The Level of Content Knowledge Practice and Technology Knowledge on Teaching and Learning Strategies in Design and Technology Teachers in Sabah Secondary School

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Abstract
The ability to use content and technological knowledge in order to ensure the best methods of teaching and learning are implemented is an exceedingly significant matter in this age in regards to Design and Technology. This article examines the teaching and learning strategies in the subject of Design and Technology pertaining to the practices of content knowledge and technological knowledge used in secondary schools in Sabah. By using a quantitative approach where 136 questionnaires were distributed to secondary school teachers, it facilitated the collection of large data samples. This study shows that by effectively refining the practices of teaching and learning in Design and Technology, teachers as well as students will continue to improve in this subject successfully over time. Consequently, efficacious educational policies can be formulated to enrich this much needed subject.
Keywords: Content Knowledge, Technology Knowledge, Teaching and Learning Strategies

Introduction
Education as a field of work has always welcomed change and improvement in line with the development of technology and in context with the world's current education standards (Saal & Graham, 2023). New knowledge is essential to education in terms of the way one may approach teaching. Assessing up to date learning concepts and methods of teaching that are relevant to the level of demand required by schools is paramount so that holistic learning can work effectively. Furthermore, educators should be implementing e-learning within their instructional strategies as a means of developing a culture of sharing resources, and building a community of well-founded e-learning practitioners.

In KSSM, Design and Technology is a new addition to STEM (Science, Technology, Engineering and Mathematics) introduced gradually from 2017 onwards to Form 1 to Form 3 secondary students. This subject introduces students to design criteria using technology in construction and product manufacturing. It can train students to adapt improved critical

thinking and understand the latest technology that can resolve future issues (Curriculum Development Division, 2017). The importance of this subject lies in the fact that it can assist in enhancing students' creative and critical cognitive development because within this educational field they may diversify their knowledge related to technology (Abdullah Razak, 2021).

This attempt to integrate Design and Technology into the STEM curriculum has been difficult as it significantly contrasts the other subject matter present within the STEM system (Abidin Zulkifli, 2021). Taking into consideration the persistent complications that other subjects within the curriculum still face, introducing a subject with a potential greater level of difficulty could prove tumultuous to the pupils involved. These complications would need to be resolved for the students to attain the educational goals necessary to complete this subject in its entirety.

Background and Problems

The ability to comprehend and apply certain teaching strategies is a significant bridge that an educator must cross in order to ensure all education goals are achieved accordingly. As previously mentioned, the practice of teaching has undergone many revisions and alterations in pursuance of meeting the dynamic demand of students all around the globe. Various professional efforts have been made in accordance with the intention to strengthen the educational system (Starko, 2021). Regardless, the process takes time, as does ensuring that the same issues previously seen within the learning environment do not occur continuously. As in the case of Design and Technology currently, there are various problems occurring within the classroom that impede student progress and achievement.

It is optimal for educators to implement lessons that engage students by incorporating a high level of creativity in their lesson plans (Serin, 2023; Machisi, 2023). However, this is on the basis that teachers are consistently able to perform to the degree of creativity their lesson plans are based on, providing quality education (Guillén-Gámez & Rosli, 2023). It is necessary for teachers to prepare prior lesson alternatives to make certain they are ready to execute an effective learning experience. Additionally, most lecturers are not adequately trained or do not have the appropriate subject matter; causing outbursts of anger as well as instances of anxiety within the workplace (Rakes et.al, 2022). In spite of this, they are assigned these tasks with expectation of completion by their respective schools (Nurmelda Patric & Roslinda Rosli, 2020). As such, this strains the quality of education the teacher may produce in the classroom.

A challenge consistently faced in today's education system, particularly in a technological sense, is the lack of capacity in understanding how to use technological tools; numerous educators are limited to only Powerpoint presentations without the use of other available media, thus threatening the interest in the topic as a whole. This then begs the question – how can we, as a whole, solve this? The lack of technologically capable lecturers causes underdevelopment in students, especially considering the subject matter at hand. New studies and training must be implemented to establish a solid foundation for both educators and students.

Efforts to overcome the issues as previously mentioned have not been successful, as described in the study (Catherine, 2019). Failure to meet a moderate standard of education

is common amongst Design and Technology teachers; completed studies are overgeneralized, lacking the in-depth research necessary to isolate and overcome issues within the field of study. The answer to this is improving the education lecturers receive prior to being qualified to teach the subject. Without resolving the problem, students will continue to be underdeveloped in their knowledge of Design and Technology.

Inaccuracies within the content due to poor prior education in teachers impact their teaching strategies. Textbook-centric pedagogy often originates from how overwhelming modernized syllabuses and technology can be – with final exams continuing to be a major educational measuring tool, it further reinforces the textbook based teaching style. With all the studying involved depending on the results of the final exam, it can be exceptionally easy to lose morale with regards to putting more effort and energy into captivating lesson plans. This is compounded by the struggle some face with understanding how to most effectively use technology; it is not only faced by the seniority, but also with newer teachers. (Rahman & Zailani, 2021). Essentially, all Design and Technology teachers must be prepared and qualified to apply their technological knowledge in their respective learning environments.

All teachers should be prepared to include materials that add value to their lesson plans and optimize their teaching skills. Every educator should moreover understand how to improve their knowledge with the intention of furthering their career. Education within the country aims to maintain the unity of various races, and allows future leaders and professional workers to confidently face the challenges ahead of them.

Literature Review

Previous studies have found that using technology helps in improving student results in their learning. However, it is not used exorbitantly – instead it simply helps in meeting the criteria necessary to complete work. Similar studies also show that the technological knowledge of teachers is not up to standard – this is especially true in rural areas. This influences and affects the field of study as a whole, as it relies largely on a competent understanding of technology (Rum et.al; 2022). Without comprehension on the subject, it becomes easy for pupils to lose confidence in their teacher's ability to teach adequately. These shortcomings substantially impact to what extent they may be able to contribute to the country's needs in the future.

Previous studies have shown that teacher content knowledge relationships with teaching and learning strategies (Shulman, 1986). Similarly, studies involving teacher technology knowledge with teaching and learning strategy (Li, et al., 2022). However, not many studies have been conducted to study the impact, the relationship of teacher knowledge in terms of content and technology with teaching and learning strategies. All of these studies have stated constraints on teaching and learning in Design and Technology subjects in schools.

Constraints in terms of time causes teaching and learning problems to be well implemented. Of course, this pays a big challenge to the implementation of RBT teaching. In the findings of the previous study, it was found that although there were various efforts such as ongoing in-service training, it was seen as less effective because of various constraints, for example, teachers could not provide enough time to learn and apply the technology on the basis of other true duties Roslina et.al (2019).

There are various anxiety among teachers regarding the mastery of content and technology knowledge can be seen in terms of teaching strategies in the classroom. Teaching strategies are a very important process in the delivery of knowledge and information to students (Ravendran & David, 2020). The objective of student-centered learning is to help teachers provide effective teaching that can produce positive student behavior. Content knowledge and Technology knowledge needed to influence teacher teaching strategies.

However, in the context of this study, there is still lack of research on Design and Technology subject. Efforts to empower this subject are made by increasing the results of Design and Technology studies. Otherwise the desire to empower this subject is difficult to achieve. Accordingly, this study was developed in an effort to study and provide in -depth information on Design and Technology subject.

The Analysis and Findings of the Study
The following are the analysis and findings of the study obtained from field studies using the questionnaire form. The analysis of the study was performed using a descriptive approach to find out about the level of content knowledge and technology knowledge.

Objectives of Study 1
Identify the level of content knowledge of design and technology teacher

Study Questions 1
What is design and technology teachers' content knowledge level?

Table 1.1
Content knowledge (CK) level analysis based on items as a whole

CK	N	Min value	Standard deviations
CK1	136	4.13	.672
CK2	136	3.84	.702
CK3	136	4.01	.759
CK4	136	3.96	.774
CK5	136	3.92	.721
CK6	136	4.25	.738
CK7	136	3.86	.862
CK8	136	3.89	.786
CK9	136	3.77	.677
CK10	136	3.81	.735
CK11	136	3.54	.778
CK12	136	3.60	.723
CK13	136	3.76	.733
Valid N (listwise)	136		

Based on the findings of the knowledge-based analysis study all items are at a high level. Although some of the low -value items are 3.54, if the value of the value is 4. Thus. Based on the findings of this study, the level of knowledge in the subject of Design and Technology is significant to teachers.

Objectives of Study 2
Identify the level of technological content knowledge of design and technology teachers

Study Questions 2
What is the design and technology teachers' technological level of knowledge?

Table 1.2
Design and Teacher Level Analysis

	N	Mean	Standard deviations
Level of teacher technological	136	3.8020	.52185

Table 1.2
Technology knowledge (TK) level analysis based on items as a whole

	N	Min value	Standard deviations
TK1	136	3.52	.798
TK2	136	3.49	.861
TK3	136	3.51	.798
TK4	136	3.44	.805
TK5	136	3.89	.727
TK6	136	3.78	.776
TK7	136	4.19	.661
TK8	136	4.26	.644
TK9	136	4.03	.788
TK10	136	4.12	.731
TK11	136	3.82	.781
TK12	136	3.91	.715
TK13	136	3.46	.825
Valid N (listwise)	136		

Based on the findings of the knowledge -level analysis study it is said that all items are modest. This is because if it is rounded to the whole value below 4. Through the findings of this study, it can be interpreted that technological knowledge among teachers needs to be further enhanced in the future to ensure teachers can teach students well.

Conclusion
The overall cover of content knowledge and technology knowledge is at a high level. The findings of this study show that the level of teacher readiness in this Design and Technology teaching is high. Therefore, this will help them to teach well even though the Design and Technology subject is a new subject. However, it is undeniable that there are still constraints that need to be resolved. This is because every teaching and learning assignment in the classroom certainly has constraints and tests whether directly and indirectly.

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