Rethinking construction: inclusion of slow learners as taker-off in quantity surveying practice

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Abstract: The objective of this paper is to present the preliminary findings regarding the participation of OKU with learning disability in Science Technology, Engineering and Mathematics (STEM) sectors. Review of the works of past researchers suggested that OKU is a potential workforce in STEM sectors but still under-represented due to lack of efforts from stakeholders and learning institutions in providing information on the opportunities that are available. A research has been initiated to explore the potential of slow learners to become workforce in the construction industry as a taker off – part of work of a Quantity Surveyor. Against the findings from the literature review, the modest attempt to attract slow learners to become taker off in the construction industry require the formulation of appropriate learning environment and strong support from the respective key players and stakeholders.

1. Introduction

According to government estimate, there are approximately 1.3 million people in Malaysia with various forms of disability [1]. In Malaysia, people with disability is referred as *Orang Kurang Upaya* (OKU). However, Malaysian society has yet to give serious thought on equipping the OKU with certain skills so that they can have more opportunities and be gainfully employed. There is a perception that assistive technologies and building modifications in the workplace to meet the needs of people with disabilities is difficult and expensive. This notion is subject to further argument as there are also evidences captured from the US Department of Labour which suggest that job accommodations to accommodate the OKU is cheap and up to 58 per cent came at no cost at all [2]

Malaysia has embarked the implementation of policy of 1% job quota for the OKU in the public sector [3-4]. Subsequently, the private sector is also expected to follow-suit and absorb OKU in the workforce [5-6]. All these efforts are made to help OKU to be more self-reliant and obtain decent jobs in the market.

Nonetheless, giving opportunities to the OKU or attempting to build a diverse team is a challenge for a lot of employers, and the STEM fields are certainly no exception. Persons with disabilities have been under-represented in the science, technology, engineering, and mathematics (STEM) fields for many years [7]. Reasons for this include low exposure for students with disabilities on STEM courses, and poor career advice, support and networking with people form scientific industries [7-9].

The present study is initiated since the authors believe that OKU can get a better job if there are efforts from various bodies to change the societies' perceptions on the ability of the OKU so that they

can work in various fields. This on-going research is a novel attempt in investigating the ability of OKU under the category of slow learners to become taker-off; which is part of the roles of Quantity Surveyor in preparing Bills of Quantity [10]. The authors acknowledge that there are many categories of OKU. The explanation of some categories of OKU was discussed in the next section. Some researchers refers the slow learners as person with below average cognitive level [11]. Hence, in this document, the term slow learners and person with below average cognitive level will be used interchangeably in which both carries the same meaning.

This paper represents the report of the initial finding of this on-going research whether there is a possibility to include OKU in general to venture in STEM fields. The outcome from this literature review will become a meaningful guide on the possibility of including OKU with below cognitive level as assistant to quantity surveyor in the construction industry of Malaysia. In carrying out this research, past studies and literature with the key words of OKU, slow learners, handicapped person, and person with below average cognitive level and handicapped person in STEM fields were searched, reviewed and presented in this paper.

2. Overview of disability

There are various ways in categorizing disability or OKU. According to the United Nations [12], disability results from the interaction between persons with impairments and attitudinal and environmental barriers that hinder their full and effective participation in society on an equal basis with others. Oxford Dictionary [13] define the term disability as physical or mental condition and the state of not being able to use a part of the body completely of easily or mental disability means is not be able to learn easily. The Malaysian Disability Act 2008 and United Nations (2017) defined "persons with disabilities" include those who have long term physical, mental, intellectual or sensory impairments which in interaction with various barriers may hinder their full and effective participation in society and equal basis with others[12,14]. This definition further explained disability in relation to a person as a substantial restriction in the capacity of the person to carry on a profession, business or occupation in the State or to participate in social or cultural life in the State by reason of an enduring physical, sensory, mental health or intellectual impairment. The categories of disabilities as stated in Jabatan Kebajikan Masyarakat (JKM) [15] are as the followings.-

2.1 Hearing

Hearing Disability means cannot hear clearly in both ears without the use of a hearing aid or not to hear directly even with the use of hearing aids.

2.2 Vision

Disability Visibility means both blind eyes blind in one eye or vision in both eyes or etc. permanent vision disorders.

2.3 Speech

Speech Disabilities means they cannot speak up cause interference to communicate properly and cannot be understood by those who interact with it. This condition is permanent or will not heal. For children must be based on the assessment at the age of five years.

2.4 Physical disability

Physical Disability means the inability to remain members of either body caused by loss or inability absence of any member of the body that can affect their function in the fundamental activities. Activity is defined as basic as personal care, movement and body position changes. This condition can occur as a result of injury (trauma) or disease in any of the nervous system, cardiovascular, respiratory, haematology, immunology, urology, hepatic, musculoskeletal, gynaecology and others that cause malfunction

2.5 Learning problems
Learning problems means intelligence problems that are not consistent with biological his/her age. Those who fall into this category is Late Global Development, Down Syndrome and intellectual disabilities. This category also includes conditions that affect individual learning capabilities such as autism (Autistic Spectrum disorder), Attention Deficit Hyperactivity Disorder (ADHD) and specific learning difficulties such as (dyslexia, dyscalculia and Dysgraphia).

2.6 Mental disability
Mental Disability refers to a state of severe mental illness makes a person unable to function either partially or fully in matters pertaining to his or relationships in society.

2.7 Multiple disabilities
Multiple Disabilities has more than one type of disability, and is generally not appropriate to be classified in the above category in 2.1 to 2.7.

Upon synthesizing past literatures, the characteristics of slow learners conform with the definition of JKM under the category of 'learning problems'. Slow learners are the group of peoples with below cognitive capacity, poor memory, capability of having distraction, lack of concentration and inability to express ideas. The slow learners relatively unable to do work normally expected of their age group [16]. In Richard (2005) slow learners were described as group of people who are not able to do well in a particular project that sometime appear immature in interpersonal relationships, and often times do not understand simple skills while performing a task. In order to grasp new concepts, a slow learner may require more time, a number of repetitions, patience and often more resources from teacher or the trainer to be successful [17]. Slow learning young adults are capable of achieving further intellectual growth as such adolescents are become more sensitive to the felt needs of life and become more ready to accept help [16].

In psychometric terms, slow learners have a measured intelligence quotient (IQ) between 70 to 85%. Incidentally, IQ score should not be used as the sole indicator of diminished potential for the slow learner, as that determination is usually accompanied by myriad assessment evidence that include behavioral, academic, formal and informal measures [18]. Although their poor learning rate and limited intellectual capacity may not be a marked handicap in the employment, they will have realized that further education is essentials for promotions at works. This prove that they are the potential group of the people who are able to be guided with the instructional strategy to bring out the uniqueness in the individual to the surface.Variables of human ecological environment such as type of family, caste, education of family members, age, friends and neighboring hood exerted a powerful influence on the slow learners' multiple intelligence [19].

3. Background and prior work on OKU in STEM courses.

In general, the STEM field is hardly to be diversified and include people who are with disability in the workforce [8]. In Malaysia, the OKU are often portrayed by the local society as weak and could not afford to perform jobs as productive as other workers [20-21]. Nonetheless, findings from literature shows that the education system across countries either gives less attention or are still struggling and exploring the ways to increasing STEM workforce diversity that meets the needs of all concerned [8-9]. Hence, the scientific workforce remains primarily for people with a non-minority-dominated field, especially as technician or professional levels [8]. Against this background, the main issues concerning the inclusion of disable person in STEM courses or careers is how to provide appropriate information, learning environment and support system so that the OKU can obtain more opportunity to venture in STEM field. Such effort, although minimal will manage to open up opportunity for OKU in STEM field.

The inclusion of persons with disabilities in STEM career need a lot of effort especially from the stakeholders and education institution. In a study [8], the researchers highlighted that there is still lack

of efforts from the stakeholders and education institution in providing information on the opportunities with regard to STEM courses for persons with disability although some platforms have been established to attract more people with different ability. For example, Institute for Accessible Science is certainly concerned and provides a specific channel for disabled person to be in the field of biomedical science. The establishment of organization such as the American Association for the Advancement of Science Entry Point is another channel that is encouraging STEM students with disability to become professional workforce [8].

However, reaching and encouraging people with different ability requires more effort than just providing a channel or platform. Mankin and Rohde [8] further highlighted that mentoring and networking programs need to be established and yet there is difficulties in performing collaboration with key players in STEM fields. Hence, this community will remain under-represented should there is lack of effort from respective key players.

Another important study with regard to people with disability in STEM is done by Rule Stefanich [7]. The study again highlighted the need of strong commitment between teachers, stakeholders and education institution in providing support and appropriate learning environment to the slow learners to be in STEM courses or careers. He proposed nine main ideas in response to the central problem of supporting students with disabilities in STEM courses or careers, i.e. 1) Self-advocacy and knowledge of one's disability, along with possible effective accommodations, will help students succeed. 2) Teachers need high expectations for students with disabilities and should encourage their participation in STEM subjects early so that students have appropriate knowledge bases for pursuing STEM. 3) Teachers need to be creative and willing to make accommodations so that students with disabilities can reach the same objectives as other students. 4) Universal design strategies, inquiry, hands-on learning, and real-world applications will benefit all students. 5) Laboratory assistants need to facilitate access and learning. 6) Assistive technology allows students to more fully participate in lessons. 7) Teamwork and sharing between faculty and support personnel of effective practices is needed. 8) Internships and mentorships build confidence, teach knowledge of the field, and help with transitions to work. 9) Transitioning to community colleges, four year institutions, or work can be facilitated by appropriately educated support personnel.

The study by Lam et al. [9], gives important indication that people with disability have strong interest in venturing STEM field. An academic program which initiated to stimulate interest towards STEM courses has received positive feedbacks from both parents to and students with learning disability. although students with learning disability faced some difficulties in understanding some of the scientific areas, but that does not stop them from giving encouraging comments, feedbacks and instilling interest in STEM field. This indicate that there is high possibility to include OKU or disable person in STEM field should they were given the exposure and chances.

In terms of teaching and training, in general, past studies have shown that there are constraints experienced both by the students and instructors or teachers in teaching disable person with below average cognitive level in the classroom. The teaching of OKU with below average cognitive level must be done with different approach than the normal students. Researchers suggested that the teaching of disable person must be done in different pace and in a controlled class room. In Wettasinghe and Mazlan [22], the researchers suggested the approach of teaching person with learning disability and can be enhanced with support of Information and Communication Technology (ICT). ICT is found to able to students' understanding and later increase self confidence in learning.

4. Quantity surveyor and taking off

It is the focus of this study to include OKU with slow learning ability to be part of the workforce in the construction industry of Malaysia. In the economy of Malaysia, the construction industry has been recognised as a major employer that employed more than 1 million people per annum [23–25]. There are various fields in the construction sector and some may be appropriate for the slow learners.

Quantity surveying is one of a team of professional advisers in the construction industry which concerned with contracts and costs of construction projects [10]. A quantity surveyor (QS) estimates and monitors construction costs, from the feasibility stage of a project through to the completion of the construction period. They work closely with architects, financiers, engineers, contractors, suppliers,

project owners, accountants, insurance underwriters, solicitors and with all levels of government authorities. One of the tasks of the QS is to prepare bill of quantities which involve the measurement or "taking off" quantities of various items of work from design drawings prepared by the project architect and engineer [10].

In relation to the construction industry, the term taking off can be presumed to be specific to one of the roles of QS. It can be described as an operation which consists of taking the dimensions of the various items from the drawings and entering them with their proper descriptions on "dimension paper" or so called "taking off paper" [7].

5. Conclusion and the way forward

This paper represents the report of the first finding of this on-going research whether there is a possibility to include OKU in general to venture in STEM fields. Specifically, the present study undertakes to perform a preliminary study on the potential of OKU under the category of slow learners to perform part of the job of QS. While the job description of QS encompasses various dimensions, the present study is limited only on the role of QS to do taking off.

Based on the reviews which has been discussed above, it was found that the research pertaining to OKU in general is still at infancy stage. Nonetheless, the existing research posit that attracting OKU in STEM is a challenging task and require and in-depth study on the teaching module and establishing collaboration with respective stakeholders and learning institutions.

Some minimal attempts have been done by past researchers in providing opportunities for disabled persons to join STEM courses. These attempts are positive signs that disable persons can become part of workforce in STEM fields. The present research will need to establish the appropriate modules as well as in depth study on the capability and capacity of slow learners in capturing the modules so that they can have options to become part of the construction industry players. In the next phase of the study, the team of researchers will identify students who are slow learners and further explore methods to equipped them with the knowledge as taker - off.

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