi}(A \cap X_i) = \{a, c, d\} \subseteq K_{qs}(A) = \{a, b, c, d\}.$$

Note 3.4.48 By Theorem 3.4.46, let $A \in q_s\text{-}O\left(\bigoplus_{i\in I} X_i\right)$ then $\bigcup_{i\in I} K_{q_i}(A \cap X_i) = K_{qs}(A)$ #.

Conclusion

The purpose of this research was to introduce a generalization of quasi generalized weak structure namely quasi generalized weak sum space (briefly, q_S- space), and to study some fundamental of qualitative intrinsic properties in term of q_S-interior, q_S-closure and q_S-kernel. We found that these sets were working on q_S-space and gives some fundamental properties under basic operations on sets. Furthermore, it can be show that the q_S-closure and q_S-kernel sets were containing the arbitrary union of intersection of q_i-closure and q_i-kernel for any set A and X_i on the space $\left(\bigoplus_{i\in I} X_i, q_i\right)$, $\forall i \in I$ respectively, but not for q_S-interior, it is contained in the arbitrary union of intersection of q_i- interior for any set A and X_i on the space $\left(\bigoplus_{i\in I} X_i, q_i\right), \forall i \in I$ In the future, we shall investigate q_S-derived, q_S-exterior and q_S-boundary sets, and study to fundamental properties of them.

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กลวิธีการสอนเรียบเรียงประโยคภาษาไทยสำหรับผู้เรียนชาวอินโดนีเซีย โดยใช้ความรู้จากคำศัพท์เรื่องการเดินทาง

Teaching strategies for making Thai sentences to Indonesian learners Using travel vocabulary

สุทธิยา มาหาเจริญ[1*] และจอมขวัญ สุทธินนท์[2]
Suttiya Mahajaroen[1*] andJomkwan Sudhinont[2]

[1*,2]คณะศิลปศาสตร์ มหาวิทยาลัยสงขลานครินทร์ จังหวัดสงขลา 90110
[1*,2]Faculty of Liberal Arts, Prince of Songklauniversity,
Songkhla 90110, Thailand
[1*]Corresponding Author , E-mail: dah_suttiya@hotmail.com

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บทคัดย่อ

บทความวิชาการนี้มีวัตถุประสงค์เพื่อนำเสนอกลวิธีการสอนเรียบเรียงประโยคภาษาไทยสำหรับผู้เรียนชาวอินโดนีเซียโดยใช้ความรู้จากคำศัพท์ที่ได้เรียนมา จากการศึกษาพบว่าผู้เรียนในโครงการจำนวน 13 คน ได้เรียนการเรียบเรียงประโยคภาษาไทยโดยใช้ความรู้จากกิจกรรมการเรียนการสอนคำศัพท์เรื่องการเดินทางจัดการเรียนการสอนตามแนวคิดแบบเน้นประสบการณ์ผนวกกับวิธีการเรียนการสอนโดยใช้สมองเป็นฐานโดยเริ่มสอนเรียบเรียงประโยคภาษาไทยจากความรู้เดิมคือคำศัพท์เรื่องการเดินทางและสอนโครงสร้างประโยคตัวอย่างโดยใช้คำศัพท์เรื่องการเดินทาง เพื่อเป็นแนวทางในการแต่งประโยคที่สามารถนำไปใช้ได้จริงในชีวิตประจำวัน มีการวัดและประเมินผลจากกิจกรรมเสริม คือกิจกรรมเติมถ้อยคำในบทสนทนาให้ถูกต้องผู้เรียนสัมฤทธิผลตามวัตถุประสงค์การสอน กล่าวคือผู้เรียนสามารถจดจำคำศัพท์ที่จะนำไปใช้เรียบเรียงประโยคได้และสามารถจดจำโครงสร้างประโยคเพื่อนำไปใช้จริงในชีวิตประจำวันได้

คำสำคัญ : กลวิธีการสอน, การเรียบเรียงประโยค, การสอนแบบเน้นประสบการณ์

Abstract

The purposes of this research article was to present teaching strategies for making Thai sentences to Indonesian learners using travel vocabulary they had learned. Thirteen students under the project PSU International Block Course in semester 1 of academic year 2018were taught how to make Thai sentences with travel vocabulary they had learned. The teaching was based on the experiential learning (EL) and brain-based learning (BBL) approaches and the teaching began from how to make sentences using travel vocabulary that the students had learned, followed by making sentences, which could be used in real