Interdisciplinary Knowledge Adaptation: Engineers in Android Application Development

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Introduction

Industry 4.0 can be summarized by six building blocks as in Figure 1, and addressing each in appropriate complexity at progressive levels of education becomes integral to producing a career-ready individual who possesses the right combination of skills and abilities needed by today's engineering industries. Students at each level of education require level-appropriate exposure to and experience with each of the six building blocks. The integration of these six blocks identified as interdisciplinary knowledge integration. Our present degrees are very much focused on preparing students for the single discipline of multi-discipline workplace. In industry, engineers work in multi-skilled teams to solve complex problems. By adopting an interdisciplinary approach, students are well equip with the knowledge and skills needed to enter Industry 4.0. Engineers will be able to use the breadth of knowledge and depth of understanding acquired throughout degree in a range of sectors.

Industrial Success Skills	Industry 4.0 skills: collaboration, problem solving, discipline and time management.
Inform-Actionable© Data	Industry 4.0 analytics: Information to perform analysis, draw conclusions and take action.
Industrial Equipment & Technology	Robotics and automation in Industry 4.0
Smart Sensors and Smart	The core of Industry 4.0 gathers virtually infinite volumes of information
Control Systems	Control Systems are the heart of Industry 4.0
Connectivity and Networking	Networks carry the lifeblood in Industry 4.0

Interdisciplinary Knowledge integration Challenges

A well-known barrier to successful interdisciplinary work is the difficulty of integrating knowledge across disciplines. In the context of literacy and education, the principle of interdisciplinarity needs to be given substance, especially against the background of the concept of sustainable development. Today, science has to meet the challenge of generating knowledge that satisfies the complexity of present problems. Such knowledge or know-how does not remain within the scientific community but has to be absorbed within different educational contexts. This is a more challenging task among the students who are already in the system and will be graduating in the next five years.

Study Objective

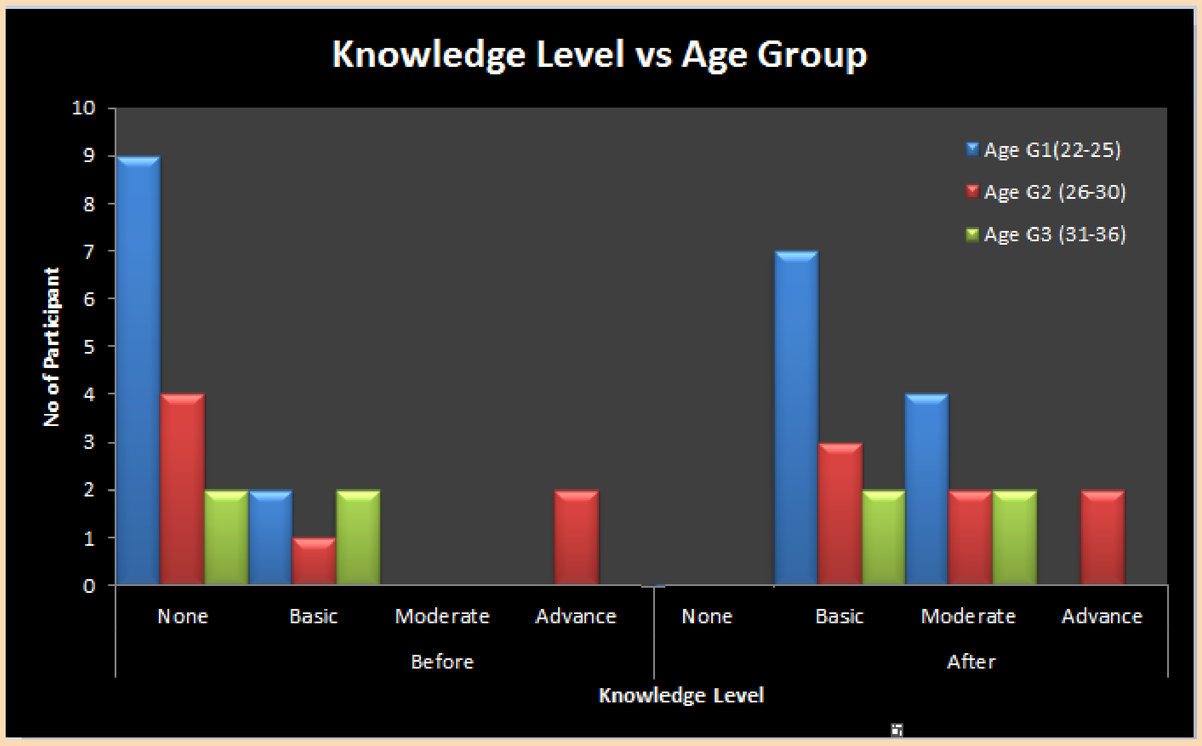
To explore the impact of education level, age and gender in adapting interdisciplinary knowledge among 22 final year undergraduate and post-graduate students in Electrical, Electronics and System Engineering, Faculty of Engineering & Built Environment, Universiti Kebangsaan Malaysia

Methodology

In this study, a workshop-based interdisciplinary knowledge integration approach introduced among undergraduate and post-graduate students. Students attended a three days Android Development Essential Training (ADET) program. The participants are from electrical, electronics, computer and communication engineering education background, aged between 22 up to 36 years old. There were 18 male and 4 female students. All participants were assessed on their pre and post-workshop content knowledge with the same questions. Participant's workshop satisfaction level was assessed to ensure the knowledge delivered was at the expectation of the participants. Quantitative analysis method was adopted in this study as elaborated in the result section.

Result

The survey instrument was able to provide an assessment of the pre and post knowledge and skills in different age group, gender and education level.



A paired samples t-test was conducted to evaluate the impact of the ADET workshop on participant through literacy knowledge score in mobile apps development.

There was statistically significant decrease in literacy knowledge score in mobile apps development before (M=34.77, SD 12.00) and after ADET (M=55.68, SD =13.12), [t (21) =12.32, p<.005].

Table 1: Mean and standard deviation of knowledge scores literacy in mobile applications development based on pre and post test.

Dependent Variable	Pre Test		Post Test	
	Mean (M)	(SD)	Mean (M)	(SD)
Knowledge Literacy in Mobile Apps Development	34.77	12.00	55.68	13.12

Note*n=22

An independent sample t-test was conducted to compare knowledge scores literacy among male and female participants. There was no significant difference in knowledge literacy scores among male (M=6.94, SD=2.65), and female [M=7.00, SD=0.82; t (20)=0.41, p>,05] participants. This result proves there was no differences in knowledge literacy between gender before this training. There was no significant difference in knowledge literacy scores for male (M=11.00, SD=2.83), and female [M=11.75, SD=1.50; t (20)=0.51, p>,05] participants. This result proves there is no differences in knowledge literacy between gender after this training.

Table 2: Number of subjects, mean and standard deviation of knowledge scores literacy in mobile applications development based on gender before and after training.

	Gender	n	Mean	SD	Df	t	p
Before Training	Male	18	6.94	2.65	20	0.041	**0.968**
	Female	4	7	0.82			
After Training	Male	18	11	2.83	20	0.508	**0.617**
	Female	4	11.75	1.5			

An independent sample t-test was conducted to compare knowledge scores literacy among current education level. There was no significant difference in knowledge literacy scores after training for participants who have degree background (M=7.56, SD=2.79), and participants who have master background [M=6.54, SD=2.11; t (20)=0.98, p>,05]. This result prove there is no differences in knowledge literacy between current educational level before this training. There was no significant difference in knowledge literacy scores after training for participants who have degree background (M=11.44, SD=3.50), and participants who have master background [M=10.92, SD=1.94; t (20)=0.45, p>,05]. This result prove there is no differences in knowledge literacy between current educational level after this training.

Table 3: Number of subjects, mean and standard deviation of knowledge scores literacy in mobile applications development based on current education level before and after training.

	Current Education Level	n	Mean	SD	Df	t	p
Before Training	Degree	9	7.56	2.79	20	0.976	0.658
	Master	13	6.54	2.11			
After Training	Degree	**9**	**11.44**	**3.5**	**20**	**0.449**	**0.658**
	Master	**13**	**10.92**	**1.94**			

The highest knowledge literacy scores in the development of apps mobiles in this training was perceived by the subjects of 22 to 25 years old (11.82). The score was followed by subjects of 31 to 36 years old (10.75) and 26 to 30 years old (10.29).

Conclusion

This study concluded that interdisciplinary knowledge integration among both undergraduate and post-graduate students are not discriminated by gender and education level. Age found to be playing a significant role in interdisciplinary knowledge integration, age group 22 to 25 found to have higher score compared the other two groups. This study as identified age as a significant factor among employees in adapting to the Industry 4.0 interdisciplinary knowledge integration. Indirectly, this factor will lead to employment challenges among the senior employees. In study the authors are recommending an Industry 4.0 gap fitting training program to be introduced for engineering post-graduates who will be moving into a changing employment market upon their graduation.

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