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Exploring Indigenous Knowledge of Traditional Martial Art *"Silat Beksi"* to Identify Contents and Contexts for Science Learning in Biology Education

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Abstract

Many educators highly recommend integrating science learning with the themes of local wisdom. Orientation to indigenous knowledge and Western science is believed to facilitate students in connecting science learning with the actual condition of their surroundings. The applied curriculum yet widely provided an opportunity for such local integration in science learning. This study aim to investigates the indigenous science and values of Betawi tribe (Indonesia) traditional martial art "silat beksi" to identify ccontent's and valuable context for science learning in biology education on the topic of movements systems. This study employs a qualitative method with a descriptive approach of ethnoscience studies. Data analysis was carried out by qualitatively interpreting the results of interviews and direct observations (data reduction/categorisation, data appearance, drawing conclusions). The results showed twelve reconstructed moves of *silat beksi* based on the bones, joints, muscles and the type of movement. It shows a scientifically rich cultural context in the local wisdom of Betawi people. This research contributes to integrating aspects of local wisdom that are relevant to science learning. It also emphasizes the importance of studying and identifying local wisdom aspects in science learning before being integrated into the curriculum.

Keywords: indigenous knowledge, biology learning, culture-based curriculum, contextualization

Introduction

Indonesia is blessed with abundant cultural heritages with various ethnic groups, traditions and customs. Matsumoto (1996) mentions that culture is a set of attitudes, values, beliefs, and behaviours that are shared by a group of people, but are identical for each individual, passed from one generation to the next (Spencer, 2012)the American anthropologists, Kroeber and Kluckhohn, critically reviewed concepts and definitions of culture, and compiled a list of 164 different definitions. Apte (1994: 2001. Culture is a complex term to define because it involves every people action in this world (Fuentes, 2019)psychology, political sciences, The definition of culture is an important term to define in sociology, psychology, political sciences, anthropology, international business and cross cultural studies. It is quite difficult to find a anthropology,

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international business and cross cultural studies. It is quite difficult to find a terminology. The paper covers the definition of Culture, efiniti of Culture, Cultural Challenges and Globalization and C Cultural Challenges and Globalization and Culture. In 1952, the American anthropologists, Kroeber and Kluckhohn, critically reviewed concepts and definitions of the American anthropologists, Kroeber and Kluckhohn, critically reviewed concepts and definitions of culture, and compiled a list of 164 different definitions. culture, and compiled a list of 164 different definitions. Apte (1994:2001. It affects all aspects of human life, including the economy, politics, and education. The Indonesian government always tries to preserve cultural wisdom and align them to improve the quality of human resources by conducting sustainable curriculum improvements (Suardana et al., 2018). The revision from the 2013 Indonesian curriculum to the new Indonesian curriculum (2022) is expected that the learning process, especially science, will develop students' hard skills, soft skills and character. The teachers are demanded to have flexibility in combining essential materials and local content. In the new curriculum, seven themes can be integrated into science learning. It is to help students to face real and contextual situations in their surrounding environment. Contextualisation of science learning with the nature of science can enhance students' perceptions towards the relevance of science learning and promote sustainable development (Zidny et al., 2021). The principle of contextualisation can benefit students to access their culture through relevant science education (Sánchez Tapia et al., 2018), (Rusilowatil et al., 2021). In addition, local cultural phenomena aligned with students' prior knowle will assist them in constructing new insights (Suardana et al., 2018).

The integration of indigenous knowledge in science learning is also applied by other countries such as the United States (Dupuis & Abrams, 2017), Africa (Thuranira & Mwangi, 2018), and educational institutions in Thailand that are encouraged to integrate local content into learning process. The local knowledge is built to offer students to learn from the real world (Ratana-Ubol & Henschke, 2015), (Asiyah et al., 2021), (Slikkerveer, 2019). Indigenous science provides a rich and authentic context for science learning. Figure 1 below shows the framework for science teachers to integrate indigenous knowledge in science education (Zidny et al., 2020). Young people should be encouraged to recognise and appreciate their indigenous knowledge and participate in preservation actions (Pornpimon et al., 2014). One of the goals of culture-based learning is to help the young to find identity social meaning (Zubaidah & Arsih, 2021). Integrating science with indigenous science has proven effective in arousing students' interest in science learning (Angaama et al., 2016), (Ardianti & Raida, 2022).

The relevant curriculum must be adapted to the context that addresses the problems and challenges of the local community. However, the development of curricula and sources of teaching materials that link biological science knowledge and the context of local community science knowledge is still limited. So it is necessary to conduct research to identify and reconstruct local community science, which will be integrated into the science learning curriculum (biology content). The first step is identifying and examining the extent of indigenous knowledge interacting with science. It is vital to make it well accepted before being integrated into the curriculum (Thuranira & Mwangi, 2018). Based on the observations that have been made, the teacher finds it challenging to incorporate ethnoscience in science learning. They experience problems in reconstructing the local content into scientific science. In this study, we present on how local

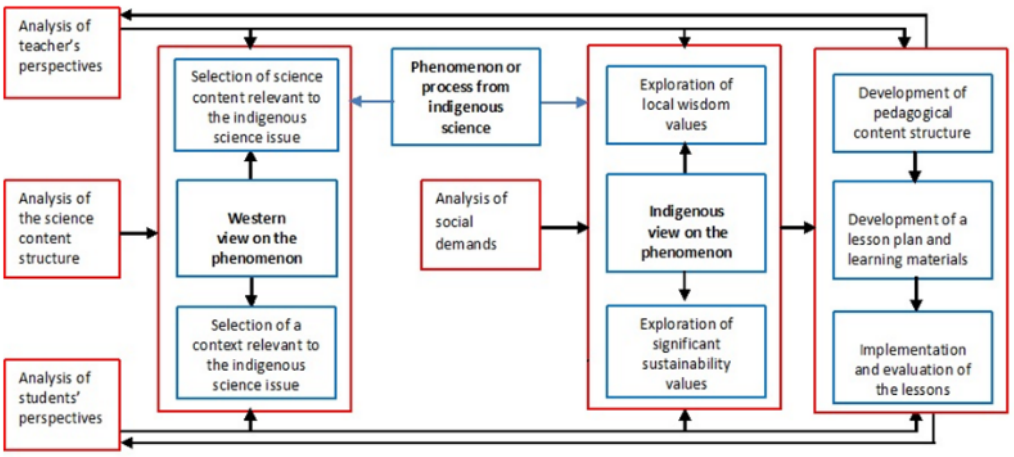


Fig. 1: The framework to combine indigenous knowledge and science education (Zidny et al., 2020)

indigenous knowledge can be reconstructed and integrated into science knowledge especially with biological science knowledge by lifting contexts taken from cultures close to the students' environment. One of them is the knowledge taken from the Beksi Silat culture for the context of learning biology in Indonesia. As one of the well-known local heritage of Indonesia, *Silat* has been widely learned from generation to generation. *Silat* was used for self-defense during Indonesia colonialism to fight the Dutch and Japanese. Silat is used not only as a martial art but also for body art and competed in various tournaments. The movements involve a series of bone, joint and muscle work. The values of *silat* are beneficial for Biology learning as a science that studies living things, including morphology, anatomy, physiology, ecology, etc. The motion system is one of the biological materials taught to students at the middle to college level. The materials for the motion system are quite abstract, so teachers need to visualise or contextualise them in learning that is closely related to students' daily lives. This study aims at reconstructing the values of indigenous science of the Betawi people, *Silat Beksi*, in Jakarta, which are integrated into the biological content of the movement system.

Method

The This study employs a qualitative method with a descriptive approach of ethnoscience studies. This research was conducted at *Silat* Hermitage (*Padepokan*) of Beksi Merah Delima (BMDI). BMDI is actively and consistently developing *Silat Beksi* in Jakarta. The data collection method was done through observation and interviews in January to June 2022. It was carried out by direct observation related to the martial arts movement at the BMDI hermitage. The interview process was to reveal information about the values of indigenous science. The head of the BMDI hermitage became the respondent of this study, because the number of respondents who are knowledgeable about Silat Beksi is limited. The method of reconstructing indigenous knowledge of *Silat beksi* focuses on the movements that can be reconstructed into original scientific knowledge and integrated into biological contents.

Table 1 shows the observation activities towards the movements of *Silat beksi* that can be integrated into biological material, covering the involved bones, moving joints, muscle types and types of movements.

Table 1: Observation Guidelines for Silat Movements

Aspects	*Description*
Martial Techniques	Identifying some basic movements in Silat such as: kick, open arms attack, legs sweeping, parrying, elbowing and knee attacks, punches, and various avoidance tactics. Most styles incorporate footwork, and stances that support defense, attack, or both.
Bone	Silat beksi involves a series of bone movement consisting of five types of bones in the human body, i.e. (1) long bones that support the body's skeleton, such as the thigh bone (femur), calf bone (fibula), shin bone (tibia), foot bone (metatarsal), and palm bone (metacarpals), the radius (phalanges), and the arm bones (humerus, ulna, and radius). (2) short bones that allow some to move, like the ankles (tarsals) and the wrists (carpals). (3) flat bones that protect the muscles including the ribs, the skull, the sternum, and the scapula. (4) irregular bones. (5) sesamoid bone embedded in a tendon (muscle tissue connected to bone) where these small round bones are commonly found in the tendons of the hands, knees, and feet. Sesamoid bone protects the tendons from pressure on the joint and increases joint efficiency. One example of this bone is the kneecap (patella). These bones help and protect the organs in one's body.
Joint	The joints are parts that connect the bones and help one's movement. Based on the movement direction, it can be divided into bullet joints in the shoulder, roll joints in the wrist, the hinge joint in the knee, the swivel joint in the neck, the saddle joint in the thumb and the sliding joint above the wrist.
Muscle	The muscle is like an driven tool that moves the bones. When performing Silat Beksi, the skeletal muscles involve the tendons of the biceps and triceps.
Movement Types	Several types of body movements occur in Silat Beksi, including (1) extension movement as a straight movement, (2) flexion as a bending movement, for example, the movement of the elbow, knee, or knuckles, (3) Abduction as a movement away from the midline, (4) adduction, the opposite of abduction, as a movement that approach the body.

Table 2: Interview Guidelines

Interview Indicators	Description
The philosophy	Identifying the philosophical aspects of silat beksi can grow spiritual and physical values and develop students' character
The history/ genealogy	Identifying the historical aspects of silat beksi that are passed down from generation to generation
The meaning	Identifying the meaning of twelve movement of Silat Beksi, i.e. Basic Beksi, Gedig, Tancep, Cauk, Lokbe, Beksi 1, Broneng, Tingkes, Kebut, Bandut, Petir, Silem
The values	Identifying the values inside Silat Beksi like moral and spiritual values

The instrument had been through a validation process among colleagues. It was followed with several revisions emphasising four indicators during the interview proce

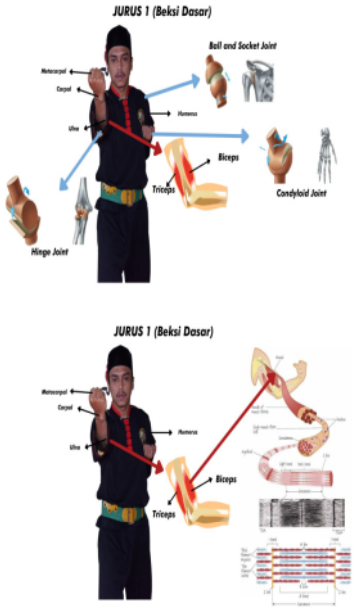
Table 2 indicates the four interview indicators. Data analysis was carried out by qualitatively interpreting the results of interviews and direct observations (data reduction/ categorisation, data appearance, drawing conclusions). The interview results were narrated based on interview indicators (Dewi et al., 2021). The obtained information covered the values of *Silat beksi* that can be reconstructed and integrated into biological content.

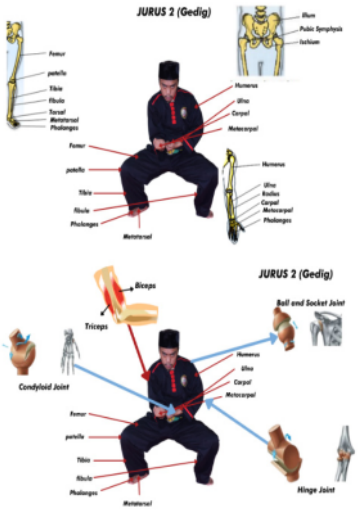
Findings

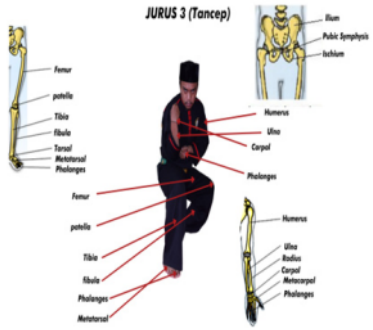
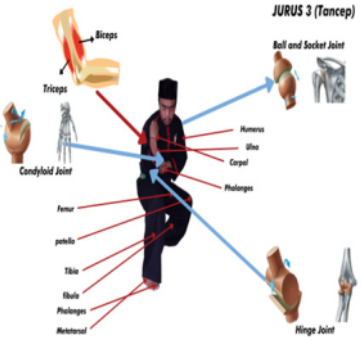
The Based on the observation results in Betawi community, it reveals Indigenous knowledge of *Silat Beksi* t can be integrated into the content of Biology learning. The results of data analysis (Table 3) show the relationship between the techniques of *Silat Beksi* and several movements of the body's limbs, namely bones, joints and muscles which are included in the topic of motion systems in biology learning. The meaning of each movement technique has also been identified to observe the combination of motion systems in *Silat Beksi*.

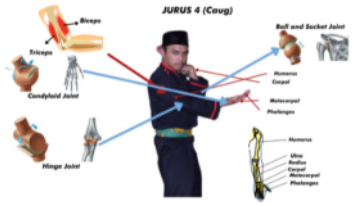
The results also show that indigenous knowledge of *Silat Beksi* contain a meaningful learning context that can enrich biology learning. It relates to historical, philosophical and cultural values of *Silat Beksi* which can be integrated into biology learning. *Silat,* in general, is widely learned in several regions in Indonesia. Each *silat* hermitage has its characteristics based on the local area. *Silat* is also intended for art, as is the case in Betawi tribe, known as *Silat Beksi*. It has been a traditional martial a passed down from generation to generation. Indigenous knowledge can be used as a reference source to contextualise the learning process at school (Imaduddin et al., 2020)and (2. *Silat beksi* is a popular martial arts among Betawi community t involves four body defenses from the opponent's attack. This martial art is a mixture of Betawi martial arts and China fighting styles. *Silat Beksi* is still popular among Betawi community, with 120 existed hermitages of *silat beksi* in Jakarta (Purnama, 2018). *Beksi* refers to the meaning of *Bek-* (defence) and *-si* (four) defence directions. Beksi descends from Pun Cheng Ok, which went successively down to H. Marhali, H. Gozali, and H. Azbullah. In the era of H. Gozali, it grew many more streams. The name of *Silat Beksi* techniques is from Betawi tribe language that is daily used among the community, such as *cauk* (stirring), *beroneng* (right elbow), *tingkes* (parrying), *kebut* (slashing). Some of the names are given referring to the movements in everyday life.

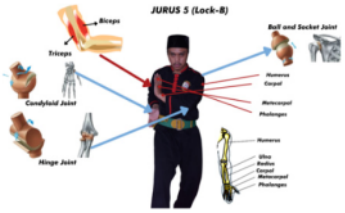
Table 3: Content Analysis of Biology in Silat Beksi

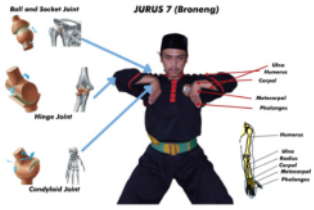
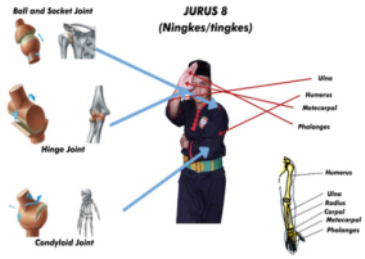
Technique/movement	*Bone, Joint and Muscle involved*	*Movement meanings*
Technique 1 (basic beksi)  	• Bones: Upper limb bones (arm or hand) - Humerus (arm bone) - Ulna bone - dial bones - Carpals (wrist bones) - Metacarpals (palm) - Phalanges (finger bones) • Joints Hinge joints (where the movement is in one direction like a door hinge on the elbows, ankles and fingers) Bullet in hip joint (in the shoulder girdle and upper arm between the humerus bone and the shoulder girdle) Condyloid joints (in the movement of clenching the hand, namely at the wrist bone joint) • Muscles Skeletal Muscles (functions as an active tool for movement, namely in the tendons of the biceps and triceps muscles) • Type of Movements - Flexion (Bending movement by the flexor muscles at the elbows, and knuckles) - Extension (at the time of movement straightening)- Supination (move up)	When one's body is pushed, the body gets up to dodge and strike with a punch combination of right and left hands

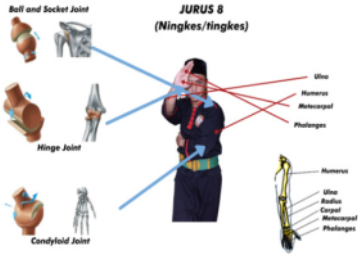
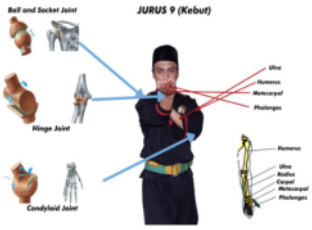
Technique/movement	*Bone, Joint and Muscle involved*	*Movement meanings*
Technique 2 (gedig) 	• Bones: Upper limb bones (arm or hand) - Humerus (arm bone) - Ulna bone) - Radial bones - Carpals (wrist bones) - Metacarpals (palm) - Phalanges (finger bones) • Movement 3 - Pelvic girdle (hipbone) - Lower limbs to support body weight (femur/thigh bone, patella/kneecap bone, tibia/shin bone, tibula/calf bone, ankle bone, metatarsal/sole bone, and phatalanges/toe bone) • Joints - Hinge joints (where the movement is in one direction like a door hinge, namely on the elbows, ankles and fingers) - Bullet in hip joint (at the shoulder girdle and upper arm between the humerus bone and the shoulder girdle) - Condoloid joints (in the movement of clenching the hand, namely at the wrist bone joint) Movement 3 Hinge joint (knee)	If the opponent does elbows attack, take the hands, the fighter will do bedel (sweeping) and kemplang (slash attack). Similarly, if the feet will be taken by the opponent's hand, the feet must be lifted followed by a gedig (elbow attack) moves, and do kemplang to the oppponent
Technique 2 (gedig)	• Muscles Skeletal Muscles (functions as an active tool for movement, namely in the tendons of the biceps and triceps muscles) Movement Types - Flexion (Bending movement by the flexor muscles at the elbows, knuckles) -Extension (at the time of movement straightening)	If the opponent does elbows attack, take the hands, the fighter will do bedel (sweeping) and kemplang (slash attack). Similarly, if the feet will be taken by the opponent's hand, the feet must be lifted followed by a gedig (elbow attack) moves, and do kemplang to the oppponent

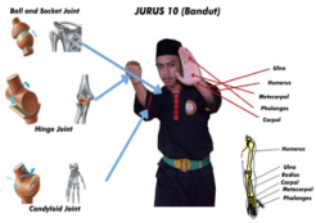
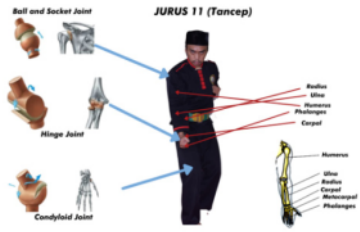
Technique/movement	*Bone, Joint and Muscle involved*	*Movement meanings*
Technique 3 (tancep) 	• Bones: Upper limb bones (arm or hand) Humerus (arm bone) Ulna bone Radial bones Carpals (wrist bones) Metacarpals (palm) Phalanges (finger bones) • Joints Hinge joints (where the movement is in one direction like a door hinge, namely on the elbows, ankles and fingers) Bullet in hip joint (at the shoulder girdle and upper arm between the humerus bone and the shoulder girdle) Condoloid joints (in the movement of clenching the hand, namely at the wrist bone joint)	Grab oppponent's hands, then steps up with the technique of taking the opponent's second hand and giving a tantap movement by grappling in front of the opponent's side
Technique 3 (tancep) 	• Muscle Skeletal Muscles (functions as an active tool for movement, namely in the tendons of the biceps and triceps muscles) • Movement Type Flexion (Bending movement by the flexor muscles at the elbows, knuckles) Extension (at the time of movement straightening) Supination (move up)	Grab oppponent's hands, then steps up with the technique of taking the opponent's second hand and giving a tantap movement by grappling in front of the opponent's side

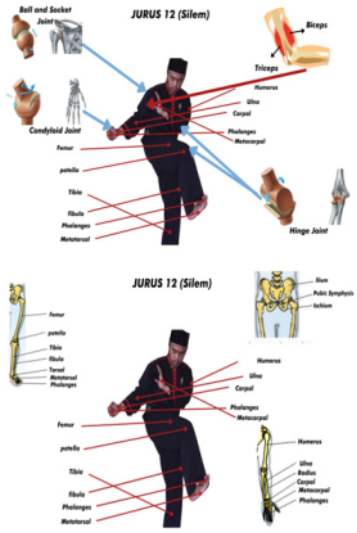
Technique/movement	*Bone, Joint and Muscle involved*	*Movement meanings*
Technique 4 (caug)  	• Bones: Upper limb bones (arm or hand) Humerus (arm bone) Ulna bone Radial bones Carpals (wrist bones) Metacarpals (palm) Phalanges (finger bones) Bones: Upper limb bones (arm or hand) Humerus (arm bone) Ulna bone Radial bones Carpals (wrist bones) Metacarpals (palm) Phalanges (finger bones) • Joints Hinge joints (where the movement is in one direction like a door hinge, namely on the elbows, ankles and fingers) Bullet joint (at the shoulder girdle and upper arm between the humerus bone and the shoulder girdle) Condoloid joints (in the movement of clenching the hand, namely at the wrist bone joint) • Muscels Skeletal Muscles (functions as an active tool for movement in the tendons of the biceps and triceps muscles) Movement Types Flexion (Bending movement by the flexor muscles at the elbows, knuckles) Extension (at the time of movement straightening) Supination (move up) in Movement 1 Pronation on Movement 2	If one is hit, make defence in the left (side) hand and cauk (tiger-claw weapons) with the right hand and followed by the right pounch.

Technique/movement	*Bone, Joint and Muscle involved*	*Movement meanings*
Technique 5 (lock-b)  	• Bones: Upper limb bones (arm or hand) Humerus (arm bone) Ulna bone Radial bones Carpals (wrist bones) Metacarpals (palm) Phalanges (finger bones) • Joints Hinge joints (where the movement is in one direction like a door hinge, namely on the elbows, ankles and fingers) Bullet in hip joint (at the shoulder girdle and upper arm between the humerus bone and the shoulder girdle) Condoloid joints (in the movement of clenching the hand, namely at the wrist bone joint) • Muscles Skeletal Muscles (functions as an active tool for movement, namely in the tendons of the biceps and triceps muscles) Movement Types Flexion (Bending movement by the flexor muscles at the elbows, knuckles) Extension (at the time of movement straightening) Supination (move up) Pronation	When one's whip is taken, catches it with two hands. The right hand goes up with the left hand strikes.
Technique 6 (Beksi 1)  	• Bones: Upper limb bones (arm or hand) Humerus (arm bone) Ulna (ulna bone) Radial bones Carpals (wrist bones) Metacarpals (palm) Phalanges (finger bones) • Joints Hinge joints (where the movement is in one direction like a door hinge, namely on the elbows, ankles and fingers) Bullet in hip joint (at the shoulder girdle and upper arm between the humerus bone and the shoulder girdle) Condoloid joints (in the movement of clenching the hand, namely at the wrist bone joint) • Muscle Skeletal Muscles (functions as an active tool for movement, namely in the tendons of the biceps and triceps muscles) • Movement Type Flexion (Bending movement by the flexor muscles at the elbows, knuckles)	When one gets pounch, parries, and counters it with a left hand punch or grapple the opponent's neck with a quick elbow strike.

Technique/movement	*Bone, Joint and Muscle involved*	*Movement meanings*
	Extension (at the time of movement straightening) Supination (move up) Pronation	When one gets pounch, parries, and counters it with a left hand punch or grapple the opponent's neck with a quick elbow strike.
Technique 7 (broneng) 	• Bones: Upper limb bones (arm or hand) Humerus (arm bone) Ulna bone Radial bones Carpals (wrist bones) Metacarpals (palm bones) Phalanges (finger bones) • Joints Hinge joints (where the movement is in one direction like a door hinge, namely on the elbows, ankles and fingers) Bullet in hip joint (at the shoulder girdle and upper arm between the humerus bone and the shoulder girdle) Condoloid joints (in the movement of clenching the hand, namely at the wrist bone joint) • Muscle Skeletal Muscles (functions as an active tool for movement, namely in the tendons of the biceps and triceps muscles) Movement Type Flexion (Bending movement by the flexor muscles at the elbows, knuckles) Extension (at the time of movement straightening)	After the hands were taken, the fighter grabbed them again.
Technique 8 (ningkes/tingkes) 	• Bones: Upper limb bones (arm or hand) Humerus (arm bone) Ulna bone Radial bones Carpals (wrist bones) Metacarpals (palm) Phalanges (finger bones) • Joints Hinge joints (where the movement is in one direction like a door hinge, namely on the elbows, ankles and fingers) Bullet in hip joint (at the shoulder girdle and upper arm between the humerus bone and the shoulder girdle) Condoloid joints (in the movement of clenching the hand, namely at the wrist bone joint) • Muscle Skeletal Muscles (functions as an active tool for movement, namely in the tendons of the biceps and triceps muscles) Movement Type Flexion (Bending movement by the flexor muscles at the elbows, knuckles)	If one is hit repeatedly, parries with the right and left hands and make a countre punch.

Technique/movement	*Bone, Joint and Muscle involved*	*Movement meanings*
Technique 8 (ningkes/tingkes) 	• Bones: Upper limb bones (arm or hand) Humerus (arm bone) Ulna bone Radial bones Carpals (wrist bones) Metacarpals (palm) Phalanges (finger bones) • Joints Hinge joints (where the movement is in one direction like a door hinge, namely on the elbows, ankles and fingers) Bullet in hip joint (at the shoulder girdle and upper arm between the humerus bone and the shoulder girdle) Condoloid joints (in the movement of clenching the hand, namely at the wrist bone joint) • Muscle Skeletal Muscles (functions as an active tool for movement, namely in the tendons of the biceps and triceps muscles) Movement Type Flexion (Bending movement by the flexor muscles at the elbows, knuckles) Extension (at the time of movement straightening) Supination (move up)	If one is hit repeatedly, parries with the right and left hands and make a countre punch.
Technique 9 (kebut) 	• Bones: Upper limb bones (arm or hand) Humerus (arm bone) Ulna bone Radial bones Carpals (wrist bones) Metacarpals (palm) Phalanges (finger bones) • Joints Hinge joints (where the movement is in one direction like a door hinge, namely on the elbows, ankles and fingers) Bullet in hip joint (at the shoulder girdle and upper arm between the humerus bone and the shoulder girdle) Condoloid joints (in the movement of clenching the hand, namely at the wrist bone joint) • Muscle Skeletal Muscles (functions as an active tool for movement, namely in the tendons of the biceps and triceps muscles) • Movement Type Flexion (Bending movement by the flexor muscles at the elbows, knuckles) Extension (at the time of movement straightening) Supination (move up)	When the opponent hits with the right hand, catch it and do kebut with the right hand. Kebut movement is like slashing.

Technique/movement	*Bone, Joint and Muscle involved*	*Movement meanings*
Technique 10 (bandut) 	Bones: Upper limb bones (arm or hand) Humerus (arm bone) Ulna bone Radial bones Carpals (wrist bones) Metacarpals (palm) Phalanges (finger bones) Joints Hinge joints (where the movement is in one direction like a door hinge on the elbows, ankles and fingers) Bullet in hip joint (at the shoulder girdle and upper arm between the humerus bone and the shoulder girdle) Condoloid joints (in the movement of clenching the hand, namely at the wrist bone joint) Muscle Skeletal Muscles (functions as an active tool for movement, namely in the tendons of the biceps and triceps muscles) Movement Type Flexion (Bending movement by the flexor muscles at the elbows, knuckles) Extension (at the time of movement straightening) Supination (move up)	When the hands are taken, do bejut and followed by bandut, a bottom up strike.
Technique 11 (tancep/petir) 	Bones: Upper limb bones (arm or hand) Humerus (arm bone) Ulna (ulna bone) Radial bones Carpals (wrist bones) Metacarpals (palm) Phalanges (finger bones) Joints Hinge joints (where the movement is in one direction like a door hinge, namely on the elbows, ankles and fingers) Bullet in hip joint (at the shoulder girdle and upper arm between the humerus bone and the shoulder girdle) Condoloid joints (in the movement of clenching the hand, namely at the wrist bone joint) Muscle Skeletal Muscles (functions as an active tool for movement, namely in the tendons of the biceps and triceps muscles) Movement Type Flexion (Bending movement by the flexor muscles at the elbows, knuckles) Extension (at the time of movement straightening) Supination (move up)	If the elbow is taken, pull the opponent down with a slash and slam.

Technique/movement	*Bone, Joint and Muscle involved*	*Movement meanings*
Technique 12 (silem) 	Bones: Upper limb bones (arm or hand) Humerus (arm bone) Ulna bone Radius (pick bones) Carpals (wrist bones) Metacarpals (palm) Phalanges (finger bones) Pelvic girdle (hipbone) Lower limbs to support body weight (femur/thigh bone, patella/kneecap bone, tibia/shin bone, tibula/calf bone, ankle bone, metatarsal/sole bone, and phatalanges/toe bone) Joints Hinge joints (where the movement is in one direction like a door hinge, namely on the elbows, ankles and fingers) Bullet in hip joint (at the shoulder girdle and upper arm between the humerus bone and the shoulder girdle) Condoloid joints (in the movement of clenching the hand, namely at the wrist bone joint) hinge joint (knee) Muscle Skeletal Muscles (functions as an active tool for movement, namely in the tendons of the biceps and triceps muscles) Movement Type	When the feet are taken, lift the feet and do kemplang. Take the neck opponent and rotate it like turning a ball.
	-Flexion (Bending movement by the flexor muscles at the elbows, knuckles) -Extension (at the time of movement straightening) -Inversion Evers	When the feet are taken, lift the feet and do kemplang. Take the neck opponent and rotate it like turning a ball.

Discussion

This Indigenous knowledge from *Silat Bekti* movements can be reconstructed into scientific knowledge in biology learning. The movement involve body parts that can be a meaningful learning content and enhance students' learning motivation when discussing the topic of the body motion system. Generally, the topic of motion systems is "rote learning" which is only dominated with memorisation of body parts in the topic of motion system without interpreting them. In line with Varea & Tinning (2016) we study technical knowledge and theories, but "knowing" also involves personal experience, especially when the "object" of knowledge is the body. Several research findings suggest that most high school students find it difficult to understand the topic of movement system (Syamsurizal et al., 2021). The content covers the human skeleton, muscles, and abnormalities in the human movement system. Meanwhile, at the university level, the material for movement systems is included in the course of human anatomy and physiology. Human anatomy has been categorised as the most complex material among university students (Estai & Bunt, 2016). According to (Çimer, 2012), some recommended strategies in teaching biology are reducing the content of the biology curriculum and connecting topics with everyday life (Etobro & Fabinu, 2017), to make it enjoyable. Integrating the silat movement in the motion system material is an effort to connect biology material with students' daily lives (Suciyati et al., 2021). Students are expected to be able to relate the biological content of the motion system with their culture and day-to-day activities.

Several aspects of philosophy and noble values in Silat Beksi can also be integrated as a meaningful learning context. Silat as a martial art continues to evolve based on the needs. Silat or Betawi people say "punching" is a self-defense because Betawi people are never taught to attack but more to defend themselves. There is indeed an attack movement in self-defence, but it emphasises defensive skills like beksi, cingkring, kortek, etc, defending first not directly attacking or fighting. Silat can also train fighters' mentality because the learning process from silat ends with a specific test so that it can develop their minds. The essential values of Silat Beksi which can be applied in the school curricula consist of four aspects, namely:

a. Mentally spiritual, if a fighter has martial arts, he/she must be brave and kind to the community and follow their religious thoughts to fortify from all darkness. They must avoid abusive actions toward others.
b. Culture, as an asset of the nation and state that needs to be raised and preserved.
c. Martial arts, every movement contains meaning, so the defender must understand the meaning. There are three principles: self-defense, community defense, and family defense.
d. Sports, every movement of *silat* can be practiced in tournaments or festivals so that they can have a positive impact on martial arts actors.

The values of indigenous science in silat generally include mutual cooperation, aesthetic, and religious values (Sulastri & Winarti, 2020). Instilling the values that exist in silat is also part of preserving the nation's cultural values. The noble values of *silat* cover mental and spiritual aspects, sports, art, and self-defence. The noble values of *silat* are contained in identity, which includes three main things as a unit, namely: (1) Indonesian culture as its origin and style, (2) the philosophy of noble character as the soul and source of motivation for its use, (3) spiritual mental development/ethics (Gristyutawati et al., 2012).

The new 2022 national curriculum in Indonesia demands science learning (biology) to fulfil several crucial aspects of curriculum development. It includes 1) student-centred learning, 2) contextual aspects in nature that shows uniqueness based on the characteristics of the education unit, cultural context and environment, 3) essential values which contain all vital information elements, 4) accountable, 5) various stakeholders involvement (Kementerian Pendidikan, Kebudayaan, 2021).

In the high school curriculum structure, the motion system material is included in the biology course with a proportion of the learning load in the form of intracurricular learning and projects based learning to strengthen the profile of *Pancasila* students. (Kebudayaan, 2022). Pancasila learners are the embodiment of lifelong students who are competent, having good character, and behavior based on the values of Pancasila (Indonesian ideology). The integration of indigenous knowledge in *Silat Beksi* and biology learning will certainly support the development of the 2022 national curriculum because it contextualizes knowledge and the uniqueness of local culture in science learning. In addition, the philosophical and cultural aspects of indigenous knowledge can instill noble values that can build students' character. The contextualisation process can be culturally relevant by taking into account not only students' ideas and experiences brought to class, but also the psychological reasoning models, traditions, and community structures that make those ideas meaningful to students (Sánchez Tapia et al., 2018), (Ardianti et al., 2019). The process of integrating indigenous knowledge into science curricula allows the community to 1) identify knowledge that can be integrated with science, which will be further disseminated to scientists, practitioners, and policymakers, and 2) maintain and appreciate the knowledge that is difficult to be scientifically explained (Hiwasaki et al., 2014).

In addition, the sociocultural context in the knowledge of traditional societies, including culture, philosophy and life values in *pencak silat* can be linked to education for sustainable

development (Education for sustainable development) (Zidny et al., 2021). Students can reflect and interconnect knowledge surrounding them within the science (biology) framework at school so that learning process is more meaningful and can maintain cultural sustainability in their environment.

Conclusion

The reconstruction of *Silat Beksi* from Betawi indigenous knowledge formulates twelve martial arts movements that can be integrated into biological content. A series of motion systems work synergistically when a fighter performs *silat* movements, including moving bones, working joints, involved muscles, and movement type. This contextualisation process assists teachers in identifying existing local wisdom for reconstruction into biology curriculum. Moreover, indigenous knowledge in *Silat Beksi* also offers a meaningful learning context for students. The philosophical, historical and cultural aspects of *Silat Beksi* can grow prominent values that shape the students' character and present meaningful learning content. Hence, the curriculum objectives can be achieved optimally.

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