Indonesian Teacher’s Competencies Profile According to The SAMR Model Framework

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Abstract. The purpose of this research was to take inventory of teachers’ experiences and practices in online learning services during Covid-19 were aligned with the SAMR model (substitution, augmentation, modification, and redefinition) as a framework for the formulation of 21st Century Teacher competencies. Formulation of 21st-century teacher competency profiles is specifically developed based on competency standards for Indonesian Teachers, online learning practice experiences during Covid-19, and synergized with the SAMR framework. The 21st-century Indonesian teachers profile conceptually validated through the FGD technique (focus group discussion). The formulation of the specific competence of 21st-century Indonesian teachers refers to the SAMR framework is formulated successively in stages: 1) substitution; 2) augmentation; 3) modification; and 4) redefinition. Specific professional competences in developing content: 1) packaging and serving; 2) enrich; 3) adapting, and 4) creating. Specific pedagogical competencies in packaging and serving content: 1) offline; 2) online; 3) offline simulation; and 4) online simulations. Teacher position-specific social competencies: 1) instructor; 2) facilitator; 3) motivator; and 4) inspiration. Personality specific competencies in classroom communication: 1) passive; 2) active; 3) adaptive; and 4) interactive.

1. Introduction
Following the development of information technology-based learning technology, the characteristics of 21st-century learning, and the 4.0 industrial revolution, the competence of prospective teachers are required to be prepared since the learning process on campus. Learning experiences with various sources (media) and on-line based learning technology facilities provide teachers and prospective teachers to be able to create materials, packaging, and presentation (media). Limited distance learning has been implemented by established educational institutions that are supported by a communication technology infrastructure. For a wide range of applications, web-based application facilities are available, either free or paid. The communication revolution has had a wide social impact on all aspects of social, business, education, or politics. Teachers, who are mostly ICT users, are advocated to shift their teaching attitudes to embark integrating technologies into teaching practices [1]. Teacher competence based on the SAMR model can provide a level of technology use in learning [2]. The SAMR model can be applied in the teaching strategy to play a role in learning services according to the development of digital technology. This change is also expected in teacher skills and competencies [3].

As times change, the teaching profession must be able to adapt and accommodate the learning needs of (students). In the end, the teacher's operational competence in selecting content, delivering (delivery) material, evaluation, and assessment techniques requires specific competency attributes according to the
needs of the times. For this reason, a formula or formulation of model teacher profiles is needed as a study material to prepare prospective teachers in teacher education institutions (LPTK).

Indonesia teacher competency standards according to the Teacher and Lecturer Law consist of four competencies (1) professional, (2) pedagogical, (3) social, and (4) personality. Along with the development of digital technology (internet), it has directly or indirectly brought changes in social, economic, and learning behavior. The implementation of online learning (e-learning) and the use of online-based multimedia is a necessity in the 21st century. Based on the development of digital technology, the formulation of four teacher competencies must be able to adapt to specific competencies characterized by digitalization. The TPACK framework (technological, pedagogical, content knowledge) is one of the sets of knowledge tools that teachers need for effective learning [4]. The conceptual about the attribute profile of 21st Century Teachers in accordance with the framework of National Teacher professional standards and aligned with TPACK [5].

When compared to the total competency of Indonesian professional teachers with Malaysia, teachers in Malaysia have two more competencies. In addition, the formulation of competence has accommodated the development of 21st-century technology. Teacher competencies in Malaysia include mastery of (1) content, (2) 21st-century pedagogy, (3) evaluation, (4) psychological abilities; (5) counseling, and (6) information technology [6]. Technological and pedagogical advances in the 21st century have been accommodated. Rusdin has determined that technology and pedagogy are the demands of 21st-century teachers for more effective learning so that teachers must prepare and use technology systematically and selectively. The integration of mastery of technological knowledge, pedagogy, and content is an inseparable unity in learning. In the era of the 21st century which is synonymous with the era of communication technology, student-teacher communication is very important so that learning in physical and online classes can be effective [7].

One of the 21st-century Teacher updating needs is the alignment of the SAMR (substitution-augmentation-modification-redefinition) framework concept [8]. The relevance and need for 21st-century teacher competence in accommodating the SAMR framework is the ability of teachers to gradually substitute, augment, modify, and redefine learning materials, processes, and evaluations in accordance with the characteristics of 21st-century learning, namely digital-based learning (digital-learning).

The experience of the Covid-19 emergency, which forced teachers to apply digital-learning or e-learning, provided practical experiences as a teacher shock which also affected students and parents. The practice of online learning in the Covid-19 emergency in Indonesia can certainly be implemented by teachers due to various conditions both from the teacher or the support of the communication system infrastructure. To formulate the adjustment of the 21st-century Teacher profile based on the SAMR framework, it can be developed from the real experience of online learning during the Covid-19 emergency. The conceptual framework that the researchers will develop needs to be validated with the real practice of online learning during the Covid emergency. Research on online learning practices with the SAMR framework will help in defining competency profiles that are operational for the Teacher in selecting content, producing teaching materials, delivering materials, conducting evaluations, and assessments of need. The real output of this research is the formulation of the specific competency attributes of 21st-century teachers according to the SAMR framework. In real terms, the disparity and disparity of teachers in catching up with digital-based technology, the SAMR framework can help direct the gradual improvement of teacher competencies. The formulation of teacher-specific competencies in the digital era can help the teacher coaching process as needed.

There are four stages to the SAMR Framework: substitution-augmentation-modification-redefinition [9]. During the substitution stage, technology replaces tools to perform the same function but does not change the learning environment. For example, a washing machine is a technological tool that people substitute for washing clothes by hand. Hands and machines washing serves the same function; Most people substitute washing machines for their hands to make the process more efficient. In a school setting, students use word processing programs to design academic writing, as opposed to pencil and paper. These are both technologies integrating at the substitution level.
The augmentation stage occurs when technology contributes to changes in the learning environment to enhance the functionality of the learning experience. Allowing students to automatically save their cloud documents, as opposed to saving them manually, is an example of augmentation. The job-saving function has changed.

The modification stage leads to the integration of technology which causes significant changes in the learning environment and allows the educator to redesign the learning task in a new and meaningful way [10]. This is the first step in using technology to transform the task and the learning experience. Imagine that a history assignment calls for students to create a timeline of the last century, highlighting one event every decade. Typically, students will present their work using a sheet of paper and pencil to draw a timeline and write events on paper or use a computer to type their timeline.

The redefinition stage occurs when technology redefines learning and outcomes in innovative teaching and learning environments that would not have been possible without technology integration. Learning activities at this level use several technology tools including the ability to work on projects and documents simultaneously with colleagues, collaborate with people around the world and create real, digital projects infused with technology.

This paper is to redefine the competence of Indonesian teachers according to the 21st-century learning character aligned with the SAMR framework and real learning experiences during the Covid-19 pandemic. This paper presents the formulation of the specific competencies of Indonesian teachers according to the context of digital learning as a feature of 21st-century technology.

SAMR framework is a guideline for thinking levels that are developed along with the use of technology. As in Bloom's Taxonomy, the level of thinking of SAMR is in accordance with the demands and practice of online learning, each teacher has a different experience. Based on Indonesian teacher professional standards, the experience of teachers in online learning practices during the Covid-19 pandemic will be able to define the level of competency attributes more specifically. The formulation of more specific competency attributes will be useful as a basis for mapping real competencies in supporting the achievement of the character of teachers in the 21st century. SAMR Framework and 21st Century Learning Skills. Other benefits that can be provided from the results of this research exist to develop Teacher Education standards, both in undergraduate teacher education or in teacher professional education.

2. Research Method
The population of this study was teachers of primary and secondary education in North Sumatra province. The research sample was carried out randomly with reference to any size, amount, and time adequacy.

The research was adapted from the ADDIE (Analysis, Design, Development, Implementation, and Evaluation) method, which is suitable for curriculum design and learning [11]. The research phase begins with a survey of lecturers, with the following detailed stages: 1) literature study; 2) analysis: a preliminary survey (mapping) of online learning practices during the Covid-19 pandemic; 2) design: best-practices and the SAMR framework; 3) development of 21st Century Teacher conceptual framework 4) conceptual test or validated through FGD, and 5) evaluation, revision, teacher framework for teacher model.

![ADDIE method stages](image-url)
The stages of literature study were carried out by searching online academic resources with keywords: "professional teacher", "21st-century teacher", "SAMR", "Teacher and SAMR", "Teacher Profile in 21st-Century", "cyber pedagogy", "digital literacy". The form of academic manuscripts that will be guided is in the form of e-books, journals, research reports, and the like. The results of the collection of literature data are grouped based on keywords: 21st century, SAMR, cyber pedagogic, and digital literacy. The result of data acquisition is a list of competency attribute items (attribute listing) of the teacher profile according to the needs of the 21st century.

The list of competency attributes was confirmed to 4 experts, learning experts, evaluation experts, measurement experts, and practitioner representatives. This consultation technique was carried out with Delphi online so that in the end specific competency items were agreed upon through the FGD format.

After the teacher profile is defined in the form of a list of specific competency attributes, the researcher creates a competency matrix as a framework for making field validation questionnaires (teachers). Before the questionnaire was distributed to respondents, the questionnaire was validated by experts through FGD techniques with 5 sources, namely: learning experts, evaluation experts, measurement experts, practitioners (teachers), and linguists.

Literature studies were used to identify competency attributes that are consistent with the character of 21st-century learning that is reviewed based on the SAMR framework. The specific competency attributes was consulted with experts for validation. Based on the results of expert validation, the researcher determined specific competencies that were presented in the form of a matrix. The determination of specific competencies is defined as a conceptual formulation of the 21st Century Teacher Competency Profile based on the SAMR framework. The results of the conceptual formulation were again consulted with experts to obtain justification.

3. Result

3.1. Teacher Competencies in the SAMR Framework

Referring to 4 (four) competency profiles of Indonesian teachers aligned with the SAMR framework it can be presented in 16 (sixteen) is a multiplication of 4 by 4 (four times four). The key competencies of each cell are items of competence for Indonesian teachers under the SAMR framework. SAMR and bloom taxonomies can be developed for the formulation of 21st century teacher competencies [12]. The formulation of the key competencies that are defined is the specific competencies of 21st-century Teachers that must be achieved according to the SAMR framework. In detail, 4 Indonesian teacher competencies according to the SAMR framework are presented in Table 1.

| Competency Attributes          | SAMR framework |
|-------------------------------|----------------|
|                               | substitution   | augmentation | modification | redefinition |
| Professional                  | packaging     | enrich       | adapting     | creating     |
| Pedagogical                   | offline delivery | online delivery | offline interactive simulation | online interactive simulation |
| Social                        | instructor     | facilitator  | motivator    | inspiration  |
| Personality                   | passive        | active       | adaptive     | interactive  |

In detail, the formulation of the specific competency profiles of Indonesian teachers following the SAMR framework is as follows:

3.2. Professional Competence in Substitution Framework

Academically, the teacher's professional competence must be able to package existing content into other better media formats. If the teaching material is available in text form, a teacher must be able to package multimedia-based material. Teacher competence in substituting packaging in the era of digital learning is a minimum competency that must be possessed by 21st-century teachers.
3.3. Professional Competence in the Augmentation Framework
After being able to package (substitute) content that has been in other forms of media, a teacher must be able to enrich the material from existing materials. If initially a teacher only uses one teaching resource to present to class participants, the teacher should be able to make enrichments from other sources as a complement or supplement to learning. The availability and openness of online learning resources have provided opportunities for teachers to be able to augment (add) as 21st-century teacher figures.

3.4. Professional competence within the framework of modification
The availability and openness of online teaching materials are very helpful for teachers in compiling teaching materials to be adapted according to the learning objectives to be achieved. Teaching material modification framework can be implemented in adapting to the needs of the class. To become a 21st-century teacher, the opportunity to adapt material from many forms (formats) and various sources will make it easier to create learning modules.

3.5. Professional Competence in the Redefinition Framework
Redefining in the SAMR framework in developing teaching materials must be done through efforts to create content to be presented as a learning module. Redefining teaching material from one competency can be created from a different context from existing learning modules. One of the efforts to redefine teaching materials is to present material in the context of time as an update so that it is closer to the real issue or surrounding problems. The research process and new findings presented as teaching materials are the highest level in the development of teaching materials. To become a 21st-century teacher who can redefine teaching materials is required to be sensitive to the surrounding problems related to the curriculum so that it can become a study and research.

3.6. Pedagogical Competence in Substitution Framework
A specific pedagogical competence that 21st-century teachers must have is the ability to present teaching materials offline in digital-based packaging. The use of the application (MS-PowerPoint) in the delivery of material in class must be able and used by the teacher.

3.7. Pedagogic Competence in Augmentation Framework
The specific pedagogical competence that 21st-century teachers must possess in augmenting teaching material offerings is the ability to deliver the material through online media. After the teacher can package digitally and be able to present it offline, the 21st-century teacher must be able to communicate (delivery) via the internet media. The specific skills of 21st-century teachers to deliver teaching materials are the use of LMS, blogs, or social media as teaching media.

3.8. Pedagogical Competence in Modification Framework
The competence of 21st-century teachers in presenting material is the ability to create interactive teaching materials for simulation problem-solving. Interactive digital teaching material packaging will be more attractive to students. The use of simple, everyday applications (MS-Excel or MS-PowerPoint) can be created as interactive teaching media and presented offline.

3.9. Pedagogical Competence in Redefinition Framework
Redefining the presentation of digital-based teaching materials as a pedagogical competence of 21st-century teachers is the ability to deliver material online and interactively. Teaching material presentation technology can be developed into interactive content that can simulate various phenomena that can be presented online. The use of VR (virtual reality) and AR (augmented reality) technology should be tried and done by the Teacher.
3.10. **Social Competence in Substitution Framework**
Teacher social competence is related to the teacher-student relationship. The teacher-student relationship related to the position of teacher to students at the furthest level is only as an instructor who delivers and teaches teaching material. The position of the teacher only replaces (substitutes) textbooks. At this level, learning is still in the teacher centre condition.

3.11. **Social Competence in Augmentation Framework**
The role of the teacher socially that is closer to students is as a facilitator whose role is only to provide additions (augmentation). The role of the teacher in augmenting as a facilitator is by providing materials, tools, and guiding the learning process to achieve learning outcomes.

3.12. **Social Competence in Modification Framework**
To develop students as independent learners, teachers must position themselves not as a center or learning resource. Teachers must be able to provide challenges and encouragement to students so they can learn more independently so they can explore broader knowledge. The social position of the teacher is within the framework of the SAMR (modification) is to become a motivator.

3.13. **Social Competence in the Redefinition Framework**
Socially, students are human beings who are required to be independent in society when they grow up. Teachers must train students to be able to high order thinking to become agents of change and problem-solving. The learning process that builds higher order thinking skills must be trained and started from the school environment. The real learning process that teachers can do is not only delivering teaching materials but also providing best-practices and role models as inspirational figures.

3.14. **Personality Competencies in Substitution Framework**
Teacher personality competencies in the learning process can be presented in communication and interaction in delivering teaching material in class. The habit of teachers in general only asks questions to measure learning outcomes. Authoritarian teachers do not provide many opportunities for students to be active in responding or discussing. A passive personality without giving many opportunities for students to be more interactive is the lowest social competency in the SAMR (substitution) framework.

3.15. **Personality Competencies in Augmentation Framework**
A good learning activity is learning whose interactions are not dominated by the teacher. Teacher communication that is open and active, giving space for students to ask questions and discussion is a personality competency. The competence of 21st-century Indonesian teachers in terms of personality according to the SAMR framework (augmentation) is to be an active teacher allowing students to interact in class.

3.16. **Personality Competencies in Modification Framework**
Personality competence in communicating according to the SAMR framework (modification) is to become a teacher who can adapt to the context of students. Being a teacher who can act as a conversation partner and discussion partner for students is the demand of the 21st-century teacher.

3.17. **Personality Competencies in Redefinition Framework**
To become the ideal teacher as a person who is idealized by students is to get used to being an accommodating person in communicating. Redefining the personality competence of Indonesian teachers according to 21st-century learning is the ability to accommodate interactions (discussions) in class. The habit of listening to, responding to, and appreciating questions or discussion materials from
students by the teacher will bring a more conducive atmosphere and student-centred learning can be improved.

4. Conclusions and Recommendations

To improve the competence of Indonesian teachers according to the demands of 21st century learning with the SAMR framework, in a tiered (level) teacher must be able to use technology for substitution, assignment, modification, and redefinition. Key attributes aligned with professional competence are related to content development, in stages: 1) packaging and serving, 2) enrich, 3) adapting, and 4) creating. Key attributes aligned with pedagogical competence relate to content packaging, in stages: 1) offline, 2) online, 3) offline simulation, and 4) online simulations. The key attributes that are consistent with social competence are related to the position (relation) of teacher-student, in stages: 1) instructor, 2) facilitator, 3) motivator, and 4) inspiration. The key attributes that are consistent with personal competence are related to communication, in stages: 1) passive, 2) active, 3) adaptive, and 4) interactive. This specific teacher competence can be guided as a strengthening of the competence of Indonesian teachers in line with the development of digital technology. Teacher competency formulations more specifically need to be tested further to align with experiences, needs, and environmental support.

Acknowledgements

This research was funded by the BOPTN Medan State University research scheme in 2020.

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