

THE INFUSION OF BIOTECHNOLOGY INTO LOCAL-BASED CURRICULUM OF ACEH

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1. Rationale

Aceh is rich in natural resources. This richness can be in terms of quantity and diversity (Qanun 21, 2002). To put in another way, it exists in a large amount of natural resources and in a wide variety of kinds. The richness and diversity of resources are actually uncountable blessings for the Acehnese if they could be developed as wisely as possible. However, unfortunately, until the present the existing resources have not been managed and developed properly for increasing the prosperity of the people.

Accordingly, in order to take the most advantages of these resources without damaging the nature itself, we certainly need to develop and manage them in a proper manner (Qanun 21, 2002). Again for this purpose, the nature itself provides a comprehensive solution. It is left to the people whether they can develop these resources properly or not. Since Aceh is situated at such geographical position; it is very prospective for the development of all these resources. Its geographical structure makes it possible to be a developed farmland besides the amount of rainfall is ranging from 2000-3000 mm per year. Such climate is suitable for the agriculture development and plantation. Furthermore, Aceh has also rich potentials for the development of marine resources.

To sum up, instead of being exploited unwisely, these resources rather need to be managed and developed appropriately so that we all can take benefit from the existing potentials and maintain their existence for future generation as well. In order to be able to manage and develop all these resources properly, certainly we need the appropriate technology. Biotechnology is one of the technologies which is seen environmental-friendly and prospective. **Thus, the** need to develop human resources in this field **is the** most important of all. For this purposes, we need to introduce biotechnology in the school curriculum of Aceh.

2. Current Conditions of Aceh Education

The goal of Acehnese education is "*usaha sadar dan terencana untuk mewujudkan suasana belajar dan proses pembelajaran agar peserta didik secara aktif mengembangkan potensi dirinya untuk memiliki kekuatan spiritual keagamaan, pengendalian diri, kepribadian, kecerdasan, akhlak mulia, serta keterampilan yang diperlukan dirinya, masyarakat, bangsa dan negara*" (UU Sisdiknas no. 20, 2003). Literally it means education is the conscious and well-planned effort to realize the desired learning atmosphere and learning process in so that students can actively develop their potentials so as to attain the religious spiritual strength, self-control, desired personality, aptitude, virtuous behaviour, and skills required for themselves, society, nation and country.

As we discussed above, we can see that, ideally, after someone experiences education, he/she is supposed to have certain skills. By having the required skills, he/she will be able to develop the existing resources. In the end, it is expected that they can bring in the benefit and the prosperity for all.

In reality, until recently the educational conditions of Aceh have some improvements, thus, more or less it offer contributions to the society. In isolated cases, there are students who completed 12 years education without obtaining the desired skills from education itself.

Various efforts to improve the quality of education have been being attempted by the Education Office of Aceh. One of them, for instance, is by requiring the teacher candidates to learn in Malaysia. According to the Deputy Head of Education of Aceh, Anas M. Adam as cited by *Serambi Indonesia* (16 January, 2006), it can boost the quality of Aceh education. He adds that the teacher candidates are recruited from the graduates of education faculty and also the graduates of other various disciplines like Natural Science and Mathematics, Engineering, Agriculture and Veterinary. It is expected that through this effort it will improve the quality of education. They will be trained mathematics, physics, chemistry and biology.

The initiative above underlies two common senses. One is that the recruited teacher candidates are highly qualified since they are of various disciplines. And the other is that Malaysia has become the proper model for Aceh education. Hence, any educational research done in Malaysia may, to some certain extent, be applicable in Aceh too.

For the time being, it is likely that the weaknesses are due to the existing educational system which is characterized to be too general. Thus, in the future the education of Aceh should be shaped into a vocational system. Or even, if possible, there should be a specific subject adapted to comply with the specific potentials of each district or school-based curriculum. Such school is viewed to be able to bring about the desired human resources for the future development of Aceh.

3. A Glance at Biotechnology

Merriam-Webster Online Dictionary (2006) defined biotechnology as “the manipulation (as through genetic engineering) of living organisms or their components to produce useful usually commercial products (as pest resistant crops, new bacterial strains, or novel pharmaceuticals); *also*: any of various applications of biological science used in such manipulation.”

Wikipedia (2006) defined biotechnology is as a technology that is based on biology, especially when used in agriculture, food science, and medicine. While in the UN Convention on Biological Diversity, has come up with various definitions of biotechnology, such as, any technological application that uses biological systems, living organisms, or derivatives thereof, to make or modify products or processes for specific use; biotechnology can also be defined as the manipulation of organisms to do practical things and to provide useful products.

Goenadi dan Isroi (2003) defined biotechnology as integrating natural sciences and engineering science that aims to improve the application of life organism, cell, part of living organism, and molecular analogue in order to produce products and service. For them, biotechnology is a method that offers a chance of breakthrough in solving problems encountered in technical culture of crops and health, which cannot be solved with other methods or too costly or requires lengthy of time with conventional technology.

Based on the above definitions, to some extent we can say that biotechnology has long been recognized by early cultures. Long time ago, people have known that organic waste will naturally go through the process of decomposing and in the end it will turn back into soil. In fact, at that time, biotechnology had not yet been introduced as a discipline. Later, after the modern microbiology was introduced, then it was understood that this process is related to bacteria.

Since early cultures, agriculture has become a dominant way of producing the supply of food for mankind. As the time goes by, the simple biotechnology started to be applied in agriculture in order to process the crops for producing sufficient food. Formerly, the method of biotechnology applied by farmer was in the selection of high quality seed in order to produce adequate food products. Gradually, they also recognized that there are certain organisms that can be used for fertilizing soil, returning nitrogen, and even controlling the pest. Even to a certain extent, early farmers have amazingly been able to alter seed genetic by doing environmental exchange and crossed breeding.

It indicates that biotechnology has long been applied to support human life. It also denotes that it is a very promising way for the improvement of productivity of agriculture, plantation and fishery. Biotechnology can also overcome agricultural problems such as extending the level of crop tolerance to drought and disease pest.

In addition to the agricultural purposes, it is also applicable in health and medicine. With biotechnology, it is also likely to improve the quality of nutrition for human beings. Moreover, people have recognized that there are some types of medicine and vaccine that are made of the combination of various plants. According to Goenadi and Isroi (2003), in medical application, certain vaccines can be made of the weakened viruses and bacteria.

From the definition and the description of its simple application by the early culture above, the Acehnese people actually have also recognized and applied the biotechnology since long time ago. For instance, in the process of preserving fish, the Acehnese have traditionally used it in making what is so-called '*engkoet keumamah*' (hardened fish), in other kind of food such as the process of making '*pliek u*' (a cuisine produced through fermented coconut), and in other products like tape, terasi, tempe, and kecap. Thus, for the Acehnese, biotechnology is not new, even it has become inherited culture. So, why don't we start education from here? As a matter of fact, one of the functions of education is to inherit and conserve the existing culture of a society.

Related to the future needs and demands, Tatang (*Serambi Indonesia*, 18 November 2006) states that due to its wide farmland, Aceh is very potential to develop biodiesel and bioetanol. Thus, he encouraged the local government of Aceh to concentrate on this.

Based on the report of Asian Development Bank (2001), the development of biotechnology will bring in the beneficial advantage in increasing the food products and reducing the poverty. However, every technology brings in itself various risks, and so does biotechnology. Thus, in to obtain the desired benefits and reduce the unexpected risks, it has to be conducted and managed in an appropriate manner. Therefore, in order to be able to do it properly, it has to be introduced earlier in education.

4. The Infusion of Biotechnology into Curriculum

4.1 Definition of the curriculum

Tyler (1949) suggested that the ideal objective of education is "a process of changing the behaviour patterns of people" (p. 5). Doll (1996) defined curriculum as "the formal and informal content and process by which learners gain knowledge and understanding, develop skills, and alter attitudes, appreciations, and values under the auspices of that school" (p. 15).

Good (1959 as cited by Narongraksakhet, 2002, p. 44) identified curriculum as "a general over-all plan of the content or specific materials of instruction that the school should offer the student by way of qualifying him for graduation or certification or for entrance into a professional or vocational field."

Based on these definitions, this study attempts to develop a skill-based curriculum to fulfil the needs of the local development.

4.2 A Study in Malaysia

At present, biotechnology seems to be put in two paradoxical positions. On the one hand, it is seen as exclusive and complicated, which can only be taught at the university level. On the other hand, it is viewed as holding primary role for the future of Malaysia. While considering the importance of biotechnology for the future development, we believe it should be introduced at high school level. While with regard to its exclusiveness and complicatedness, according Bruner, an expert of education in the field of the structure of discipline (cited in Nicholls & Nicholls, 1978) stated that if a discipline is taught based on its structure, it can be introduced at any level, even to a small child.

Based on this view, we have recently conducted a research regarding the possibility of the inclusion of biotechnology into the high school curriculum in Malaysia. In this research, we applied Delphi method, which was first developed by Abraham Kaplan at the RAND Corporation in 1950s (Saedah Siraj, 2006). Saedah Siraj (2006) asserts that this method is very appropriate to be used in the determination of policy direction, decision making and planning. This method operates on the basis of gathering of the experts' opinions in the related field. When all experts' opinions have come to a consensus, it can be made as a prospective decision or policy.

After we analyzed all the data, experts have obviously come to a conclusion that the infusion of Biotechnology into the school curriculum is very possible. They have agreed that biotechnology can be taught at secondary school level. As suggested by the experts in this field, we conclude that the biotechnology should be incorporated into the secondary school curriculum in Malaysia.

Regarding the possible future areas in biotechnology, the experts convincingly agreed that agriculture, animals and molecule biotech should be included in curriculum. Some experts also suggested including marine and aquaculture biotechnology and also industrial biotech.

Above all, even though this study was done in Malaysia, it can be applied in the future curriculum of Aceh education since the natural condition of Aceh is more or less similar to that of Malaysia. Besides, the fact that the teacher candidates are required to Malaysia denotes that there is a similarity in educational needs between Aceh and Malaysia.

4.3 Current Issues Concerning Aceh Education

Moreover, this can be a feasible alternative to respond to the comments by the Governor of Aceh, Mustafa Abubakar. He said that the future development of Aceh education should not only focus on the reconstruction and rehabilitation of the damaged building but also the development of new paradigm for the educational system of Aceh (*Serambi Indonesia*, 4 September, 2006).

In addition, the Head of the Education Office of Aceh, Teuku Alamsyah Banta, had also pointed out that in order to overcome the over-unemployment of the graduates in the coming year of 2020, the education model in Nanggroe Aceh Darussalam has to be reshaped from general schools to vocational schools (*Serambi Indonesia*, 24 Jun, 2006).

Furthermore, according to Paul A. Hanle, the President of the Biotechnology Institute of Arlington, the inclusion of biotechnology into curriculum will have a large-scale impact toward the nation. Again, Scott May, the Vice-President for Systems and Curriculum of the Biotechnology Institute, states that the introduction of biotechnology into school curriculum will achieve scientific knowledge of biotechnology for all students and improve workforce readiness in this dynamic sector of economy (Biotechnology Institute Newsroom, 2006).

This institution has started a new initiative to promote interest in biotechnology education at the school system level and encourage the infusion of biotechnology into school system standards and curriculum as well as teacher professional development and

assessment. Similarly, In order to achieve scientific knowledge of biotechnology and to improve workforce readiness, Aceh can also initiate such program. Aceh has an abundant amount of various natural resources. Indeed at present, Aceh has already had some experts in this field. Thus, all we need is to educate more people who have expertise in this area. And the knowledge about biotechnology should be introduced earlier in the school curriculum.

5. Conclusion and Suggestion

5.1 Conclusion

Ideally, in order to be able to develop the existing natural resources, the education of Aceh should be directed towards natural resources development. From various perspectives of the experts, inclusion of biotechnology into high school curriculum in Aceh is very conducive, reasonable, and urgent. This is of vital importance so that all natural resources can be managed and developed wisely in 10 to 15 years ahead.

Next, we should better see a view of Kenneth T. Henson. Henson (2001, p. 287) implies that school is an agent of change. Therefore, there is a dynamic cycle in education, that is, education brings about the changes in a society and society makes the changes in education.

5.2 Suggestions

Firstly, to support this program, we would like to suggest that Aceh should establish an integrated research and development centre, and it is a strategic research institute for the development of education and natural resources. This institution will continuously carry out the integral researches in both education and other fields.

Secondly, the model of Aceh education should be redirected from general schools to vocational schools. Vocational school will provide more learning opportunities in developing the required skilful human resources.

Finally, to prepare the future human resources, Aceh should develop skill-based curriculum. As stated by Henson that by having a required skill, a graduate can participate in the society. This will be a preemptive solution to the problems about over-unemployment that is likely to happen in the year 2020.

References

- Aceh.Net. (2006). *Investment opportunities in Aceh*. Retrieved on 22 November, 2006, from: [http:// www.aceh.net/investment.html](http://www.aceh.net/investment.html)
- Asian Development Bank. (2001). *Agricultural biotechnology, poverty reduction, and food security*. Retrieved on 28th October, 2006, from http://www.adb.org/Documents/Books/Agri_Biotech/default.asp
- Biotechnology Institute Newsroom. (2006, January 5). *Infusing biotechnology into school system standards and curriculum*. Retrieved on 5th October 2006, from http://www.biotechinstitute.org/news/news_detail.php?news_id=28
- Doll, R. C. (1996). *Curriculum improvement: Decision making and process*. Boston, MA: Allyn.
- Goenadi, D. H., & Isroi (2003). *Aplikasi biotechnology dalam upaya peningkatan efisiensi agribisnis yang berkelanjutan*. Retrieved on 22nd November 2006, from http://www.ipard.com/art_perkebun/dhg1.asp

- Henson, K. T. (2001). *Curriculum planning: Integrating multiculturalism, constructivism, and education reform*. New York: McGraw-Hill.
- Narongraksakhet, I. (2002). *Developing local-based curriculum guidelines for Islamic private schools in Southern Thailand*. Unpublished Doctoral Dissertation, University of Malaya, Kuala Lumpur.
- Nicholls, A., & Nicholls, S. H., (1978). *Developing a curriculum: A practical guide*. Boston, MA: George Allen.
- Qanun provinsi NAD 21. (2002). *Pengelolaan sumber daya alam*. Retrieved on 28th October 2006, from: http://www.dephut.go.id/INFORMASI/pp/aceh/j_qanun21.htm
- Saedah Siraj (2006). *Kurikulum masa depan*. Kuala Lumpur: Penerbitan Universiti Malaya [in printing proses].
- Saedah Siraj (2001). *Perkembangan kurikulum: Teori dan amalan* (Cet. 2). Selangor: Alam Pintar.
- Saedah Siraj (1999). Kurikulum ke arah pembentukan golongan pemikir, perekacipta dan profesional. *Jurnal Kurikulum*, 1(2), 42-56. Dimuat turun 13 Mac, 2006, daripada http://www.ppk.kpm.my/html/edu%20resource/edu/bit9_siri2.htm.
- Saedah Siraj, & Faridah Abdullah (2005). Jangkaan masa depan terhadap aplikasi teknologi dalam kandungan kurikulum dan penilaian sekolah menengah: Satu kajian Delphi. *Jurnal Pendidikan, Journal of Educational Research*, 2005, 5-26.
- Saedah Siraj, & Mohd. Paris bin Saleh (2003). Aplikasi teknologi dalam pengajaran dan pembelajaran peringkat sekolah menengah: Jangkaan masa depan. *Jurnal Pendidikan, Journal of Educational Research*, 23, 123-139.
- Serambi Indonesia. (2006, 18 November). *Aceh potensial kembangkan biodiesel*. Retrieved on 28th October 2006, from <http://www.serambinews.com/index.php?aksi=bacaberita&rubrik=2&topik=13&beritaid=18274>
- Serambi Indonesia. (2006, 4 September). *Pembangunan bidang pendidikan tidak sebatas rehabilitasi-rekonstruksi sekolah*. Retrieved on 28th October 2006, from <http://www.serambinews.com/index.php?aksi=bacaberita&rubrik=2&topik=13&beritaid=20128>
- Serambi Indonesia. (2006, 24 Jun). *Pola pendidikan Aceh harus dialihkan ke SMK*. [Online] <http://www.serambinews.com/index.php?aksi=bacaberita&rubrik=2&topik=13&beritaid=18274>
- Tyler, R. W. (1949). *Basic principles of curriculum and instruction*. Chicago, IL: The University of Chicago Press.
- Wikipedia. (2006). Biotechnology. Retrieved on 5th October 2006, from <http://en.wikipedia.org/wiki/Biotechnology>