Design of TPACK Model Based on Hybrid Learning at Science Learning in PGSD

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Abstract. TPACK supported Hybrid Learning combines the trained ability of lecturers with technology, pedagogy associated mastery of the material in an passing learning by combining learning face to face and e-learning. The aim of this analysis is to vogue the event of learning model of science with TPACK framework supported Hybrid Learning. The event model used is that the ASSURE model consisting of vi steps: 1) analyze learners, 2) state objectives, 3) opt for ways that, media, and materials, 4) utilize media and materials, 5) want learner participation, 6) appraise and revise. The model are going to be valid by media consultants, style consultants, and material consultants so tested on students majoring at primary education at State University of Malang. The merchandise can generate a model of science learning through TPACK during a means that's supported hybrid learning. The implementation of Learning Model is expected to improve science learning outcomes of students majoring at (primary school teacher education) study program, able to integrate technology in science learning and it can also facilitate learning needs and learning styles of students in the digital age.

Keywords: TPACK · Hybrid Learning · Science Learning

1 Introduction

New technologies are rapidly attacking teachers from all directions along with the emergence popularity of Facebook, iPhone, iPads, Flickr, blogs, cloud computing, Smart Boards, YouTube, Google Earth, and GPS [11]. As a result, teachers and prospective teachers must equip themselves with a variety of skills both pedagogical skills and professional skills to face technological developments at present and in the future. Teachers are agents as well as change targets to lead, support, and embed technology into the classroom [9]. As a learning agent in support of change in the digital era, in the learning process teachers are supposed to have not only the mastery of teaching and learning materials but they should be able to integrate technology to prepare materials, methods, learning media, and assessment instruments on the implementation of learning. [14] argued that successful integration of technology by teachers in the classroom often

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becomes center of a strong debate in teacher education. It, therefore becomes an opportunity for teachers to quickly familiarize themselves with technological developments and accommodate the students' learning styles now. Facts on the field show that learners can easily and quickly access various materials in e-books, articles/journals, video discovey downloaded through web, blog and Youtube. In addition, the emergence of various learning systems LMS (Learning Management system) can facilitate learners so they can interact anywhere and anytime.

Situations and Conditions like this should be addressed quickly by teachers or prospective teachers so that this technological progress can be utilized properly to help the learning process. A teacher should be able to collaborate the ability to design and teach. In addition, they should master the material with existing technology to create a learning that can facilitate the needs of students in this digital age. Therefore, a learning design that is able to provide facilities accessible to learning with a variety of technology instruments is needed. As a result, the learning process will be more enjoyable and it can be done anywhere and anytime. This kind of learning model requires special skills for a teacher. Having enough content or pedagogical learning skills only is not enough as learning should be able to combine the two. Therefore, it requires a special ability related to technology use. This ability is often called as TPACK (Technological Pedagogical and Content Knowledge). In [11] it is stated that in order to develop TPACK the first thing that teachers do is focus on determining the next content and pedagogy. The second is the teacher then looks for the appropriate technology to teach the content.). The TPACK-forming components according to Mishra and Koehler (2006) consists of six knowledge components, such as Technology Knowledge (TK), Content Knowledge (CK), Pedagogical Knowledge (PK), Pedagogical Content Knowledge (PCK), Technological Pedagogical Knowledge (TPK), and Technological Content Knowledge (TCK).

Today, the TPACK framework per Mishra and Koehler has conjointly been employed in varied education contexts, significantly at intervals the sector of pre-service teacher education employment and to those who have already been in condition standing (Finger, Jamieson-Proctor, & Albion, 2010; Graham et al., 2009; Jang & Chen, 2010). TPACK has been employed in development analysis. One of the researches is done by Charles R. Graham et al., (2009: 70). In this case, TPACK Development on Teaching Science was done by measuring TPACK beliefs on junior science teachers. Furthermore, TPACK is used in the Development of Prospective Math Teachers in improving Learning Outcomes of Mathematics at teacher education programs at the University of Cape Coast (Agyei & Keengwe, 2014: 155). TPACK development is also used to Prepare teachers in teaching science and mathematics with technology. Graham, Borup, & Smith, (2012: 1) used the TPACK framework as lens to understand how prospective elementary school teachers at Brigham University make decisions about the use of ICT in their teaching. TPACK is also used to Develop Teacher Technology Integration Expertise with three phases: encouraging teacher acceptance and technical capability; implementing pedagogical modeling; and applying pedagogical applications (Koh & Divination, 2011; 35). And this study was conducted on prospective elementary school teachers by using Whiteboard instructional intervention. Furthermore, there is a study showing Model of

TPACK employed at Primary School Teacher Candidates who attend Teacher Training for meaningful learning of information and communication technology (ICT) in Singapore (Cheok & Wong, 2014: 1184).

The relationship between TPACK and Hybrid Learning is based on several research results which the writer has obtained from several research journals. One of which is TPACK which is used to establish lecturers' views of content tutored in on-line and mixed environments, pedagogy that guides teaching and course style, and therefore the technology chosen to facilitate students 'learning. (Anderson, Barham, & Northcote, 2013: 549). This is done by adopting a process of development based on the Everett Rogers model through five stages: (1) Recognizing, (2) Receiving, (3) making Adaptation, (4) Exploring, (5) Advancing. Furthermore, Moore's research, et al. focuses on the Impact of Hybrid Program on Professional Development of teachers using Geographic information system (GIS). The findings suggest that strong hybrid models using GIS can enhance teachers' professional development in preparing teaching science and math (Moore, Haviland, Moore, & Tran, 2016).

The application of TPACK (Technological education and Content Knowledge) beside hybrid learning area unit combined with the skilled ability of lecturers to technology, pedagogy and mastery of cloth throughout a learning through a combination of learning face to face and e-learning. The TPACK Learning Model can build teachers' self-confidence in the use of ICTs on pedagogic activities (Koh & Divaharan, 2011). The results of other studies suggest that teachers are satisfied with the e-learning system used extensively (Cheok & Wong, 2014: 33). The TPACK framework demonstrates the interaction between the theoretical and practical aspects of the teacher's knowledge bodies in providing a platform for successful integration of technologies that will then support effective learning and teaching processes (Anderson et al., 2013: 554).

Based on previous research results related to TPACK development in learning, no one has tried to develop TPACK framework model in the context of special learning such as teaching science (Hsu, 2015: 17). Science is a subject area that extensively requires teachers to display typically abstract or difficult scientific phenomena which is further visualized and therefore students engage in a friendly and safe environment so they can ask and communicate ideas (Hsu, 2015: 18). Therefore, throughout this analysis the author tries to develop the science learning model through TPACK framework supported Hybrid Learning.

Hybrid learning that will be designed uses a 5i framework approach namely; (1) initiative, (2) interaction, (3) independent, (4) incentive and (5) improvement (Hutchison & Mitchell, 2008: 149). Hybrid learning ought to contain parts to let students to actively participate in on-line learning (Bates and Watson, 2008) and room coaching. In hybrid learning, students will take half of their time within the room and 1/2 their time on-line. The role of teachers is being transformed from the concept of teaching moves to 'learning' because the responsibility of learning will depend on student's initiative (Bates and Watson, 2008). The interaction of activities happens between the normal category model and on-line mode. One feature that may be provided in on-line learning is that the chance of interaction among students, and between students and academics (Lee, Tseng, Liu and Liu, 2007). Then in hybrid learning students can work and suppose severally. it's acknowledged that students area unit still having difficulties doing

their preparation, assignments and managing their workloads outside of the schoolroom setting (Lee, Tseng, Liu and Liu, 2007). In hybrid learning, academics play a vital role within the on-line setting regarding the speed of student learning (Negas, Wilcox and writer, 2007). Students are going to be motivated to attend to each modes of learning if the activities area unit cross-referenced between them. They area unit actuated if their activities or functions are familiarly utilized in a hybrid course. For instance internet blogs area unit one amongst the foremost common on-line activities to post and categorical their views. Moreover, hybrid learning are designed in such how that students grasp there's a rise in learning. They will check if they need a rise attending on-line categories (Teeley, 2007). This may be achieved by victimization technology integration in providing applied mathematics results to students concerning their learning progress.

2 Method

The development model used in this development research uses the ASSURE model. There are six steps in this development model: (1) Analyze Learners, (2) State the Objectives, (3) Select Methods, Media, and Materials ((Choose strategies, media, technology and materials) 4) Utilize Media and Materials, (5) Require Learner Participation (6) Evaluate and Revise. The design Model Development can be seen on Fig. 1: The following is the development stage of the ASSURE model (Heinich, et al. (2002: 54) to be conducted in the research (Fig. 2).

The following is the development stage of the ASSURE model (Heinich, et al. (2002: 54) to be conducted in the conduct of the research.

2.1 Analyze Learners

This step is to spot the characteristics of scholars United Nations agency can perform learning activities. The analysis subjects were third semester students (three) of the PGSD study program. The items which will be analyzed square measure associated with the power of scholars to use pc, internet, and robot applications additionally because the initial ability of elementary science learning subjects.

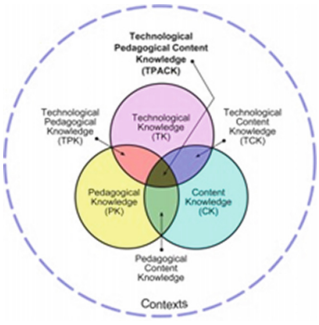

Fig. 1. TPACK Framework Component (Misra and Koehler, 2006)

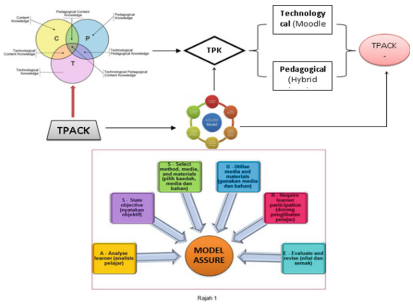

Fig. 2. Design of Development Model

2.2 State Objectives

This step is to determine learning objectives supported the results of the analysis of student characteristics. This Learning Objective is Learning Outcomes (CP) and Assessment indicators listed within the RPS KKNI that square measure then designed for Learning Activities supported the Hybrid TPACK framework.

2.3 Select Method, Media, and Materials

This step sets out strategies, media and teaching materials which will be used each face-to-face learning and on-line learning. The determination of the 3 relies on student characteristics and learning objectives. The tactic which will be used is Project primarily based Learning (PBL), Media exploitation Moodle LMS, and therefore the Material uses a range of ICT-based Learning ways, Models, and Learning Approaches.

2.4 Utilize the Method, Media and Materials

This step is to use the Method, Media and Material in learning activities. But before being used, expert validation is done first to see the quality and feasibility of the media, teaching materials and learning design through the RPS that has been made. After being validated by media experts and content experts, the next steps are individual trials (5 students), small group tests (10 people) and Field Tests (30 students).

2.5 Require Learner Participation

This step involves students within the learning that has been designed. Students should be actively concerned in learning so effective learning and learning objectives supported RPS are often achieved. Wherever the tactic of teaching which will be utilized in this learning is Hybrid Learning or combining face-to-face and on-line teaching).

2.6 Evaluated and Revised

The next step is to guage and revise. This analysis is finished to gather information associated with the strengths and weaknesses of the training program. Learning program which

Table 1. Reference for Qualitative Data Conversion into Quantitative Data

Rumus Perhitungan	Perhitungan	Interprestasi
$x > M_i + 1{,}8SD_i$	$x > 4{,}20$	Very Good
$M_i + 0{,}6SD_i < x \leq M_i + 1{,}8SD_i$	$3{,}40 < x \leq 4{,}20$	Good
$M_i - 0{,}6SD_i < x \leq M_i + 0{,}6SD_i$	$2{,}60 < x \leq 3{,}40$	Enough
$M_i - 1{,}8SD_i < x \leq M_i - 0{,}6SD_i$	$1{,}80 < x \leq 2{,}60$	Less
$x \leq M_i - 1{,}8SD_i$	$x \leq 1{,}80$	Very Less

Information:

Mi = ideal average

$= {}^{1}/_{2}$ (score maximum ideal + skor minimum ideal)

SDi = Standar deviasi ideal

1/6 (score maximum ideal − skor minimum ideal)

X = score average empirical data

will be evaluated embody product generated during this study square measure learning through TPACK framework supported learning Science PGSD Hybrid, additionally as different learning devices like, semester learning set up (RPS), student worksheet (LKM), lecturer activity sheet, and student response sheet. The results of the analysis method are often used as input or input to boost the training program.

Data collection techniques used are expert tests, questionnaires and tests. Expert testing is used to see the feasibility of the product produced, the questionnaire is used to see the student's response to the learning used and the test used to see the impact of learning. The instrument consists of expert validation sheets, closed questionnaires and open questionnaires and test questions.

Data analysis was disbursed through validation and trial by calculative the scores obtained to assess the standard of the educational model developed. Knowledge|the info|the information} collected during this study square measure qualitative data, particularly scores with a scale of one-5 (score 1 for terribly less, score two for fewer, score three for enough, score four permanently, and score five for terribly good) from the results of professional assessment and Student assessments are related to learning that is applied, advantages and disadvantages of learning. Qualitative data scores are converted into quantitative data using conversion references as in Table 1 which uses a Likert scale (Suharsimi Arikunto, 2003).

2.7 Research Results and Discussion

See Fig. 3.

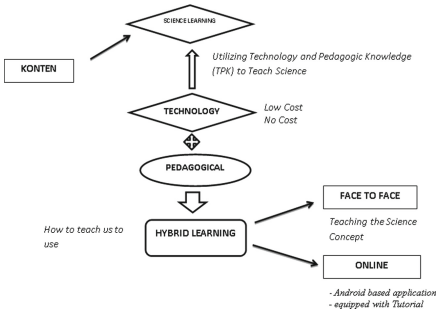

Fig. 3. Design of Hybrid Learning based TPACK Learning Model

Table 2. Evaluation of Experts

Expert	Average Score	Interpretation
Materi Expert	3.50	Good
Desain Expert	3.45	Good
Media expert	3.55	Good

2.8 Product Evaluation Results of Learning Aspects by Experts

The results of the analysis of learning embrace the accuracy of the formulation of objectives, the suitableness of the tactic learning, suitableness of the media and teaching materials, the determination of the sequence of face-to-face and on-line learning with the PBL (Project primarily based Learning) methodology, the convenience of learning activities for college students, the clarity of assignments given, and therefore the clarity of assessment and therefore the queries used. The assessment results obtained on the average 4.04 so that the categories obtained are good.

2.9 Media Aspect Product Evaluation Results by Experts

The results of analysis of media aspects of product embrace the quality of the media with learning, simple use of media, completeness of media, and media operate in facilitating the delivery of fabric. The assessment results obtained a median of 3. So that the categories obtained were good (Table 2).

2.10 Results of Evaluation of Aspects of Teaching Materials by Experts

The results of product evaluation aspects of teaching materials include conformity with Learning Objectives or CP (Learning Outcomes) KKNI courses in PGSD Science Learning, suitability with the level of student ability, completeness of material, ease of learning, ease of access to the Internet via Android devices via Smartphone, and completeness of forms display Moodle application. The assessment results obtained an average rating of 3.60 so that the categories obtained were good.

2.11 Product Trial Results

The results of product trials include individual testing, small group testing and field testing. The results obtained are shown in Table 3 below.

3 Conclusion

TPACK along with Hybrid Learning Model Design is a Learning Model designed for to meet the needs of learners and learners in improving learning innovation in the digital era. In addition, the development of this model aims to combine the professional ability of teachers to technology. Furthermore, the application of creative pedagogic through the combination of learning face to face and e-learning and knowledge of the material will be presented especially the teaching of science.

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