

The Implementation of Local Wisdom Education Global Insights in Institutional and Local Wisdom of Culture in North Sumatera Subject in Faculty of Social Science, Universitas Negeri Medan

1st Nurjannah Department of Educational Anthropology Universitas Negeri Medan nurjannahfis@unimed.ac.id

4th Trisni Andayani

Department of Educational

Anthropology

Universitas Negeri Medan

trisniandayanifis@unimed.ac.id

2nd Tumpal Simarmata

Department of Educational

Anthropology

Universitas Negeri Medan

tumpalsimarmata@unimed.ac.id

5th Ayu Febryani Department of Educational Anthropology Universitas Negeri Medan ayufebryani@unimed.ac.id 3rd Supsiloani
Department of Educational
Anthropology
Universitas Negeri Medan
supsiloanifis@unimed.ac.id

6th Bakhrul Khair Amal Department of Educational Anthropology Universitas Negeri Medan b4khrul.4m4l@gmail.ac.id

Abstract—This study aims to examine the application of global knowledge of local wisdom education on institutional or local wisdom courses at the Universitas Negeri Medan. Local wisdom education is needed as an effort so that students are able to explore regional potential based on their respective local wisdom. Global insight education directs students to be able to think globally related to the world, especially in the realm of education. Both collaborations make students open to mastering science and technology while still heeding the values of local wisdom in their environment. This also has the potential for the region to develop better in this development era. The results of the study focused on discovering the form of local wisdom on Karo ethnic in North Sumatra. Data extraction is divided into forms of local wisdom based on region, namely, local cultural institutions / wisdom in rivers, seas, forests, villages, hills/mountains, rituals, and animals. Data results are explored and introduced in general through websites built together with students in class. In addition, in writing it is produced in hard copy of the teaching materials of local wisdom/ institutional of culture ini the North Sumatra

Keywords-Education, Local Wisdom, Global Insights

I. INTRODUCTION

The development of a complex curriculum which indicated by demands of improving the national education quality in Indonesia, indirectly requires teachers and students to be able to improve the learning quality. This is certainly aimed at ensuring that education has a quality which can be globally competitive.

Especially in this highly complex globalization era, it is necessary to improve and develop science and technology. All things are studied in depth with the aim of creating an increasingly complex understanding in Indonesian generation thought. In any part of the world, including Republic of Indonesia, both directly and indirectly, we must be able to adjust the development of

the era so we will not become a country whose human resources are not capable.

On the other hand, changes in this Industrial Revolution 4.0 era also require students to be able to filter. Because in this era of disruption, it is very susceptible to changes in the old social order which makes teachers and students must be swift to handle it. Therefore, reinforcement is needed for students to be able to think globally, but act locally. Acting locally in anthropological terms is often juxtaposed with activities to understand and preserve local wisdom. Learning local wisdom is needed in mastering the anthropology education students' cognitive, affective, and psychomotor who have task to be able to master various implementations of local cultural wisdom in North Sumatra.

Especially in the Department of Educational Anthropology, there is course that is named Institutional and Local Wisdom of Culture In North Sumatera. This course requires students to be able to understand various local institutions and local ethnic-ethnic wisdom in North Sumatra. But on the other hand, students' insight must also be opened in understanding the world and everything in it. This is necessary to foster awareness that a world that is so complex and broad, can be narrow and simple due to the progress of Science and Technology. Thus it will grow in students that life is interdependence, both humans and nature.

This attitude will form a person who is aware that the world and the universe must be protected and maintained together but still heed the values of local wisdom contained in each environment. It also aims to strengthen the nation's cultural values so that Indonesian generation becomes a generation who loves its culture and is able to introduce it to international arena. This is in line with Universitas Negeri Medan (Unimed) program through its



quality culture to make Unimed able to maintain quality in *Tri Dharma Perguruan Tinggi* program.

In evaluating the learning outcomes of Institutional and Local Wisdom of Culture in North Sumatera courses, students have not been maximized in examining various local institutions and wisdom in various ethnic groups in North Sumatra. In addition, referring to the theory of social learning, culture is a pattern of behavior learned. This means that local wisdom as part of nation's culture, if left behind by its generations, will create generations who are indifferent, apathetic, and even loses good character in themselves. Especially in welcoming the demographic bonus in 2030, educational programs must be able to prepare the next generation who maintain their cultural values as national character, but also keep abreast of the times according to their era.

Therefore, this research is important to be done so that learning can be carried out more deeply, innovatively in applying local knowledge learning models with global insight. This model requires lecturers and students to master various local wisdoms through the process of inventorying and connecting them through a global perspective, so that learning process can improve the learning atmosphere which is more interesting. Local wisdom inventory is obtained through the fulfillment of KKNI assignments, which are packaged in an interesting way from assignments on routine tasks, critical book reviews, critical journal reviews, mini research, engineering ideas, and projects. The data which has been inventoried will be processed to link learning with a global perspective whose result will be read together by all audiences through online media. So that the learning innovations through this model can be more directed and learning can run more creatively, interestingly, innovatively, and globally.

Local wisdom is one of interesting things to talk about in this sophisticated modern era. Local wisdom (local genius) is the truth which has been internalized or fixed in an area. Local wisdom is one of cultural manifestations because the content of a society traditional wisdom is values conception, ideas and patterns of action which are shared as a system that tends to hold tightly to tradition, as a means to solve problems often faced by local people [1].

Wisdom in etymology means a person's ability to use his mind in responding to events, objects or situations. Whereas local, shows the interaction space where events or situations occur. Thus, local wisdom is substantially the norm which applies in a society that is believed to be true and becomes a reference in acting and behaving in daily life. Therefore, local wisdom is an entity which determines human dignity in the community [2]. So far, local wisdom is often interpreted as local wisdom, local knowledge or local intelligence[3]. The concept of local wisdom is interpreted as a unique knowledge belonging to a particular society or culture (indigenous psychology), has developed for a long time, as a result of the process of between reciprocal relations humans and environment.

Local wisdom develops in ways and practices developed by humans, from their deep understanding of environment. Inherited from generation to generation orally or through knowledge and action. Local wisdom comes from within the community itself, disseminated non-formally and collective property of the community members in a unity. Local values and knowledge are embedded in people's way of life as a means to survive [4]. Local wisdom essentially contains images and knowledge (cognitive) of the community about matters relating to environment structure, how the environment functions, how the natural reaction to human actions, and the relationships that should be created between humans and its natural environment. One manifestation of their knowledge is creation of a natural resource management system. Various traditions, traditional ceremonies, and everyday actions of humans contain deep meaning for their relationship with their environment [5]. According [6] describes local wisdom definitively, which is a life view that has been contradicted about community relations or between citizens and their environment.

Local wisdom education is needed by students in deepening lecture material in North Institutional and Local Wisdom of Culture in North Sumatera courses. This is an effort to make students are able to explore regional potential based on their respective local wisdom. Global insight education directs students to be able to think globally related to the world, especially in education field. Both collaborations make students in mastering science and technology while still heeding the values of local wisdom in their environment. This also has potential for region to develop better in this development era. The full research roadmap is explained in the following picture[7]; [8]; [9][10]; [11]; [12]; [13]; [14].

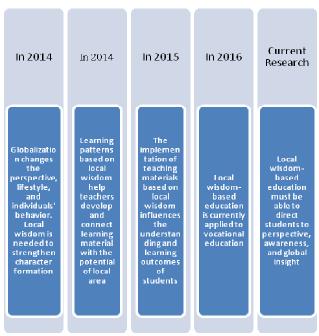


Fig 1. Roadmap of Educational Research Based on Local Wisdom



II. MATERIAL AND METHOD

The stages in the implementation of this research activity are: (i) preparation stage with include: a) subject lecturers preparing learning tools include lecture contracts, RPS, syllabus and teaching materials for Institutional and Local Wisdom of Culture In North Sumatera courses, b) preparing research instruments in the form of pretest and posttest about the institutions and local wisdom of North Sumatra culture to students at the first and last meeting, and c) compile a schedule and division of labor for lecturers team of Institutional and Local Wisdom of Culture In North Sumatera courses.

The activity implementation phase: a) collect research data related to the implementation of learning models implemented by lecturers, b) gather assignment data and division of student groups to inventory various local institutions/wisdom of North Sumatra culture, c) collect data related to the role of lecturers in creating an attractive learning atmosphere based on local knowledge with global insight, and d) analyze learning outcomes based on the application of a global-minded local wisdom learning model. The reporting research including: a) reporting phase, b) data analysis results forming, c) data conclusions, d) reports forming, and e) dissemination and publication in international journals or accredited national journals.

This research was carried out atAnthropology Education Program in Faculty of Social Sciences State University of Medan and four regions in Medan City, Langkat Regency, Karo Regency, and Deli Serdang Regency as a regional research institute/cultural local wisdom of North Sumatra. The variables observed in this study were students of Anthropology Education Department Faculty of Social Sciences, Universitas Negeri Medan year 2017.

The research design used in this study is Educational Research and Development. This study uses two research methods, those are qualitative with descriptive and quantitative approaches with the pattern of "dominant-less dominant design" and the designs are research and development with the implementation stage consists of four stages, those are: (1) preliminary study phase; (2) the preparation of teaching materials; (3) the application phase of the learning model; and (4) the discovery stage of learning outcomes and learning output.

Data collection techniques used in the study were using interview techniques, questionnaire techniques, observation techniques, documentation techniques and test techniques. Data analysis techniques were carried out by checking the data validity using data triangulation and simple statistical analysis techniques. The data analysis technique carried out in this study is a qualitative model like what has been done by Miles and Huberman[15] which consists of three activities namely data reduction, data presentation, and conclusion drawing.

So, the things whichdone in this research are (1) registering and determining research subjects whichare in

accordance with the criteria for determining research subjects; (2) collecting data through observation, in-depth interviews, and document studies; (3) Make a list and initial grouping of the data obtained. At this stage a list of questions is made and the answers are relevant to the problem under study; (4) Perform reduction and elimination. At this stage the activity carried out is test the data by asking these following questions: Does the data contain important aspects to understand the event as a whole, and does the data allow for abstraction and special labeling; (5) interpret the data obtained; (6) draw conclusions, research reflections, and suggestions for research.

To see students' understanding of the instructional material developed, it is done by measuring the magnitude of the increasing score in pretest and posttest, using the formula [16]:

$$g = \frac{posttestscore}{Maximumscore} - \frac{pretestscore}{pretestscore}$$

with increasing magnitude using gains index (g) criteria based on Hake standard, they are:

g > 0.7 : high $0.3 < g \le 0.7$: medium $g \le 0.3$: low

III. FINDINGS AND DISCUSSION

1. Local Institution of North Sumatra

North Sumatra is inhabited by various ethnicities. Some ethnic groups in this region, including Batak Toba, Simalungun, Mandailing, Karo, Pak-Pak, Angkola, Nias, Malay, Javanese, Banjar, Minangkabau, Gayo, Alas, Punjabi, Tamil, and so on. The life of multiculturalism seems to work well in this region. Each ethnic group lives and develops their respective cultural characteristics. These characteristics are inherent and become ethnic identities.

Speaking of ethnic identity, it will also relate to discussions related to local institutions. Each ethnic group has local institutions which act as reinforcement of ethnic identity. Local institutions are traditional community organizations which play a role in maintaining and preserving their local ethnic wisdom. Some of the local institutions in North Sumatra are dalihan na tolu to Batak Toba, which means three stoves. This institution is defined as the framework of three stoves which are mutually related and occupy their respective positions with predetermined roles and tasks. Dalihan na tolu consists of hula-hula (wife's family), dongan tubu (group of one clan), and boru (family which takes wife from one clan). Hula hula occupies the most respected position in the social structure of Batak Toba culture. All Batak ethnic groups are ordered to always respect hula-hula. Dongan tubu becomes a reinforcement of life of the clan even though sometimes it experiences conflict, but it is



expected that between brothers and sisters must live in harmony, harmony and wisdom. *Boru* occupies the most recent position which generally has the task of serving or known as "*parhobas*". Although served as a *parhobas*, but *boru* must be persuaded and protected.

Dalihan na tolu local institutions is interpreted as a life philosophy for Batak ethnic group. The philosophy which has somba marhula-hula, manat mardongan tubu, elek marboruterms is a local wisdom for Batak Toba ethnic group. When linked to a global perspective, it is clear that local wisdom reflects a democratic life. This can be seen from the position that must be followed alternately by individuals. Every Batak ethnic will be in time to be boru, dongan tubu, and hula-hula. These three roles also have another philosophical meaning that someone is not always above and under. Life is considered as a 'spinning wheel'. In addition, the position of furnace must also be balanced. This reflects a life that must be harmonious in kinship.

The same institutional concept is also applied to other ethnic groups such as *Karo* known as *sitelu* or *sangkep nggeluh*, which consists of *kalimbubu* (family giving wives), *senina* (family of one clan), and *beru* (family who take / receive wives). In *Mandailing* ethnic, it is known as *dalihan na tolu* which consists of *mora* (a girl giver), *kahanggi* (a relative of one clan), and *anak boru* (the recipient of a girl). The local wisdom known as *Mandailing* Ethnic life guideline is *tolu apantuno*, they are *marmora somba*, *elek maranak boru*, and *manat-manat markahanggi*. In Minangkabau ethnic known as the form of traditional institutions called *tigo tungku sajarang*.

The culture institutions consist of *ninik mamak* (male family from mother's side), *alim ulama* (religious experts), and *cadiak pandai* (people who are considered broad-minded and / or elder). In Acehnese customary institutions also consist of three parts, they are *keuchik* (village head), *tengku* (head of religion), and *tuehapet* (head of custom). Based on these two customary institutions on Minangkabau and Acehnese ethnicity, it can be observed that between religion, government and custom collaborate in creating a harmonious life. Religion teaches someone to believe in Almighty God, the government teaches someone to obey the laws and regulations that apply, and custom teaches someone to be a civilized and cultured human being.

In the end customary institutions are formed by ethnic groups as an effort to protect the needs of development, preservation, and empowerment of customs in the community. It aims to strengthen ethnic identity and enrich the culture of the community and empower community in supporting the implementation of governance at the local, national and global scale. From a global perspective, it can be concluded that the existence of a customary institution is a forum to help smooth the wheels of government, implement development while taking into account the interests of local customary law, and foster good national stability, and create an atmosphere that can guarantee the preservation of

indigenous peoples diversity in order to strengthen unity and integrity of nation in Republic of Indonesia.

2. Implementation of Global-Based Local Wisdom Education in Institutional and Local Wisdom of Culture in North Sumatera Course

Based on KKNI curriculum that applies to students of 2017, where the assignment system consists of six tasks, it can be seen that the students' enthusiasm is high in understanding the material and study material in Institutional and Local Wisdom of Culture In North Sumatera courses. Students are trained to develop the ability to do research by going directly to the field. The students use various data collection techniques which are typical of anthropology. They learned to find and inventory various forms of local cultural wisdom in North Sumatra.

But not only just finding and inventorying, students are trained in the ability of global insight to connect the meaning of a local wisdom to another by linking it to a universal global perspective. Various concepts and theories become a link from the meaning. For example, the local wisdom of Marsiadapari in Batak ethnicity shows the spirit of cooperation and / or mutual cooperation in planting rice in the rice fields. This means that work will be more easily and quickly resolved when done together. On the other hand it can be related to ecological studies, especially if the community has habits or patterns of behavior that are useful for the conservation of the physical natural environment, not only in plants, but also in animals. Students learn to relate the concept to universal theories such as the theory of environmental determinism which revealed by Donald L. Hadisty that environmental determinism plays a dominant role as a form of personality, moral, cultural, political, and religious person. The theory also shows the stronger cultural practices created by society because the strong domination of environment encourages humans to develop rites that contain a chain of natural movement relationships with supernatural / mythical forces. Myth in this case provides direction and guidance so that humans behave wiser.

3. The Role of Lecturers in Creating an Attractive Learning Atmosphere through the Implementation of Global-Based Local Wisdom Learning Models

Interesting learning is learning that can increase students' interest and motivation when they learn the course. Moreover, lecturers have a task which is not easy to make learning refers to the development of revolution 4.0. The tendency that occurs on the student side is that courses will be popular and understood when the lecturer can convey the teaching well, interesting, and fun.

The Institutional and Local Wisdom Of Culture In North Sumatera course was generally empowered by four different lecturers. Nevertheless, each lecturer has learning techniques and strategies that can make students understand and like the subject. The expected orientation is actually not on whether the course is liked or not, but



whether learning can be understood by students or vice versa. Facts on the ground show that from the results of student assignments and assessments, a global knowledge-based learning model that is global in perspective can be applied to increase students' interest in learning and exploring various cultures in North Sumatra and linking them to global reality. Students become trained to find a variety of local wisdom in the community directly, not just searches from various literary materials and websites. The tendency of copy paste culture is at least reduced, because students must reveal some information based on facts and data in the field.

Lecturers' involvement in the field becomes a benchmark for the smooth running of a study. Often students experience data shallowness problems due to weak probing. Moreover, this course is in the second semester, where students still do not understand the research strategy in the field well. In addition, data analysis techniques with ethnography certainly require researchers to be able to carry out research with data collection techniques in the form of observation and indepth interviews. Therefore, the guidance of lecturers in the field and in the classroom becomes the main reference for the implementation of a mini research.

4. Learning Outcomes and Outputs Gained

The learning outcomes of North Institutional and Local Wisdom of Culture in North Sumatera course showed that of the total students of 2017, there were 92 people, the highest GPA was at 3.83, the average GPA was 3.32, and the lowest GPA was 2.68. Based on the values of Institutional and Local Wisdom Of Culture In North Sumatera courses, there were 46.7% of students gaining A, 52, 1% of students getting B, and 0.01% of students getting E. The data showed that students could understand learning well. Coupled with the varied assignment results due to KKNI assignments, students were distributed to various research areas so that the field data had been collected even though not in depth.

The output obtained from the course is the collection of six assignments. The first assignment is a routine assignment. Students can gather various kinds of local ethnic wisdom in North Sumatra. Students are able to find various concepts of local wisdom which are not in accordance with the times or the spirit of globalization. The students record local institutions and wisdom which have been or are threatened to disappear and their causes, and students trace the forms of local institutions that still exist in Indonesia from various literatures. The assignment trains students to be able to explore cultural diversity in Indonesia in general and North Sumatra in particular.

The second assignment is critical book review task. Trained students find, read, and criticize the contents of books relating to ethnic institutions and local wisdom in Indonesia by linking to a global perspective. Some of the books criticized are *Danau Toba* by Andrew Causey, *Menggali Nilai Budaya Tradisi Lisan dari Papua* by Titus Pekel & Natalia, *Kearifan Lokal Masatua dan Kaitannya*

dengan Pendidikan Karakter Bangsa di Kabupaten Karangasem, Bali by I Made Satyananda, etc.

The third assignment is critical journal review. The ability of students is increasingly honed by the search for various journals related to local wisdom. Students download it from various official sites both managed by the government, universities, and various other institutions. Then pair them with global perspectives and insights. In addition, students are trained in using and understanding English, because the journals assigned are also in English.

The fourth assignment is mini research. The ability of students to communicate socially in the community is trained. In addition, his ability to collaborate with the team is also increasingly honed. The assignment is not just to increase student intellectuality, but at the same time to exaggerate his attitude, morals and personality in society. Mini research is divided based on the types of local wisdom that is tangible and intangible. Students browse various cultural sites such as the Old Mosque building in Gg. Bengkok, Al Mashun Grand Mosque, Tjong A Fie Mansion, Maimun Palace, East Mountain Vihara, Shri Mariamman Temple, Cathedral of Santa Maria, Green Princess Bathing Sites, and various traditional houses ethnicity in North Sumatra. In addition, students also explore various wisdoms based on nature in general, forests, rivers, mountains, hills, valleys, forest wild animals, and spirits. The division of region further broadens students' insight in understanding the local wisdom of North Sumatra culture.

The fifth assignment is engineering ideas. The task is given based on direct observation of students in the field. Assignments given by lecturers are generally oriented towards problems and threats of fading cultural values. Among these tasks are the role of traditional institutions in solving global problems, the urgency of local wisdom with the times, the role of traditional institutions in the preservation of local wisdom, local wisdom in managing rice fields / fields / gardens/forests, the influence of local wisdom with the progress of the nation, and so on.

The last assignment is project. Among the four lecturers, project assignments were generally different. The task can be in the form of making documentary films about the local wisdom of researched people culture. In addition, the students can also make a model or poster of the findings in the field, local seminars attended by other students, and workbooks from one class that contained local cultural wisdom of North Sumatra society.

IV. CONCLUSION

The implementation of global knowledge of Institutional and Local Wisdom of Culture in North Sumatera courses at FIS Unimed is basically in line with the spirit of industrial revolution era 4.0. Students are provided with basic skills which are not only intellectually charged, but also interpersonal and social. Even though the development of the times requires its people to move fast, but people in this case students must be able to



balance their global and local life. The ability to think globally, act locally is certainly an effective way for students to preserve their culture while keeping abreast of the times that are in accordance with the values, norms and morals of the nation. Therefore, the strengthening of implementation of this global insightful local wisdom education is important to be applied to this course so an increasingly complex understanding in thinking of Indonesian generation can be released.

REFERENCES

- [1] I. . Gobyah, "Berpijak pada Kearifan Lokal," balipos, 2003. .
- [2] C. Geertz, Local Knowledge: Further Essays in Interpretive Anthropology. New York: Basic Books, Inc, 1983.
- [3] J. Purba, Pengelolaan Lingkungan Sosial, Kantor Menteri Negara Lingkungan Hidup. Jakarta: Yayasan Obor Indonesia, 2005.
- [4] Arkanudin, Sistem Perladangan dan Kearifan Tradisional Orang Dayak dalam Mengelola Sumber Daya Hutan. Bandung: Pascasarjana Universitas Padjadjaran, 2001.
- [5] N. A. Ridwan, "Landasan Keilmuan Kearifan Lokal," J. Stud. Islam dan Budaya, vol. 5, no. 1, pp. 1–8, 2007.
- [6] Bathlimus, Kearifan Lokal dalam Pengelolaan Sumber Kelautan di Kabupaten Aceh Besar. Banda Aceh: Suwa-BPSNT, 2007.
- [7] N. Wijana, "Pengaruh Pengintegrasian Pendidikan Karakter Berorientasi Kearifan Lokal Ke Dalam Materi Ajar Mata Kuliah Ilmu Lingkungan Untuk Meningkatkan Soft Skill Mahasiswa Jurusan Pendidikan Biologi Fmipa Undiksha," JPI (Jurnal Pendidik. Indones., vol. 4, no. 2, pp. 647–657, 2015.
- [8] R. M. B. Eddy Noviana, "1 Implementasi Bahan Ajar Berbasis Kearifan Lokal, Pendidikan IPS SD Eddy Noviana, Rifka Mahira Bakri," I Implementasi Bahan Ajar Berbas. Kearifan Lokal, Pendidik. IPS SD Eddy Noviana, Rifka Mahira Bakri J. Prim. Progr. Stud. Pendidik. Guru Sekol. Dasar Fak. Kegur. dan Ilmu Pendidik. Univ. Riau, vol. 4, no. April, pp. 1–11, 2015.
- [9] R. M. B. Eddy Naviana, Erlisnawati, "Pola Pembelajaran Pendidikan IPS Berbasis Kearifan Lokal, Sekolah Dasar," *Primari Prodi PGSD FKIP*, vol. 3, no. April, pp. 15–22, 2014.
- [10] M. Nurtanto and S. D. Ramdani, "VOLT Jurnal Ilmiah Pendidikan Teknik Elektro MENYIAPKAN PENDIDIKAN KEJURUAN BERBASIS KEARIFAN LOKAL YANG BERDAYA SAING," vol. 1, no. 1, pp. 59–66, 2016.
- [11] I. W. Rasna, D. K. Tantra, and N. M. R. Wisudariani, "Harmonisasi Kearifan Lokal Nusantara dan Bali untuk Pendidikan Karakter di Sekolah Dasar: Sebuah Analisis Etno-Pedagogi," *J. Kaji. Bali*, vol. 06, no. April, pp. 275–290, 2016.
- [12] Z. Antosa, "Pendekatan Kearifan Lokal untuk Meningkatkan Kemampuan Apresiasi Seni Mahasiswa Pendidikan Guru Sekolah Dasar FKIP Universitas Riau," J. Prim. Progr. Stud. Pendidik. Guru Sekol. Dasar Fak. Kegur. dan Ilmu Pendidik. Univ. Riau, vol. 3, no. 2, pp. 85–96, 2014.
- [13] S. Budiwibowo, "Membangun Pendidikan Karakter Generasi Muda Melalui Budaya Kearifan Lokal Di Era Global," *Prem. Educ. J. Pendidik. Dasar dan Pembelajaran*, vol. 3, no. 01, pp. 39–49, 2016.
- [14] U. Fajarini, "Peranan Kearifan Lokal Dalam Pendidikan Karakter," SOSIO Didakt. Soc. Sci. Educ. J., vol. 1, no. 2, 2014.
- [15] Iskandar, Metodologi Penelitian Kualitatif. Jakarta: Gaung Persada Press, 2009.
- [16] D. Meltzer, "The relationship between mathematics preparation and conceptual learning gains in physics: A possible 'hidden variable' in diagnostic pretest scores," Am. J. Phys., vol. 70, no. 12, 2002.