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Articulation of the Working Experience with Undergraduate Curriculum in Industrial Automation Engineering Technology through APEL

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Abstract: Accredition of Prior Experiential Learning (APEL) encourage students to continuously improved their skills and knowledge through a structured education and training, geared towards formal qualifications and better employment outcomes. This study aimed to explore the experience and routine on office work of technicians on the appropriateness of design equalization process experience in the field of Industrial Automation Engineering Technology to higher education through APEL and to gain feedback from participants on their intentions to pursue their studies to a higher level.

Key words: Equivalence, experience, curriculum, Accredition of Prior Experential Learning (APEL), intentions

INTRODUCTION

The National Higher Education Strategic Plan (NHESP) was tabled by Ministry of Higher Education Malaysia (2007) and outlined 7 thrust to transform the higher education in Malaysia with the period of 2007 till 2020. The sixth thrust specifically emphasising on lifelong learning enculturation and to achieve the transformation of higher education in Malaysia. This transformation can be done through recognition of lifelong learning via Malaysian Qualification Framework (MQF), recognition of prior learning experience, increase participation of lifelong learning by adults and alternative pathways and programme mobility. One of the elements to transformed the non-formal education is done through Accreditation of Prior Experiential Learning (APEL). The APEL strategy was then will be widened to spur the growth of lifelong learning in Malaysia. The term APEL refers to systematic process of identification, documentation and learning assessment based on prior working experience. The chances to pursue studies to a higher level for those who have broad working experience but not gaining formal education or certification was promoted through APEL strategies. Generally, APEL assessment includes the evaluation of knowledge attainment from individual through his formal education or prior working experience Mohamad (2002) suggested that experience while working is equivalent to those who study in formal ways in university. He further adds about the need to decide one specific system for skilled worker with vast experience to be accepted in enrolling their education to another extension level.

Similarly, Yunos *et al.* (2013) stated the need to accredited the worker with appropriate skills without academic qualification is crucial for them to join the teachers training in Technical and Vocational stream in university based on the demand. However, there is no strategies formulated until today to grant those who have appropriate skills and experience with formal accreditation and based on prior experience (APEL) in teacher training (Fig. 1).

Kaprawi (2011) in her speech of "Syarahan Perdana UTHM" first edition highlighted about non-existence of well-developed systems to recognize the experience and skills of those who work and equalize it with higher education institution syllabus. In regards the existence of such credit accreditation and all the experience that this worker had will be recognize and benefited them for their personal career path. In relations, Murphy (2007) argued that the assessment of learning based on working experience is tough to be handled since the need to prove learning and experience is two conceptual things with different procedure. Prior to this issue, focused of this study was made to give attention on the process of the course equivalence in university with the working experience in Industrial Automation Technology Engineering with the basis of Accreditation of Prior Experiential Learning (APEL) Malaysia. This

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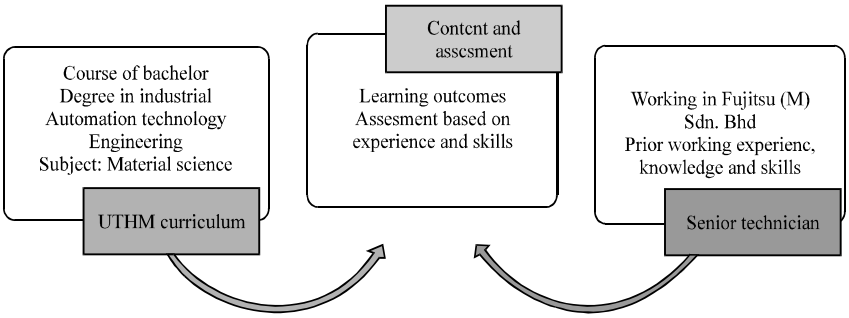

Fig. 1: Study design adapted from oldenburg accreditation Model (Muskens, 2006)

study aimed to explore the working experience and also their routine for the appropriateness in technician post to design the equivalence process of experience in Industrial Automation Technology Engineering to Higher Education level through APEL and to gain feedback on their intentions to pursue their education to the higher level. This study has outlined several objectives as follows:

- To explore the possessed experience and working routines for the technician post that can be equalized with the program of Bachelor Degree in Industrial Automation Technology Engineering
- To design the equivalence of experience possessed with working routines and curriculum of Industrial Automation Technology Engineering
- To identify the feedback of participants for their intentions to pursue study based on the findings of second research question

Accredition of Prior Experential Learning (APEL)

Introduction of Accredition of Prior Experential Learning (APEL): Accreditation of Prior Experiential Learning (APEL) is the process of enabling the individual to gain credit from their informal learning. According to Kaprawi (2011), APEL is one forms of evaluation means for students to get the recognition for their knowledge, skills and self-efficacy based on their prior experience learning. In addition, prior experiential learning is the knowledge, skills or attitude that was gained before and it covers the possessed prior experience.

MQF defines APEL as systematic process that involved identification, documentation and assessment on learning based on prior experience for credit exemption. The difference between Accreditation of Prior Experiential Learning (APEL) and Recognition of Prior Learning (RPL) is the APEL systems has more focused on the prior experiential learning (Kaprawi, 2011). In addition, Corradi holds the view that APEL can be referred as confirmation and it comprise the element of evaluation, accreditation and it is suit with learning qualification. The credit will be granted based on the fundamental of knowledge that individual have and also their experience.

As a conclusion the term of APEL are different in various countries and it was used in its broadest sense to refer to the activities of accreditation and evaluation based on prior experiential learning and based on context. The terms include Accreditation of Prior Learning (United Kingdom), Recognition of Prior Learning (Australia, South Africa, Scotland and Ireland), Recognition of Current Competency (New Zealand), Prior Learning Assessment and Recognition (Canada) and Prior Learning Assessment (America). All this definition involved the perception that prior experiential learning has to be recognized without weighing where and how it was gain as long as the learning is relevance in contributing to the competency of the subject or the program course.

MATERIALS AND METHODS

The research design for this study was based on the qualitative approach. The exploration inquiry with the interview and document analysis was utilized in gathering the data. This type of data collection was conducted to explore the experience and the working routines for the appropriate technician post to design the process of equivalence in experience of Industrial Automation Technology Engineering to the higher level through APEL.

Population and sample: This study was conducted in Fujitsu Component (M) Sdn. Bhd which located in industrial area Parit Raja, Batu Pahat and Johor. The sampling strategy employed in this study are purposeful sampling in which the chosen participant can best answer the needs of this study. The purposive sampling is selected because the criteria has been set to get the desired response. Researcher decided to use this

Table 1: Mapping of working routines and experience of a senior technician with curriculum of bachelor degree in industrial automation technology engineering

Working routines, experience of senior technician Fujitsu Component (M) Sdn. Bhd	Material science	Electrica principles I	Electrical principles II	Electrical principles lab	Electronic principles	Instrumentation and control	Electric power system	Electronic comm system
Sarjana Muda Teknologi Kejuruteraan AutomasiIndustri (UTHM)								
Handling Machines input/output	xx			x				
Fix faulty from machines assembled	x					x		
Fundamental knowledge on handled machines	x	x			xx			
Handle the operation of machines with other related machines						x		xxx
Power supply wiring		x	x	xx			xx	
Handling machines in a right way				x		xx		x
Σ	4	2	1	4	2	4	2	4

sampling because the participant is very limited in number and it only involved the senior technician. There are 3 participant for this study that represented the population of senior technician in Fujitsu Component (M) Sdn. Bhd. The following criterion has been outlined such as:

- Malaysian citizen
- Certificate/diploma holder in the specific area
- Hold the post of senior technician
- Working experience must be 3 year and above in the mentioned field

Instrument of data collection: The approach to data collection is through interview using interview protocol. Interview was done to get better pictures of how this senior technician works on the basis of their experience and working routines. The participants was interviewed through semi-structured interview. In addition, to better illustrate the scope of work and the experience of the senior technicians in Fujitsu, along with the curriculum of Bachelor Degree in Industrial Automation Technology Engineering of UTHM the mapping of equivalence process was employed. The design of equivalence mapping was built to get the percentage between the two elements and the design was solely structured based on the model (Muskens, 2006).

Data analysis: Data collection process was conducted through researching, investigating, checking, analysing and scrutinising towards the related written subject. Researcher had filter the data to simplify the information gathered and only the most crucial will be used in the study. All the data will go through a segregation parts in which classified into different files and was save in Microsoft Word 2010 format. The file that went through this process were named based on titles to enable researcher locate the files or information in the most convenient ways. The transcription mapping was done for the leeway on the calculation of percentage for the credit transfer of the indivuals. Using examples from Giorgi (1975), Kvale and Brinkmann (2009), reseachers adopted five steps for analysing interview using a phenomenological tradition:

Table 2: Comparison for total credit exemption

Participants	PK1	PK2	PK3
Potential for credit exemption on general core course (A)	7	7	5
Potential credit exemption on discipline core course (B)	37	31	40
Industrial training (C)	12	12	12
Total of potential on credit exemption (A+B+C = ΣD)	56	50	57
Cumpolsory credit (107-ΣD)+21	72	78	71

- Read through the whole interview to get a sense of the whole
- The researcher determines the natural meaning units
- The natural meaning unit is restated as simply as possible
- Interrogating the meaning units in terms of the specific purpose of the study
- Essential non-redundant themes of the entire interview are tied together into descriptive statement (Table 1)

After the mapping process between curriculum ofIndustrial Automation Technology Engineering of UTHM with working routines and also the experience the percentage that can gain credit exemption can be calculated. Prior to this, MQA has outlined the credit transfer for some modules where it should at least achieved 80percent from the course that they wish to get exemption. Therefore, to transfer the credit the individuals should possessed equal experience and working routines that covers 80% from the learning outcomes of the modules. The 'x' value in the box represents 25%. Hence, to get the credit transfer, individuals should gain four 'x' values as outlined by MQA. If in any case the modules reach 80% of working routines and experience the individuals have the bigger potential to get credit exemption for those modules. Table 2 indicate the equivalence methods in this study.

RESULTS AND DISCUSSION

Findings of this study indicated the years of exprience by each participant in which first participant (PK1) obtained 23 year of working experience the second participant (PK2) have 9 year working experience and the third participant (PK3) with 11 year working experience. All the three participants are male and they have different educational background like certificate and diploma.

The equivalence of experience and working routines of technician: The themes were categorised based on eight learning outcomes domain listed by Malaysian Qualification Frameworks (MQF) including knowledge, technical skills, communication skills, problem solving skills, team skills, lifelong learning, attitude and professionalism and leadership skills. The themes aid in the process of mapping the equivalence between working experience and the curriculum of Industrial Automation Technology Engineering of UTHM. The entire theme has been analysed based on the sub topic as follows.

Knowledge: This theme was named as 'knowledge' based on the application and exercise of related knowledge on technology and the fundamental of engineeering in the working routines and also the experience held by participants. The operation of machines and working routines are much easier when the participants have the knowledge and it help participants in a way that both sync with how they should do it and how it supposed to be done. The second participant mentioned about how the knowledge he had can be used in solving problems as well to do both working routines and solving problems simultaneously. In relations the basis of the knowledge that participant held can be used into the situation where they can practice to tolerated and handle the problems that occured. This is certainty true in the case of pneumatic and hidroulic in which machines does require the right dimension on how to operate it so with the appropriate prior experiental learning, participants can justify the methods or the right systems to aid in that situation. Other than that the knowlege that they possesed can be applied into the prior experiental learning regardless what the field is. This mean the knowledge are closely related with past learning, current learning and future learning.

Technical skills: Another themes revealed is the technical competency in which the first participant (PK1) stated about the chances of learning various specialty is greater by doing different kinds of scope like mechanical, electronic, mechatronics and others. The other way around is happening for those who does not have the related education background as he has to learn the new things for the very first time. However, such things is not an obstacle that blocks ones from his career path and instead it give the advantage for them to mastered different skills in different field. PK1 also mentioned about the probability in getting the different scope or field with the education background is slightly higher when joining the industry. This situation triggered ones to obtained different skills to make his job done in more effective ways. The first start will probably difficult but ones has to step forward with the aims to gain as many skills and knowledge as they could.

Communication skills: PK2 in his response stated about the feedback from customers is one of the effective methods for him in being constructive. The PK2 is someone who had a vast experience in industry thus his replied connotes about the demand of knowledgeable and skilled instructor is highly needed where the teaching about the practicality and technical aspect can be more effective. PK2 in this position was an appointed instructor in Fujitsu Component (M) Sdn. Bhd. PK2 mentioned about the delivery of the knowledge in technical scope whereas it should follow the right process and the right procedure. If such standards were followed then zero defection can be achieved. He further adds, reject items returned from the customer can be reduced. Customers complaint and comment are somehow reflective when they also mentioned about training of workers should be further increased. The problems of this issue can be settle down once they have two ways communication between customer and the production team.

Problem solving skills: On the other hand, PK3 mentioned about the right testing based on right procedure before the problems solving stage take place. Those who are responsible for routines maintenance will inform PK3 and he will later test the mentioned defects items. Step by step procedure will be followed to sense any faulty on the machines. In this situation, the experience that PK3 held can assisted in forecasting the sources of defects. The next step is problem solving for the situation after testing has been made. PK3 also sense the problems that caused defects items. In this context, he analyses the improvement for the machines to produce more quality items with more effective manner. This improvisation process has gone through the programming stage where trouble shooting for machines faulty has been detected. This type of problem solving skill requires different aspect of knowledge in helping him doing the task in more effective ways.

Working in teams: PK1 favor working in teams to create the technical and practical test to overcome the problems of lacking knowledge and skills for machines operation. PK1 in collaboration with Japan engineer, created technical training for technician that was responsible in handling machines. The exchange of ideas and experience between both parties can be sync based on the adjustment of culture and the scope practiced in Fujitsu Malaysia. The ideas can be well generated if the works is done in team. PK2 also joining the technical training even it is design for those who handled the machines. Aspect of training which has been put into prominence includes pneumatic, wiring and testing. The PK2 task is to deliver the knowledge of his specialty even though all the instructors knowledge of expertise are very. Working in teams could derive more supportive environment when they are able to complement each other.

Life long learning: The experience held by PK1 learned from his everyday routines in which he used to prepare documentation for changing the machines. Through discrete and thorough information searching, he can change for a new one based on the concrete reason. The reason is to produce more quality product with effective quantity. PK1 also stated the new knowledge and lifelong learning that he learn in everyday life could help him in his daily working routines as well to handle the machine. All the knowledge he had will then transferred and teach to those who will take over the task on handling machines. In his perspectives, life long learning is not limited to knowledge that was gained through formal classes and instead through environment and observation from the work he has done.

Occupational safety and health of worker: This theme discloses the knowledge that one must gain upon their engagement with Fujitsu (M) Sdn. Bhd. According to PK3 they have to sign up in a compulsory course about safety and health. This course covered the preventions on work-related illness, injury, disability and death. All employees must join this course regardless who they are. This industry dealt with high risk of injury because they have to operate industry machines therefore employees should take a precaution step based on the standard operating procedure and practiced the right ethics of working routines. The implementation of 5S in this organization can ensure the right working procedure for example Sort, Set in order, Shine, Standardize and sustain. This 5S implementation is a type of precaution step that employees must follows. In relations, PK2 mentioned about the responsibility of technician to informed the right person before doing the maintenance.

Leadership skills: In relations with leadership themes, PK2 indicate the course of supervision in which he has to attend. Executive level in this organization was also joining the program. In this supervision course they are trained to have a leadership skills via modules of personal stress coping how to handle lower management people as well how to handle top management. As a leader, these kinds of course are relatively important because it revealed the methods on how to handle both parties. PK2 further adds about his obligations in leading his inferior mates includes oversee the end product, being fair and square in breaking down the task, work execution and deliver his expectation. Leadership skills also play with the words of "communicate well" between each other.

The mapping of working routines and curriculum of industrial automation technology engineering: The exemption of credit transfer are vary among each worker depends on the experience they had even when they have similar working routines and scope of task. The assessment of working experience are based on different aspect as it is not solely gain from industry. In this context the experience of all participants are treated as equally important considering everything they gain from graduation till working. This is where the points will carry different potential of credit exemption among them. Another aspect for the credit exemption is additional tasks in their daily work. As indicated in Table 2, it revealed the comparison of credit to be exempted.

Mapping feedback: As revealed by participants the credit exemption will benefited them in terms of time and cost as it will give them some leeway in further pursuing their study to a higher level. The repetition of learning the same things could be minimized since they are skilled workers and this reduce some tense and boredom. Participant also revealed the rejection to such offer of pursuing study will be a great loss since a great deal of credit transfer will be given. They also informed the educational opportunities to upgrade their qualification is something that one's must have for the sake of learning new knowledge since it is fast track as there are a huge difference in the credit transfer in this APEL programme. PK3 also come to suggest about the credit exemption towards university core subject should be consider because most of them has mastered that modules.

The findings in this study revealed the need of researcher intentions to explore the experience and working routines for appropriate technician post to design the equivalence process in experience in Industrial Automation Technology Engineering, UTHM for a higher

level education through APEL and their intentions to pursue study to a higher level. Malaysia should seriously consider the working experience of individual to spur positive culture on lifelong learning education. In relations, any formal education in university or curriculum design can go through equivalence process (Mohammad, 2002). The researcher problems in this case is to classify the broad range of participants experience whether it's covers the university curriculum. Researcher found out the experienced that they possessed is appropriate and fit with learning outcomes of desired curriculum structure.

This study lies out about the differences of experience and working routines with curriculum of Bachelor Degree in Industrial Automation Technology Engineering, UTHM among individuals. Hence, the implementation of the equivalence process was adapted from Oldenburg Accreditation Models to mapping all the mentioned components (Muskens, 2006). Dealing with the classification process is somehow problematic thus domains that has been outlined by MQF was employed to make task easier especially to classified experience and working routines that fit with all the domain. MQA has set the total value for credit exemption in which it should not exceed than 30% however, for the APEL system, those value are being pondered whether it suit seems the total values gained by all the participants was >30%. According to KUISAS the mechanism for credit transfer and credit exemption can be decided by faculty based on the appropriateness of their experience, working routines and also the related course. In the case of obtaining >30%, senate approval was needed whereby such things can be brought forward by management of university. This includes the discussion on credit exemption for those who gained not >30% and the course is the credit exemption between curriculum and curriculum. Obviously what has been outlined by APEL system is not parallel with what practiced and MQF clause. The main reason for participant to pursue their studies is because the credit exemption offered is higher and they felt that this matter value their experience for upgrading their education. Learning accreditation based on prior experience or APEL is the method of assessment on students to recognize their knowledge, skills and their efficiency (Kaprawi, 2011). Thus, it can't be deny that prior experience is worthwhile and timely effective for students learning.

The APEL system could eliminate unnecessary redundancy of course, training and skills that they have and it resolve the issues of formal education and at the same time reduce cost for learning materials such as text book (MQA, 2011). Thus, it was proven the credit transfer in APEL systems is the drive factors that benefited four parties includes students, institution, employer and country (MQA, 2011). Individual differences in terms of their working experience and working routines determine the potential of credit exemption in which classification for both make the equivalence task much easier. It was also found out that participant does not stress too much on themes of working in teams and communication skills as all of them possessed different scope of working. The result of this study is hoped to a guidelines for Higher Education Institution in Malaysia in the implementation of APEL systems. This study will also aid in the establishment of APEL centre in UTHM for recognizing the credit transfer in the assessment of engineering skills for any extension course. With such guidelines, more systematic approach is hoped to be implemented.

Each view from the participants built the basis of more accurate equivalence process thus in the near future, this can be used between industry and another curriculum if they wish to have structuring process. It was anticipated that this study could help various industry in pooling more skills and competent workers by employing the equivalence process. In some extent, it helps industry to reduce turnover and at the same time minimize cost for any hiring process. University in this matter will also benefit from the enrolment of non-conventional students whereby teaching and learning of educators will be enriched with the sharing session from experienced students who belong to the industry. Suggestion also consider about the number of experts evaluation to get more accurate potential credit to be exempted. Experts view on experience and working routines will help the classification process more precisely. This in turns will help weighing the credit exemption based on the portfolio assessment.

CONCLUSION

This study employed a qualitative approach and exploratory in nature. The instrument used for data collection is through the interview protocol. The participants for this interview are the Senior Technician of Fujitsu Component (M) Sdn. Bhd. In addition, the process of mapping equalization between the scope of work and experience of Senior Technician at Fujitsu Component (M) Sdn. Bhd. with the curriculum of Bachelor of Engineering Technology Industrial Automation, UTHM are the instrument employed in this research. The equalization mapping design is built to get the percentage of equalization between the two elements. This study equivalence between the two elements are helpful for those who have working experience to pursue their learning to a higher level. As a result of the mapping

process the potential to get credit exemption are different for each individual but it was not much difference if the individual possessed the same field and post.

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