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THE PROBLEMS IN TEACHING TECHNOLOGY AND DESIGN SUBJECT

MALAYSIAN SECONDARY SCHOOLS

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ABSTRACT

The Technology and Design (T&D) subject was introduced in Malaysian secondary school curriculum in 2017 to replace the Integrated Living Skills subject. The replacement is to expose Malaysian nation to technology as needed by global industrial revolution 4.0 (IR4.0) at the school age. This qualitative study was conducted to explore the problems faced by the T&D teachers that majority are the Integrated Living Skills expert and their needs in teaching the subject. Data saturation showed that 12 T&D secondary school teachers have been interviewed using interview protocol and tape recorder as research instrument. They were selected as study sample using purposive sampling technique. Finding of the study found that the main problem of in teaching T&D are no trainings on how to teach the subject were given to the teachers and content of the T&D text book is failed to play its roles to provide basic knowledge and skill of the subject. The text book on the other hand focusing more on how to produce projects instead of providing knowledge and skill on how to produce those projects. Thus, the teachers require T&D teaching framework, training on how to teach the subject, teaching modules for reference, and a revised Curriculum and Assessment Standard Document (CASD) to ensure the text book that written based on this document is complete, suitable to level of the students, precise and error free. Based on findings of this study,

teachers are still looking for real teaching methods to teach T&D. So, a framework for teaching method needs to be built as a guide for T&D teachers who are teaching at 2440 secondary school in Malaysia.

Keywords: Teaching and Learning, Technology and Design, Integrated Living Skills

Introduction

The role of Technical and Vocational Education and Training (TVET) in Malaysia is very important to produce skilled and semi-skilled workforce for the Nation's development. The Twelfth Malaysia Plan (RMK 12) allocates RM5.9 billon for the purpose of upgrading and improving the TVET programmes as part of the Nation's continuous efforts in empowering TVET. Under the Shared Prosperity Vision 2030 (WKB2030), it is estimated that at least sixty percent (60%) of the Malaysia Education Certificate school-leavers will continue their studies in the TVET programmes. Meanwhile the National Key Economic Areas (NKEA) estimates about 1.3 million number of job opportunities to be created in the Nation's various economic sectors, and this number is expected to increase 2.5 folds by the year 2025 (Abd. Majid, Hussin, & Norman, 2019)

In an effort to ensure the achievement of the projected number of human capital requirements, the government introduces TVET in the Malaysian educational system starting at the primary school level in 1989 and in 1993 at the secondary school level through the subject Integrated Living Skills (ILS) (Hope, Yusef, & Vengrasalam, 2011). In order to make Malaysians technology-savvy in the Industrial Revolution 4.0 (IR 4.0) era, the ILS subject is then replaced by the subject Technology and Design (T&D) starting in 2013 at the primary school level followed by the secondary schools in 2017. (MoE, 2013)

51   The T&D subject is also taught by ILS teachers according to their respective

52   specialisations in ILS. After three years of T&D implementation in secondary schools, T&D

53   teachers are still facing the problem of lacking of proficiency in the T&D syllabus that is

54   technology design-oriented (CASD, 2013) due to contents of the subject is beyond their

55   competencies for which they do not receive adequate formal training by the Malaysia

56   Ministry of Education (MoE). Inaccurate information in the CASD, combined with the

57   unclear subject contents in the approved textbooks and lacking of additional references on the

58   subject add woes to the problems faced by the teachers in teaching T&D.

59

60   T&D is a practical-based subject. It requires a lot of teaching hours to suit its lesson

61   contents and making projects. As an example, the T&D syllabus for Form 1 has nine (9)

62   topics of practical nature that requires a minimum of seventy (70) hours of instructions in a

63   year. However, the CASD allocates only sixty-four (64) hours on the topics, which is six

64   hours less than required. This issue is also raised in the research findings by Sahaat and Nasri

65   (2020).

66

67   Kimbell (2001) and Hon (2004) state that most T&D teachers in London and Hong

68   Kong face the same problems at the early stage in adapting to this subject's teaching and

69   learning (T&L) requirements in the first five years of its introduction, until a new teaching

70   method is found. Their findings are supported by Suyanto (2017) who finds that the teachers

71   who teaching a new subjects face problem in mastering the subjects' contents as well as

72   finding suitable approach to teaching the subject.

73

74   With the greater aim of finding a way to shorten the adaptation time taken in the ILS

75   to T&D transition, this study is conducted to identify the problems faced or experienced by

teachers who teaching T&D. Findings of the study are hoped will contribute towards ensuring the RMK 12's budgetary allocation in empowering TVET does not go down to waste and at the same time the intentions of the WKB2030 can be successfully achieved within the stipulated

Methodology

This qualitative study was conducted by interview 12 T&D teachers in secondary schools in Skudai, Johor to obtain accurate and in-depth data based on their experience and needs who teach the subject. Interview protocols and tape recorder were used as research instruments. The number of T&D teachers as a sample of this study was determined by the saturation of the data. However, samples number that less than 20 will increase validity of the study in depth (Crouch and McKenzie, 2006). The T&D teachers were selected as sample of the study using purposeful sampling method. The interview data was transcribed verbatim and analyzed using a coding process that involved three stages of open coding, axial coding and selective coding. The coding process is assisted by Nvivo computer software.

Findings and Discussion

The study finds four problems faced by the teachers who teaching T&D, are (i) (the teachers) do not master or proficient in the T&D subject contents, (ii) they are unsure of the best and suitable methods to teach T&D, (iii) information and explanation on T&D contents in the textbooks are not clear enough, and (iv) additional references for the subject is extremely limited. The problems are elaborated below: -

(i) Teachers Do Not Master or Proficient in the T&D Subject Contents

100   The study finds all participants state that the switch from ILS to T&D caused them

101   difficulties in mastering or being proficient in the latter subject's (T&D) contents and in

102   identifying its appropriate teaching methods. For example, participants R5 and R9 said that

103   they are still not proficient in the T&D subject contents as it is totally different from that of

104   the ILS.

105   *I face constraints in making the preparation for the T&D T&L. My knowledge is*

106   *related to the ILS subject and its contents are different from that of the T&D. A clear*

107   *example is that in T&D, there is a topic on Mechatronics and its applications while*

108   *ILS does not have it. (R5)*

109

110   *Topics in the T&D subject are new topics that are totally different from those in the*

111   *ILS. For example, the Form 2 component on Electronics contains electronics and*

112   *electronics project sub-components. (R9)*

113

114   The participants state that teachers do not master the T&D teaching contents because

115   T&D is not their (teaching) options. An example of this view is the interviews with R6 and

116   R12. This finding concurs with that of the study by Masingan and Sharif (2019) which states

117   that the root cause of the teachers being not proficient in T&D teaching contents is they do

118   not have the professional qualification for that. This leads to the teachers facing problems in

119   teaching T&D which is regarded as a subject different from ILS.

120

121   *I lack knowledge on the T&D subject contents because my option in not T&D. My*

122   *option is ILS that has less design elements, with the exception of engineering*

123   *drawings. The T&D (contents) are more (oriented towards technology) design. (R6)*

124

125 *In teaching T&D, I always ask myself, do I teach the right thing? And (I) don't feel*

126 *confident (doing it it) because I do not master the T&D's subject contents (or)*

127 *components. (R12)*

128

129   The impacts of the teachers not being proficient enough in T&D subject contents due

130 to their limited knowledge on it, are that they are unable to teach (effectively) and cannot

131 impart to their students the generic skills of high-level thinking skills (HOTS) the latter of

132 which is part of the instruction in the T&D CASD (Nor & Kamarudin, 2017), and they

133 become unconfident in teaching the subject (T&D). According to Du Plessis, (2019),

134 assigning teachers to teach subjects beyond their specialization or options affects their

135 confidence to teach due to lacking of knowledge and pedagogical skills which in turn affects

136 their teaching style and classroom management. The teacher's explanations during lessons

137 become unclear, teacher-student communications becomes ineffective as the students'

138 confidence in their teacher drops and students may not even take part in class discussions (Du

139 Plessis, 2018).

140

141

142 **(ii) Teachers Are Unsure of the Best and Suitable Methods in Teaching T&D**

143   This problem is best stated by participants R2, R10 who are still seeking or looking for

144 the best method in teaching T&D. Participant R7 in turn admits that his/her teaching style is

145 still tied up to that of the ILS, despite T&D being design- and technology-oriented subject

146 based on the 21st Century-Learning This problem is extremely serious and will be worse if it

147 is not arrested since according to a study by Arip et al., (2014), students do not pay attention

148 in class because teachers do not use appropriate teaching methods. Therefore, attention has to

149 be paid to the teaching methods employed by teachers so that they (the teachers) can apply

150   21ˢᵗ Century-Learning in their teaching and they can become creative and innovative in

151   applying various methods, strategies and techniques in T&D T&L processes.

152

153   *We do not know the actual sketches required in the T&D subject, what kind (of*

154   *sketches does it want)? (R2)*

155

156   *Teachers are really not skilled in teaching T&D because they are confused about the*

157   *electronics topics in ILS and that of the T&D. For example, in ILS the electronics*

158   *component involves doing a project whereas in T&D it focuses on electronic*

159   *programming software. (R7)*

160

161   *In my case as an example, I teach T&D for Form 3 but how can I explain about*

162   *"technologies" (component) for Forms 1 and 2 since I do not teach Forms 1 and 2*

163   *and I do not know anything about Forms 1 and 2 (T&D) subject contents? (R10)*

164

165   The need for teaching guides is also stated by Pule (2019), Doyle et al., (2019) and

166   Sahaat & Nasri (2020) pertaining to the need for guidelines on developing a conceptual model

167   framework for T&D teaching as a T&L guide for teachers. In addition, the framework should

168   also include activities that support the curriculum and assessments. With the availability of

169   the teaching framework, the problem of time constraints can be overcome and the outcomes

170   from the projects done by the students can be enhanced in terms of their creativity.

171

172   The study finds out too that all participants state that T&D teachers still lack

173   reinforcement training on teaching T&D. According to them, they only get training on T&D

174   teaching through Professional Learning Community (PLC) that was delivered by teachers

175 who had attended courses and workshops on T&D. Later, the teachers oftentimes could not

176 impart fully what they have learnt from the T&D course/workshop facilitators. R10 also

177 suggests that courses on teaching T&D should be offered or made available to all T&D

178 teachers.

179

180   The aim of T&L reinforcement courses and trainings is to enable teachers understand

181 topics of T&D components that they have yet to master or proficient in. Why is T&L training

182 important to the teachers? Findings of past studies show that T&L training positively affects

183 teaching and it in turn improves students' learning in the subject taught. Tahir and Saleh

184 (2008) also stress the need for training for the teachers so that they can make up their

185 inadequacies and at the same time improve their teaching skills and qualities. This fact

186 concurs with a study by Yusnita et al., (2018) which states that teachers who attended

187 educational and professional training programmes did improve their pedagogical skills and

188 teaching performance. Therefore, all teachers need to be adequately trained to improve their

189 quality in teaching T&D.

190

191   *Each school is asked to send a teacher as its representative to the T&D teaching*

192   *course or workshop. Upon return to the school, his/her is tasked to conduct in-house*

193   *training to other T&D teachers in the school. Unfortunately, the said "trainer"*

194   *teacher is oftentimes not having clear understanding of the materials on the subject.*

195   *The information and explanation given by the "trainer" teacher is not the same that*

196   *he/she gets from the training that he/she himself/herself attended. (R5)*

197

198   *The information on the T&D teaching methods needs to be imparted to the teachers*

199   *through training. The problem is we are not supplied with proper knowledge on T&D*

teaching methods. A majority of us are at a loss on how to teach especially on how to assist the students doing the projects. (P10)

I used to attend a course on T&D subject in 2017. The majority of the teachers attending the course did not understand what was being told. Attending one single course is definitely not helpful in making me understand the T&D subject's contents let alone teaching it (effectively). (P12)

(iii) Information and Explanation on T&D Contents in the Textbooks are Not Clear Enough

A majority of the participant state that they do not feel comfortable using the T&D textbooks due to the terminologies used, explanations that are too concise and contents level is too high, and therefore unsuitable to the secondary school students. The lessons are incomplete too. The imperfections of the textbooks are worrisome because textbooks are the main source of reference in classrooms (Väljataga & Findler, 2014).

For Yildirim (2006) and Sinaga, Kaniawati, and Setiawan (2017) textbooks quality will have positive effects on the students if the facts in them are complete, written in precise and concise manner, easy to understand and able to elicit interests among the students to use them. Unfortunately, the T&D textbooks that are supplied to the schools are full of errors and mistakes in many aspects, as said by the participants R2, R3, R6 and R12.

The contents in Mechanical Engineering in the T&D textbook got mixed-up with facts in Physics. This causes the T&D teachers to feel unsure on how far to teach on engineering topics. (R2)

225

In my view, the level of T&D syllabus is too high for junior secondary school students. The language and words used in the textbooks are too high. Explanations on certain facts are too long-winded, they can be written more concisely and precisely. The impact is that students find it tough to understand the textbooks' contents. (R3)

231

For example, the topic on Dress Designs provides no clear information on basic dress-making, pattern drawing, types of fabrics and so on. What is mentioned in the textbook is more on the process of producing the products. There should be information on basic sewing so that students can use or apply it in making the product. (R6)

237

The language used in the textbooks are hard to comprehend by students and teachers. The materials shown in the books are more suitable to high-achiever students. low achiever's student finds it hard to understand the language used in the textbooks. (R12)

242

According to Jasmi et al., (2011), textbooks and modules are main materials for teaching aids that can be used in the classroom. Matić and Gracin, (2016) and Pansell and Bjorklund Boistrup, (2018) also agree that the use of textbooks influences teaching practices because teachers depend on textbooks to prepare lessons and training. Teachers who have limited knowledge and contents in the teaching of science and STEM subjects are seen as highly dependent on textbooks to explore basic concepts and other terms (Du Plessis, 2018).

249 Therefore, the Textbooks Division of Malaysian Ministry of Education needs to pay more

250 attention towards this question to prevent from becoming worse.

251

252 **(iv) Limited Additional References**

253   Teachers interviewed say they really need reference materials to help them in the T&D

254 T&L processes to enhance their understanding of the subject's contents. The available

255 materials in the market are full of weaknesses and unattractive, look more like workbooks and

256 are not up to the standards required for Form 3 Assessment (PT3). The examples are as given

257 by Participants R3, R5 and R9 below: -

258

259   *I need reference books to assist me in teaching the T&D. Reference materials can help*

260   *me in understanding the contents of the subject. (R3)*

261

262   *Comparing the T&D textbooks with the T&D references available in the market shows*

263   *their contents are totally different. I have to get the correct information from the T&D*

264   *subject trainers for accurate facts. (R5)*

265

266   *There should be more additional reference materials for the teachers and students to*

267   *use. For the time being, the available reference books are from the publisher, Sasbadi,*

268   *but they are unattractive, incomplete and more like workbooks. (R9)*

269

270   Participants R6, R7 and R11 are also suggest that reference materials such as the

271 modules and so on have to be developed according to needs that suit the teachers and students

272 alike.

273

274   *I really need a module especially for the Electrical and Electronics Design*

275   *component. In the university, I did learn for a semester the topic on Electric and*

276   *Electronics but only the basics. So, I need the modules that contain in-depth*

277   *information on each T&D topic. (R6)*

278

279   *I need reference materials on each topic under* T&D. *Some reference books from*

280   *outside appear more advanced. Some* T&D *modules that are available in the market*

281   *do conform to the* T&D *CASD but their notes are unattractive so much so that they do*

282   *not generate many interests among the students to use them. (R7)*

283

284   *There are teachers who face problems some topics under* T&D. *So, the modules are*

285   *really needed to provide more knowledge to the teachers on topics that they are not so*

286   *familiar with. (R11)*

287

288   The T&D additional reference materials are seen as a guide that is badly needed to

289 assist teachers to understand content of the T&D subject, and indirectly assist in the subject's

290 T&L processes. Other sources of reference are also especially the ones that contributes

291 towards supporting STEM learning under the national curriculum which requires teaching

292 materials in the form of lesson plans, interactive books, animation stimuli, and the practicum.

293 Additional reference materials can also influence T&L effectiveness by generating ideas and

294 creativity among teachers who can plan various activities that can draw interests among the

295 students (Zakaria et al., 2018) Meanwhile, Hassan et al., (2017) also states that module sets

296 and guides can be the guidelines for teachers to carry out T&L in the subject taught.

297

298 **Conclusion**

299   This study seeks to identify problems faced by teachers in in T&D teaching at lower

300   secondary school. Firstly, the teachers are not proficient enough in the T&D subject content

301   due to its syllabus being clearly different from ILS, and their option is not T&D despite being

302   asked to teach T&D.

303

304   Secondly, the teachers are not sure of the best teaching methods to use in T&D

305   because they do not receive training to teach the subject. Thirdly, although textbooks are the

306   main source of reference in the classroom, their unclear contents cause difficulty among

307   teachers to use them in the subject's T&L processes. The use of high-level terminologies,

308   complex explanations and the subject's syllabus itself being too high for the junior secondary

309   school make it unsuitable.

310

311   Finally, the lack of available additional reference materials for the T&D makes the

312   problem worse although additional references are needed to enhance the teachers'

313   understanding of the subject's content. According to Zakaria (2018), the available sources of

314   reference in the market are still not up to the standards required for the PT3 examinations.

315   Therefore, additional reference materials for the T&L are badly needed to increase the

316   teachers' undertanding of the T&D and its teaching.

317

318   This study provides an insight into the four problems as being the elements in a

319   teaching methods framework. Thus, this study proposes a T&D teaching method framework

320   to be developed. The framework can become a guide to all T&D teachers in 2,440 schools all

321   over Malaysia. The findings of this study can also be used to assist the Curriculum Division,

322   the Textbooks Division and the Teacher Training Division in of the Ministry of Education in

323 initiating a proper action to overcome the issues relating to textbooks, CASD contents and

324 training of teachers.

325

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