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Research Article

Integration of Funds of Knowledge as Contextual Knowledge

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Abstract: This study discussed the importance of funds of knowledge as contextual knowledge to generate the impact of 'resonance' in sustaining students' interest and motivation towards science, especially Physics. The funds of knowledge that comprises of cultural and language knowledge, which are richly embedded within the students due to daily interaction with family members, friends and community activities should be addressed, explored and utilized by science educators to generate the relationship between the science curriculum in school and students' experience in community. The teaching and learning processes should be based on students' cultural experiences and be contextually related to their rich community knowledge, so that an intersection occurs between the science curriculum and their community experiences. Example of a lesson plan integrating funds of knowledge in teaching Archimedes Principle was produced. The awareness and creativity of educators in adapting the repertoire of their own cultural experiences as well as students' funds of knowledge would eliminate negative perceptions and difficulties in the understanding of Physics concepts.

Keywords: Contextual knowledge, funds of knowledge, physics, teaching and learning

INTRODUCTION

A professional teacher does not only need to master the knowledge discipline or knowledge content that will be conveyed to the students, but also the Pedagogical Content Knowledge (PCK), which would create a conducive and cheerful learning climate. One of the components in PCK is contextual knowledge. This knowledge should be identified and activated to create a 'resonance' effect by science educators in their quest to make the learning environment meaningful in order to sustain students' interest and motivation towards science. Many science educators argued that teaching should be carried out according to context and students' learning culture so that an 'engagement' between the school lessons and community experiences takes place.

The combination of creativity in teaching strategies that takes into account the diversity in student's characteristics such as their backgrounds, interests, experiences and learning styles ascertained that every teaching scene would take place consciously. The teacher's capability to comprehend students' background as well as elicit their cultural experience, language and history i.e. funds of knowledge, would construct a learning climate, which is livelier and engaging, as well as a two-way sharing between the student and teacher. If the students' rich funds of knowledge were to be integrated with the science educators' existing funds of knowledge, the learning situation would be much more effective as a result of one complementing the other and vice versa.

Including the element 'funds of knowledge' into the learning environment signified that education itself is directly promoting the idea of a social relationship between the school and the home, which at last would foster trust between the participants, namely the teachers and students to drive the education system into being more active and beneficial for both parties. Furthermore, according to Basu and Barton (2007), this strategic relationship not only has to take into account the types of knowledge commonly employed at home or in the local community, but also the approach to be taken in order to achieve given learning objectives. In other words, teaching has to be centred to not only cultural experiences that have become norms to the students but also to the strategic knowledge and activities that enable the students to achieve life's goal outside of the periphery of school life.

Science educators have various models and strategies to link students' knowledge and cultural experiences with the science curriculum in the classroom as advocated in the Instructional Congruence concept (Azman, 2009; Lee and Fradd, 1998), everyday sense-making (Warren *et al*., 2001), Contextually Authentic Science (Burton, 2010) and Hybrid Space (Barton and Tan, 2009). All of these approaches have provided the needed insight into the correlation between the students' real-live world and the school science curriculum that ultimately helped students gain

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a deeper scientific understanding in a fun atmosphere without the feeling of unusual anomalies, particularly in low-performing schools in the rural areas (Ahmad Nurulazam *et al*., 2010).

Because of the interaction among peers, family and local community, every student has gained different exposures, cultural knowledge and contextual knowledge. They later brought different background knowledge into the class, which they used to process, evaluate and build new knowledge of a particular concept taught by the teacher in the classroom. According to Rumelhart and Norman (1978), the processes of assimilation, tuning and re-structuring of existing knowledge scheme would happen to newly received input. Lee and Fradd (1998) argued that it was important for science educators to acknowledge the existence of student's rich cultural experiences and to consciously adopt them along with their funds of knowledge into the teaching scene in order to produce the resonance effect, which were the efforts and initiatives of educators that could create a learning environment that was relevant and contextual with students' daily lives. This situation further helped to increase students' interest, self-efficacy (Azman, 2009) and motivation (Luykx and Lee, 2007) towards science and Physics. As for that, this study discussed the importance of Funds of Knowledge as a contextual knowledge to generate the impact of 'resonance' in sustaining students' interest and motivation toward science, especially Physics.

FUNDS OF KNOWLEDGE

According to Moll and Greenberg (1990), 'Funds of Knowledge' was a cluster of skills and knowledge gained through cultural interaction and history and was crucial for the proper functioning of an individual in a community. Among the knowledge gained through activities or interactions that took place at home or in the community were cooking, gardening, doing business, recreational-cycling, learning the art of healing, hiking, swimming, playing football, picnic, doing construction projects, community service, organizing campaigns, etc.

Lee and Fradd (1998) described cultural experience as the students' experience or existing knowledge of various cultural objects commonly found in the environment and their communities. Examples of cultural objects includes common areas or locations visited, picnic or recreational spots, shops, buildings, roads, rivers, vehicles, equipments such as glasses, flashlight and so on. Meanwhile Basu and Barton (2007) and Beth *et al*. (2001), referred to funds of knowledge as 'cultural and historical knowledge or specific experience in the context of families and communities'. In addition, knowledge, action, disposition and behaviour were inclusive, with the recognition that each domain was formed culturally. According to them, the funds of knowledge concept would award recognition to an individual's life experiences in a family or the community, which would produce useful knowledge, was effective and could be transferred. In other words, it did not stereotype cultural practices, but rather a dynamic process of student's life experiences in his/her family and community.

Culture was a complex and a multidimensional construct that could be studied from an organizational, business, regional, national or international perspective. Every individual was influenced by cultural factors such as ethnic, organization and national (Duarte and Snyder, 2001). Meanwhile, according to Hofstede (1991), culture was defined as "the collective programming of the mind which distinguishes the members of one group or category of people from another". This definition essentially meant that the mind and cognitive behaviour played a role in shaping the cultural attitude of an individual (Saadé *et al*., 2009).

In a study carried out by Moll *et al*. (1992) on Hispanic students, they have found that the funds of knowledge possessed by the students' were so rich and diverse as a result of having mingled and participated actively in a multi-ethnic community. Teachers' failure to unearth the student's funds of knowledge sources and link it in the teaching and learning process would result in a didactic teaching. Next, the classroom atmosphere would turn bland and there would be less involvement from the students. In other words, teachers would seem to introduce a scientific concept in an indoctrinative and deductive manner with the hope that students would be able to grasp it immediately. They fail to realize that the construction of new knowledge required past knowledge schemes, which would enable the students to find similarities and differences among the concepts put forward.

Funds of knowledge and conceptual understanding: Learning involved the modification or construction of new knowledge schemes as a result of the processes of accretion, tuning and restructuring of the existing schemes. Conscious integration of cultural and linguistic experiences in a classroom teaching process would help teachers to explain a concept as well as the knowledge content of a given academic discipline in a manner which was meaningful, relevant and related to the daily life of the students, which ultimately would have impact on a deep conceptual understanding (Driver *et al*., 1994). At the same time, it would make the students happy as their experiences were appreciated and used as an example and analogy in understanding the scientific concepts presented by teachers (Azman, 2009; Lee, 2004; Lee *et al*., 2007) and this would indirectly acknowledge the student as a knowledgeable individual that was capable of using that knowledge as a basis for future learning (Gonzalez and Moll, 2002).

Luykx and Lee (2007) argued that the study of science would become more interesting and easier to

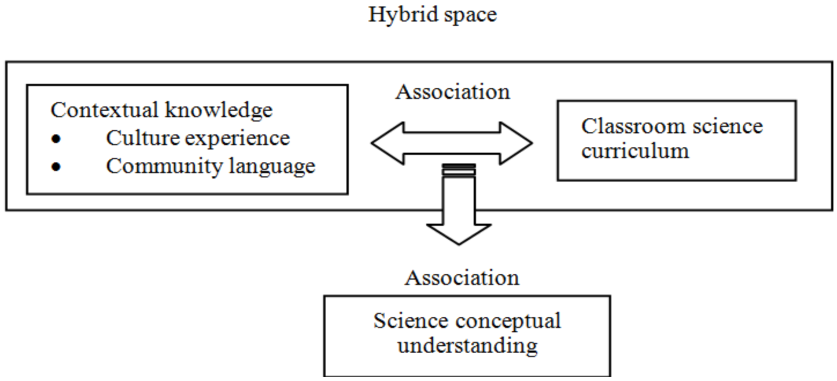

Fig. 1: Associating funds of knowledge for conceptual understanding

understand if cultural experiences such as students' knowledge about various sources, objects and artefacts (fabricated goods, especially appliances and weapons, which was remnants of a bygone era) available or commonly found in the students' environment or the community, were used explicitly in teaching. This view was also supported by Azman (2009) and Ahmad Nurulazam *et al*. (2009) whom asserted that "the use of cultural experience in learning science can help students make the connection between the science concepts learned in the classroom, with a variety of cultural objects that students encounter in an environment which is part of the students existing knowledge".

Students entered the classroom with a set of schematic knowledge and the funds of knowledge accumulated in their brains when learning science (Basu and Barton, 2007). According to Lee *et al*. (1995), students would use the funds of knowledge, which was an existing repository of knowledge to assess, filter and find the meaning of science knowledge content presented by the teacher. In other words, students would try to find the relationship or 'connection' that would enables them to see the relationship, similarities between the classroom curriculums and the realities of their lives.

Azman (2009) used the cultural experience of students during a picnic at a waterfall that they commonly visited to explain the concept of distance, velocity and acceleration when he taught kinematics, a Physics topic. With the aid of a location map sketched by the students referring to the cultural objects found during the picnic, the teacher was able to explain the concepts well. During the 'talking science' activity, students actively shared their experiences of cultural objects found and associated it to the physics concepts presented by teachers, in a more cheerful learning environment.

Meanwhile, Rohandi (2010) adapted the artefacts found in students' environment such as a guitar to explain physics concepts related to frequency, amplitude, sound pitch and slinky spring to describe the light wave characteristics, such as wavelength. Furthermore, the funds of knowledge in the local community that used the facial mirror had made the facial mirror an important artefact in life, as it was the initial idea in the discussion of the characteristics of plane mirror images. He also used games and played the role as student's funds of knowledge for students to explain the characteristics of a facial mirror in a more cheerful and interesting learning environment. The picturisation of this situation reflected the passion and creativity of science educators, whom made use of the rich contextual knowledge that was existing in self, community and the students' environment to explain the science concepts so that it could be more easily understood by students, as shown in Fig. 1.

Integrating funds of knowledge in teaching AND learning activity: Although teachers commonly possessed science content knowledge and were exposed to the teaching of science based on inquiry, they were not adequately prepared to meet the needs of students who differ in terms of language and culture. Many teachers did not realize the influence of culture and language on students' learning and did not place an emphasis on teaching diverse groups of students or 'teaching for diversity' as a duty, or they were against the multi-cultural view of learning to the extent of ignoring differences in cultures, nations and languages that existed among students (Buxton, 2005; Lee *et al*., 2007).

Cultural knowledge, the use of everyday language and the history in the students' life that were built-in should be excavated, explored and explicitly integrated in the teaching and learning scene. There were times when the funds of knowledge belong to the teachers needed to be merged with student's knowledge and experiences in order to produce a meaningful learning of science (Upadhyay, 2006). Educators need to change their beliefs and practices regarding the importance of student diversity in terms of language and culture; they need to use the language and cultural diversity as the basis or 'starting point' in teaching science in the classroom (Lee *et al*., 2007). Educators should be more innovative in creating a correspondence/similarity between the natural science with the cultural and language experiences of the students. According to Lee and Fradd (1998) when carrying out Match Instruction, the teacher must (a) understand and appreciate the language and cultural experience of students, (b) have the scientific knowledge and scientific habits of mind and (c) capable of connecting science concepts and topics taught with students' background experiences.

Since the concepts of science in the standard science curriculum were in English, teachers face greater challenges in extracting the funds of knowledge from students who were less proficient in English, especially those who were in rural areas so that there was an 'engagement' between the concepts put forward with the daily experiences of students. Intelligence and creativity in extracting students' contextual knowledge resources would stimulate social interaction and scientific discussion. Students would become more comfortable and confident when speaking of a scientific concept, which has a direct relationship with their life experiences. This situation would help the development of a more advanced language literacy with the support of 'linguistic scaffolding' provided by the teacher to further strengthen the existing comprehension of the standard scientific conceptual design (Luykx and Lee, 2007) in addition to fostering a closer bond between the home and school.

Lee and Fradd (1998) Advocated the Instructional Congruent strategy as a pedagogical technique that would help students to understand the contents of a subject when the school science curriculum was matched or tailored to the diverse characteristics of students. Teachers should take the initiative and tap into the students' rich resources and experiences repertoire, as a result of their social interaction at home or in the community during the learning of science in the classroom (Moje *et al*., 2001; Warren *et al*., 2001). Next, teachers should determine how the linguistic and cultural knowledge owned was being adapted into the school science curriculum. Through this Instructional Congruent, teachers were provided with a 'starting point' to plan activities and organize the next step so that comprehension and better practice of science occurs among students (Luykx and Lee, 2007). A classroom environment with a 'third space' or 'hybrid space' would drive social interaction among students and thus enrich the scientific scholarly discussion. Students share their cultural experience and use it as a bridge to find a linkage with the science concepts in the school curriculum (Barton and Tan, 2009; Luykx and Lee, 2007).

Funds of knowledge integrating strategy: The integration of funds of knowledge in the teaching and learning strategies was adapted from the Instructional Congruent strategy (Azman, 2009; Lee and Fradd, 1998; Lee and Fradd, 2001) which involved five phases as follows:

Table 1: Floating objects and condition of movement

Floating objects	Condition of movement/ Movement
Mineral water bottle	Fast
Slippers	Fast
Coconut husk	Fast
Wood fragments/splinters	Medium/average
Shoes	Medium/average
Cloth	Slow
Shirt	Slow
Box	Slow

Phase 1: Identifying student's funds of knowledge: In this context, educators should take the initiative to closely identify students' personal characteristics, environment, cultural experience, history and language of daily communication with friends, family and community. Educators could carry out informal conversation with students during recess, extra-curricular activities or upon their return from school. Teachers' willingness to visit families and villages, parks or community where the students live would enable them to clearly understand the cultural and language experience embedded within the students. Not all experience that was related to culture, language and history could be used, thus educators need to choose an appropriate example or analogy to relate to the content found in the Daily Lesson Plan.

For example, let us take into account the context of students who frequently come across flash floods during the rainy seasons in urban areas. In order to explain the concept of buoyancy and Archimedes' principle, the teacher can draw the attention of students by giving them the opportunity to relate their experiences during flash floods or elaborate on the condition of the river near their village that may be contaminated with a variety of waste materials. In the case of polluted rivers or flash floods, students were to list out the floating objects and the condition of movement as shown in Table 1. In another context of students involved in the small industries of salted eggs and pickled lime production, the knowledge resources of the community and family can be related with the concepts of floating and buoyancy force.

Phase 2: Matching physics knowledge content with funds of knowledge: A new concept in the discipline of physics presented to students should be integrated with cultural knowledge, daily experiences and history of students. Various connecting mechanism can be used such as analogy, simile, examples and parables appropriate to the context and cultural experience of students. In matching the science concepts, it was necessary to look at the differences and similarities that exist between the daily routine and a practical science

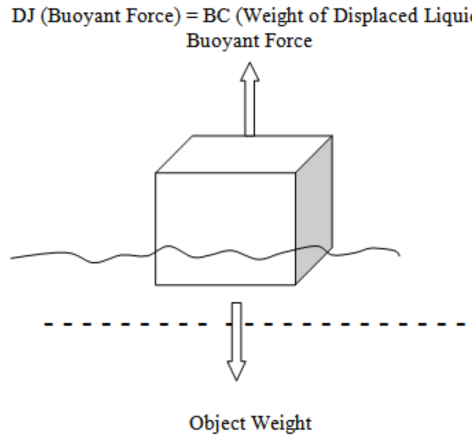

Fig. 2: Floating object

inquiry. This model allowed students to understand how to speak and think scientifically which might differ from the daily life practices (Lee and Fradd, 2001).

The use of cultural objects, everyday language, artefacts and appropriate analogy would allow students to see the connection and relationship that would help them to understand and explore the science concepts in discussion (Barton and Tan, 2009). In the example above, the students got the initial idea of Archimedes' principle, as it was associated with objects that floated or sunk in liquid or fluid. The floating or sinking of an object was associated with the object's buoyant force and its weight. Logically, an object would float in liquid if the weight of the object were equal to its buoyant force, as in Fig. 2. Teachers can also use the word equation; buoyant force was equal to the weight of displaced liquid.

Phase 3: Using experience and language skills in science discourse: Using appropriate language in describing the knowledge content by using examples that were familiar to the students would facilitate the understanding of a concept. By leveraging on the experience and language skills acquired in the activities of talking science either orally, in writing, sketching, drawing, summarizing using tables or graphs when presenting ideas or experience, would stimulate scientific writing. In addition, this advantage would enrich the discussion and further enrich the funds of knowledge and cultural experience through knowledge sharing and cultural experience among students. For example, the teacher can ask students who live near the coast or the river to narrate their sea-bathing experience and river-bathing experience for the purpose of explaining the buoyancy effect of objects in liquids of differing densities. Through this science talk, the language and concepts of science literacy would be more meaningful and should occur simultaneously.

Linguistic scaffolding would help students to make the expression of a science concept in their community to match the actual science concepts in the curriculum. For example, teachers would use the phrase that described efforts to lift up an object to explain the Archimedes Principle or Buoyancy Principle in the context of everyday language. Besides that, teachers could use language experience through proverbs '*Untung sabut timbul*, *untung batu tenggelam*' as a linguistic scaffold when discussing objects' ability to float. In this expression, the coconut husk would arise because its density was less than water, while the stone would sink because its density exceeded water density. Teachers can relate this to the fate of a person; if one is well-fated like a coconut husk that arises, is dynamic and continues to progress from one destination to another in search for development and improvement due to having support (this context refers to high buoyancy force); whereas for an ill-fated person, he is submerged as a stone, not moving and static, not known and narrow minded due to lack of exposure (this context refers to low buoyancy force). Through this analogy, the Physics knowledge presented would appear to have a 'connection' with the language and literary experience learned; it would also seem unified and would give meaning and impact to students (Gonzalez and Moll, 2002; Lee and Luykx, 2005; Warren *et al*., 2001).

Phase four: Creating a hybrid space: The environment should be conducive for an effective learning experience. For specific topics, the physical space of the classroom would need to be switched to a noisy outdoor environment similar to the student's life at home or in the community. This situation would create a 'third space' so that there would be an intersection between the students' funds of knowledge with school science experience (Moje *et al*., 2001). The concept was also shared by Barton and Tan (2009) who termed it as hybrid space.

Teacher's initiative in creating the relevant climate, environment and learning experiences through the integration of student's real-life experience in family and the local community would accelerate the comprehension of science concepts taught in the classroom. In addition, students were bound to discover that science learning occurred formally in the classroom, laboratory or small-scale industries such as pickling, but also indirectly at home.

For example, in studying the changes in buoyant force acting on a lime and an egg with the density of water, the teacher can change the classroom to look like a kitchen or a research room of a pickling industry, which was familiar to the students. Students or teachers can bring the necessary materials such as limes, eggs and a 5L water bottle, salt and ladle to conduct a simple experiment.

Water was poured into a 5L water bottle until half full, a lime was then dropped into the bottle and the

Table 2: Example of Daily Teaching Plan (DTP) based on Needham's five phase constructivist model that integrates funds of knowledge

Phase	Content	Teaching/learning activity	Note
Phase 1 orientation	Density concept Comparison of floating and sunken objects	Teacher asks student to give examples of objects that can float on water and to explain the phenomena/incident. Teacher states expected learning outcomes.	Cultural experience: Daily drink Iced tea Shaved ice Cendol pulut Cultural object: Sungai Pinang, Penang Island Penang Jetty
Phase 2 elicitation of idea	Material density $\rho = \frac{m}{v}$ Buoyant Force Volume displaced Object weight	Teacher elicits students' experiences about flash floods, monsoon season. Teacher asks students to list floating objects and their speed of movement in a table.	Funds of knowledge Cultural experience: Flash floods Monsoon floods
Phase 3 restructuring of idea	Volume displaced Object weight, W W = mg Archimedes Principle. For sunken objects J = BC For floating objects. J = BC = BO Note: J: Buoyant force BC: Weight of displaced liquid.	Teacher tells story of the thirsty crow that found a bottle of water. The teacher explains the concept of object weight, density, volume of liquid displaced and associated it with Buoyant force. Teacher asks students to create a graphical representation showing the relationship between weight of objects, weight of displaced liquid and Buoyant force for a variety of cultural objects found by them.	Funds of knowledge Cultural experience: The thirsty crow Cultural object Elephant Motivational quotes Arise: can, yes/ successful Sink: cannot/fail
Phase 4 application of idea	Archimedes' Principle. Object weight, W W = mg (For floating objects) J = BC = BO For sunken objects J = BC ≠ BO	Teacher changes the feel of the classroom to a small lime pickling/preservation industry room (providing a hybrid space) Teacher asks student to run an experiment on lime pickling/ preservation Students explained their observation on the movement of lime in a bottle filled with water when the density of water increases. Students share their experience in observing a mechanic using a hydrometer to determine car battery's condition by testing the concentration of battery water. Teacher discusses on the experience bathing in river, in the sea and in pools using floats or coconuts. Teacher shows video clips of bathing in the Dead Sea, Jordan Teacher trigger ideas on making salted chicken eggs and duck eggs by preservation/pickling process using salt. Teacher discusses on the sailing of ships on sea which differs in depth and water salinity	Cultural Experience: Lime pickling /preservation industry, fruits. Bathing in river, in pool, in the sea Watching the mechanic determine the condition of the battery Cultural Object Batu Feringhi Beach, Air Putih River, Ah Seng Battery Shop Cultural Experience: Lime pickling industry, fruits Bathing in river, pool and the sea. Cultural Object Batu Feringhi Beach, Air Putih River Penang Por
Phase 5 reflection	Summary of Archimedes' Principle	Teacher asks each and every student to talk about their experience in visiting the Penang Port Teacher asks students to summarize their learning outcomes.	Archimedes' Principle (For floating object) J = BC = BO (For sunken object) J = BC ≠ BO

Learning Areas: Force and Pressure
Topic: Archimedes' Principle
Learning outcome: At the end of the lesson, students will be able to
1. State density and its relationship with/to mass and volume
2. Explain the principles of Buoyancy and Archimedes
3. Calculate buoyant force for objects which floats and sinks
Thinking skills: Comparing the differences and to analyse
Scientific Attitudes/Moral Values: Appreciating God's creation, systematic and cooperation
Teaching aid: salt, egg, lime, a 5L mineral water bottle, ladle

state of the lime was observed. Next, salt was added gradually into the bottle and stirred. The movement of the lime was observed again. The experiment was repeated using chicken eggs and the changes to the movement of the eggs was recorded. The greater the amount of salt added and dissolved in water, the greater the buoyancy of the lime and egg as the density of the liquid increases. In conclusion, buoyant force depends on the density of the liquid; the higher the density of the liquid, the greater the buoyant force.

Phase five: Using a constructivist approach model: According to constructivism, learning was a process of an active construction of knowledge structures as a result of an interpretation of someone's experience towards knowledge or a new scheme found through social interaction. The structure of knowledge built was always open to assimilation or modification until equilibrium was attained each time an individual experiences or receives new input.

A constructivist approach emphasized that learning occurred through active social interaction among students, via information sharing and cultural experience that was already embedded in their funds of knowledge. The new knowledge found would undergo a rectification process that was adapted and matched with existing experience to get a more concrete meaning. Through this approach, students were given more autonomy in "doing science" and "talking science" activities by including cultural knowledge and experiences from home or the community in learning science at school. Teachers have to identify the funds of knowledge, background knowledge, experience and students' skills in order to blend them with learning experiences in school.

Integrating funds of knowledge in this context fit the constructivist perspective, such as when students were stimulated to talk about various experiences related to science concepts in discussion. For example, students' description of their experience bathing in rivers or the sea, riding a raft or boats, making floats out of car tire tubes during the flood season, making salted eggs, as well as their participation in small lime pickle industry can be applied and associated either directly or indirectly with the 'Archimedes Principle' concept.

Similarly, students' experience in seeing coconut husks floating down the river or stones submerged in the river would allow teachers to use the knowledge of language and proverbs that were richly instilled in the students' culture. Teachers can relate this with the proverb '*Untung sabut timbul*, *untung batu tenggelam*' to describe the Buoyant force acting on a floating object such as a coconut husk that equals the weight of liquid displaced and thus equal the weight of the floating object (coconut husk).

The concept can be summarized by the equation of AJ = BC = BO. Other terms can be used such as narrations or motivational expressions, for instance: "*Aku Juga* (AJ) *Budak Cemerlang* (BC) *dan pasti boleh* (BO) if I was like a coconut husk that arise and move from one place to another". On the other hand, for the sunken object in the water, the buoyant force equalled the weight of liquid displaced, but was less than the weight of the object. This direct relationship would give a significant impact to the students' interests because their experience was appreciated and used as contextual learning in the classroom. The interaction and discussion between them would not only add excitement and a better conceptual understanding, it would also stimulate motivation and it was entrepreneurially eye-opening in generating financial resources as in the examples of industries such as pickling lime, salted eggs and fruits.

Example of a daily lesson plan based on the constructivist approach: The Daily Lesson Plan was not "rigid" and can be adapted to suit teacher's creativity based on student's funds of knowledge and repertoire in the environment and their communities that have been known by educators.

Table 2 was an example of a Daily Lesson Plan adapted to integrate the funds of knowledge in a constructivist approach. Funds of knowledge integration was matched to teaching and learning activities, taking into account educators' understanding about culture and students' experiences in their communities. For example, the ingredient used in this lesson were consisted of lime; perhaps in another location, fruits like rambutan, guava, pear fruit or garlic can be used as an alternative.

CONCLUSION

Successful and effective integration of funds of knowledge in classroom teaching of science was a major challenge to science educators, especially those who were not as much aware of the importance of contextual knowledge. In student-centred approach, the main challenge was to free the perception of most people that science was a collection of facts contained in a book and not a collection of topics related to the daily experiences of students (Seiler, 2001). According to the scholar, teaching of critical skills may be based on the repertoire of ability and cultural characteristics that has been accumulated by the students.

The integration of funds of knowledge in the school science curriculum not only could increase the excellence of students but also the equality (equity) of students in rural areas, appropriate to the education reforms that emphasized the 'science for all'. With the recognition of the characteristics of students from diverse cultural backgrounds, experience and language opened a new chapter to the individual and social contribution of scientific knowledge (Driver *et al*., 1994).

When identity, beliefs, experiences and views of the students about the future were considered in the school science curriculum, students were given the opportunity to engage in activities related to the vision of the future and how they evaluate their relationship and their definition of science; hence, indirectly these students will build a long-term commitment and continue the science project and career in the field of science (Basu and Barton, 2007).

Given that the relationship between culture and language with the learning of science remained fragile and difficult to understand and mastered by some teachers, more efforts and initiatives need to be undertaken to find a relationship between the life experiences of students and the knowledge of science in schools. Exposure to contextual knowledge needs to be done on a regular basis through professional development, by taking into account the experience of successes and failures in the past (Lee *et al*., 2007). Documentation about the element of sharing the rich cultural experience, language and history that were in the repository of students and teachers can be a source of reference for science teachers who were less aware of the importance of that element.

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