



Exploring the Synergy of the SAMR (Substitution, Augmentation, Modification, and Redefinition) Model and Technology Integration in Education: The Key to Unlocking Student Engagement and Motivation

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Abstract

The SMAR Model of teaching and technology integration are compared in this research study with an emphasis on how they affect motivation and engagement among students in classrooms. In the context of the SMAR Model, the review investigates the theoretical underpinnings of technology integration and how it could encourage student motivation and engagement. It emphasizes the value of technology in education, the many forms of technology used, the variables affecting effective integration, and its effects on student motivation and engagement. The review also recommends areas for further research and emphasizes how closely the SMAR Model's integration of technology and student motivation and engagement are related. A significant positive relationship between the SMAR Model's integration of technology and improved student motivation and engagement has been found in the literature, particularly in the stages where technology is used to create interactive, dynamic, and personalized learning experiences. With an emphasis on boosting student engagement and motivation, the study provides educators and instructional designers with useful insights and ideas for successfully integrating technology inside the SMAR Model. It also looks at issues and things to think about while putting technology integration into practice. The review's conclusion highlights the potential for technology integration within the SMAR Model to increase student engagement and motivation, highlighting the necessity for creative technology usage to provide engaging and inspiring learning environments.

Keywords: Creative Technology Usage, Technology in Instruction, Learning Environments, Personalized learning, Instructional design, SMAR Model

1 Introduction

According to Hamilton et.al., (2016), SAMR (Substitution, Augmentation, Modification, and Redefinition) is a framework for educators to use when incorporating technology to create or enhance instructional practices. Dr. Ruben Puentedura developed this model, which provides a framework for incorporating technology into the classroom (Hamilton et.al., 2016). Puentedura's model works within this framework by illustrating how technological tools and resources can be used to support or enhance teaching and learning (Puentedura, 2014). The importance and relevance of bringing the SAMR Model to classrooms is the fact that it helps instructors promote student engagement and motivation, as technology is an integral part of students' lives (Puentedura, 2014). Technology can enrich learning activities for students in the classroom (Puentedura, 2014). Bringing technology into instruction allows the instructor to create authentic learning opportunities that are active, engaging, and fulfilling for students' various needs and interests (Hamilton et.al., 2016). The more active and enthusiastic students are during lesson delivery, the more they will be involved in their learning and benefit from it by gaining academic achievement and positive learning outcomes (Hamilton et.al., 2016).

In today's education, Harapnuik and Thibodeaux (2020) asserted that the integration of technology has gained importance as a result of rapid technological advances. Harapnuik and Thibodeaux (2020) further stipulate that several types of frameworks have been created to help teachers integrate technology into the classroom, and one of the most important models to guide teachers and students is the SAMR model developed by Dr. Ruben R. Puentedura. Nair and Chuan (2021) highlighted that the SAMR model provides a framework for teachers to effectively use technology in instruction and enhance their students' engagement and motivation in school. These levels as explained by Puentedura (2014) point out that the SAMR model is made up of substitution level whereby technology is used as a direct tool replacement with no real task change. This is followed by the augmentation stage where technology is used in addition to a task, providing an improvement (Puentedura, 2014). As highlighted by Puentedura (2014), the third level is the modification level where technology alters the task demands and project; and the redefinition level is where technology changes the task demands and projects to create a new, transformative task that would otherwise be impossible.

Savignano (2017) stressed that the transformative nature of the SAMR model in instruction is its ability to go well beyond technological substitution to create authentic, significant learning experiences by augmenting, modifying, and redefining educational tasks. By augmenting, modifying lessons, and redefining learning through technology, instruction can be transformed into a dynamic and engaging environment that engages students with a need and interest (Harapnuik &Thibodeaux, 2017). Additionally, because students are immersed in technology almost everywhere, the proper use of technology in teaching is essential for building the digital literacy skills needed for 21st-century success.

At the heart of the SAMR model is the idea that using it as a guide for student learning will improve learners' thinking, collaboration, creativity, and communication (Pfaffe, 2017). This will enable students to develop the kinds of skills and dispositions they need to be successful in an increasingly complex and connected world (Pfaffe, 2017). Wood and Reiners (2015) stipulated that authentic and real-world contexts provided by the learning environment also create intrinsic motivation for learning and limitless curiosity to continue learning. Moreover, Wood and Reiners (2015) further stressed that integrating the SAMR model in

education improves learning and helps move students from their comfort zone to modifying tasks. According to McQuiggan et.al., (2015), the implementation of the model requires investigation of real-world issues, such as providing professional development for the educators' needs, integration of technology with the curriculum goals, and integration of technological resources like laptops, and personal computing devices (McQuiggan et.al., 2015).

Contemporary educators have significant obstacles when it comes to successfully incorporating technology into teaching methods (McQuiggan et.al., 2015). The problems consist of opposition to altering teaching methods, time limitations, and inadequate technical proficiency among personnel (McQuiggan et.al., 2015). The integration of digital technologies to improve teaching and learning is still challenging, despite technology being widely used by students (Wood and Reiners, 2015). This study aims to provide a systematic framework to assist instructors in using technology to enhance student engagement and motivation. The study focuses on examining how the SAMR (Substitution, Augmentation, Modification, and Redefinition) model is used and its effects on integrating technology effectively in educational environments. Many educators face problems, such as staff members' resistance to changing their instructional pedagogies, time constraints, and low technological literacy (Wood and Reiners, 2015). This study examines various aspects of technology integration using the SAMR model. Furthermore, it explores the various benefits of this model, ways and examples used to integrate it with education, how successful it has been, the challenges associated with it, and its limitations. It provides a roadmap for educators, administrators, and policymakers to make this model successful in various educational settings. It strives to achieve this by providing a more expansive understanding of the impact of technology integration on the future of education.

1.1 Objectives of the Study

To provide an overview of the SAMR Model of Instructions.

To provide strategies to employ SAMR in classrooms better using technology.

To explore whether research studies/findings prove that SAMR affects student engagement and motivation.

1.2 Research Questions

How can technology be effectively integrated into the SAMR Model to enhance pedagogical development?

How does the SAMR model affect student engagement and motivation?

2 Methodology

This literature review employed a systematic approach to investigate the relationship between the SAMR (Substitution, Augmentation, Modification, and Redefinition) Model and technology integration in education, specifically focusing on their impacts on student engagement and motivation. Initially, an extensive search was conducted across academic databases, including PubMed, ERIC, PsycINFO, and Google Scholar, using search terms such as "SAMR Model," "technology integration in education," "student engagement," and

"student motivation." The search encompassed a wide range of publication dates, with emphasis placed on recent studies to ensure relevance to contemporary educational practices. Articles were screened based on their relevance to the study topic and potential contribution to understanding the relationship between the SAMR Model, technology integration, and student engagement and motivation. Only peer-reviewed journal articles, conference proceedings, and scholarly books were included, encompassing empirical research, theoretical frameworks, case studies, or critical analyses related to the SAMR Model and its implications for technology integration in education.

Upon identifying relevant publications, data extraction was conducted to retrieve pertinent information regarding the SAMR Model, technology integration strategies, and their effects on student engagement and motivation. Key themes, methodologies, findings, and implications were extracted and synthesized to identify prevalent trends and insights in the literature. The synthesized findings were organized into thematic sections corresponding to different aspects of the SAMR Model, technology integration techniques, case studies, and the impact of these interventions on student engagement and motivation. Additionally, the review identified areas within the literature that warrant further investigation and proposed avenues for future research, aiming to contribute to the ongoing discourse on the role of technology in education and its implications for student engagement and motivation.

3 Literature Review

3.1 Overview of the SAMR (Substitution, Augmentation, Modification, and Redefinition) Model

The SAMR (Substitution, Augmentation, Modification, and Redefinition) model provides a framework for understanding the stages of technology integration in educational settings (Hamilton et al., 2016). This approach, often talked about in academic literature, outlines four clear phases in which technology might change teaching and learning experiences (Puentedura 2014). Technology at the substitution level acts as a direct replacement for conventional tools or activities, with few alterations to the learning process (Hamilton et al., 2016). Substituting pen and paper with word-processing software for writing assignments is an example of substitution, where the work stays essentially the same but is done via a technological medium (Hamilton et al., 2016).

Advancing the augmentation stage, technology improves conventional tools or activities by including features that were previously unavailable (Hamilton et al., 2016). An instance of augmentation is the use of digital collaboration tools, such as Google Docs, which enable students to work on projects simultaneously and provide instant feedback, enhancing the writing process (Puentedura, 2014).

Technology is used to restructure learning challenges at the modification level, resulting in substantial alterations to the learning process (Hamilton et al., 2016). Students may choose to produce multimedia presentations or digital storytelling projects instead of conventional research papers. These projects may include photographs, videos, and interactive features to enhance communication (Puentedura, 2014).

Technology at the redefining level allows for completely new learning experiences that were previously unimaginable (Puentedura, 2014). This level signifies the furthest level of technology integration when learning activities are altered to fully exploit technology

capabilities (Hamilton et al., 2016). Utilizing virtual reality simulations for exploring historical events or scientific topics offers immersive and engaging learning experiences that transform conventional classroom teaching (Hamilton et al., 2016). The SAMR model offers educators an organized framework for incorporating technology into teaching activities, advancing from a basic replacement to more innovative technology applications (Puentedura, 2014). Educators may use the SAMR model to enhance teaching and learning experiences using technology, leading to deeper engagement and higher results for students (Puentedura, 2014).

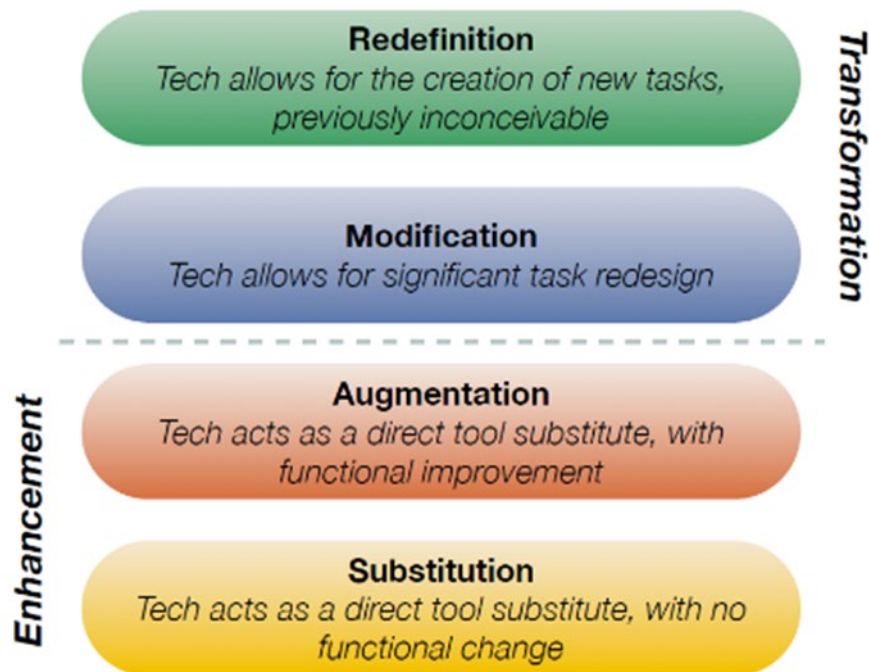


Figure 1. SAMR model (Puentedura, 2003)

3.2 Technology Integration into the SAMR (Substitution, Augmentation, Modification, and Redefinition) Model

Technology Integration into the SAMR Model Savignano (2017) stressed that once schools blend learning technologies into the classroom to improve student motivation and enhance teaching practices SAMR model can be used to foster sustainable technology integration and advance best teaching practices in schools. This section is concerned with the current literature outlining the ways to integrate technology into classroom practices which are systematically in line with the four levels of the SAMR model and, thereby, demonstrating practice approaches and examples of implementation.

Substitution Level

At the substitution level, technology is used as a direct replacement for traditional tools or tasks; however, it does not transform the fundamental nature of the learning process (Eteokleous et. al, 2024). As the first step in the SAMR model, this level represents the earliest stage of technology use in the classroom but plays an important role in setting the stage for more transformative uses of technology in education (Eteokleous et. al, 2024). Recent research has emphasized that the technological tools and resources used at the substitution level should be appropriate (Eteokleous et. al, 2024). For example, Young (2020) asserts that some teachers found that interactive whiteboards were a good substitute for

chalkboards as they were able to deliver more exciting lessons that included interactivity. Lesson delivery can now include elements of games with challenging tasks, fun animations, and sound effects (Young, 2020). Similarly, cloud-based productivity tools, such as Google Docs and Microsoft Office 365, have enabled the writing and editing of documents that are saved in the cloud rather than printed and handed in (Hamilton, & Rosenberg, 2016).

Augmentation Level

The next level, augmentation, involves people learning to do something better with technology than they could do without it (Hamilton, & Rosenberg, 2016). This enhances traditional tools or tasks to add functionalities that could not previously occur without technology to improve overall learning (Hamilton, & Rosenberg, 2016). Currently, there is a significant focus on how digital tools and applications extend learning activities (Hamilton, & Rosenberg, 2016). For example, many educationally focused apps and gamified learning environments enable learners to engage in interactive quizzes, simulations, and exercises to reinforce learning objectives as well as provide formative feedback to learners upon completion of the activity (Graesser et.al., 2022). Others facilitate multimedia presentations and storytelling to enable learners to create multimedia products that demonstrate their interpretation and understanding of content in creative and engaging ways (Harapnuik, & Thibodeaux, 2017).

Redefinition Level

Turner (2020) explained that the Redefinition level is the highest level of technology integration in the SAMR model, where technology allows teachers to reimagine completely new and transformative learning experiences for their students. Turner (2020) further observed that the use of technology to redefine learning activities allows for deeper learning of 21st-century skills. Emerging research examines some of the more innovative ways in which technology is changing how learning takes place so that our traditional understanding of learning in the classroom can align with a new vision for learning grounded in both cutting-edge research and advanced technology (Turner, 2020). This includes learning tailored through artificial intelligence (AI) and machine learning algorithms that respond to each learner's patterns and preferences (Turner, 2020). Learning can involve immersive virtual environments and interactive simulations that make it possible for students to collaborate in parallel worlds to solve problems and foster deep learning in labs (Scavarelli et. al, 2021).

Overall, the literature shows that today's educational technology can be implemented at all four levels of the SAMR model to improve the quality of learning and teaching using new software tools and environments. This ranges from substituting traditional tools with new digital tools to redefining learning tasks through virtual environments and environments with personalized intervention based on AI insights and simulations.

3.3 Case Study

Technological Integration in Social Studies Education: SAMR (Substitution, Augmentation, Modification, and Redefinition) and TPACK (Technological Pedagogical Content Knowledge)

In 2019, Hsu and Chen conducted a study examining the use of the SAMR Model and TPACK models to assess technology integration in two eighth-grade social studies

classrooms. The study took place in a medium-sized urban school district in southwestern PA during the 2014-2015 school year. Two eighth-grade social studies classes received iPads from the school, with veteran teachers selected based on their willingness to take risks and to allow students to integrate technology for learning. Data was collected through technology journals, semi-structured interviews, and reflective sessions. The teams evaluated the integration of iPads using SAMR and TPACK reflective models.

The SAMR model was found to be more practical as a tool to assess whether technology was used to reach instructional goals rather than as a hierarchy for designing instruction. The teachers observed that the SAMR model was more focused on learning content, whereas TPACK reflections were more refined and focused on the overall integration of technology across the school year. The Tech challenges arose due to technical difficulties and the apparent lack of connection between TPACK theory and the reality of technology integration.

Teachers have become digital media multitaskers, as they manage the needs of diverse districts, including home technology deficits and the need for highly mobile and transient students. TPACK reflections began to show what was made for effective social studies teaching in diverse districts. In summary, the teachers found SAMR to be a more straightforward model for reflecting on their use of technology with their students, while TPACK was found to be too cumbersome and complicated to work with in their actual classrooms because of pragmatic concerns regarding technology issues. This study supports the need for systematic, reflective ways of thinking about technology integration, and highlights the potential usefulness of both SAMR and TPACK for technology planning and reflection in classroom social studies practice.

3.4 Impact of the SAMR (Substitution, Augmentation, Modification, and Redefinition) Model on Student Engagement and Motivation

One implication of the SAMR model is that integrating technology into our classrooms has a direct impact on student engagement and motivation, both of which are tied to achievement (Akcaoglu, 2016). This section discusses research studies and findings on the effects of the SAMR model on student engagement and motivation in the context of technology use in education.

Many studies have measured the effects of SAMR on engagement and motivation, with a strong emphasis on encouraging students to participate and develop intrinsic motivation. Harapnuik and Thibodeaux in their 2017 comprehensive review of the SAMR Model emphasized the transformational nature of the SAMR model, namely, empowering students to engage at higher levels via the modification of learning tasks and the use of technology to empower students by making learning deeper and more meaningful, as well as authentic and engaging, as they become more involved.

Also, in a critical review paper on the SAMR model, Hamilton, Rosenberg, and Akcaoglu (2016) underscored the benefits of technology integration by stating that 'R in the SAMR categorization reconfigures how students interact with the content and embodies an increased mindset of ownership and power over their learning.' When students become more invested in their learning process, they are more likely to be motivated to explore, discover, and master information, which leads to superior learning achievement.

4 Discussion/Findings

The ‘Substitution, Augmentation, Modification, and Redefinition’ (SAMR) model has become the dominant educational technology framework that guides teachers about how to incorporate technology into their instruction. This study offers a detailed analysis of the role of the SAMR model in these classrooms and reveals significant consequences for how technology is integrated into teaching and learning for student motivation and engagement. At its core, the SAMR model is a way to move beyond old paradigms in instruction and to embed technology in different ways throughout the learning process. Move through the levels, and take students from substitution, where they just replace a common classroom task with a technology component, all the way to redefinition, where technology drives the learning process and transforms the assignment. At the core of the conversation is how technology can support authentic learning experiences. When educators move past substitution to the augmentation, modification, and redefinition levels of the SAMR model, it opens new possibilities for learning and engagement. Using technology to personalize learning, as well as shifting the focus toward student agency in learning, helps teachers create learning experiences that are relevant to students’ interests and goals.

In addition, the addition of multimedia and interactivity can amplify motivation and creativity. In a technology-enabled setting, via applications and tools, learners are not merely information wallflowers, but co-creators of knowledge. The transformation from learning-as-consumer to learning-as-interactor motivates learning as intrinsic motivation jumps when people engage with content. However, the path toward making technology a viable and useful partner in the classroom is facing some challenges. Educators are still grappling with issues of technological literacy, not just among themselves but also among students, change resistance, and time constraints. These hurdles make it critical for TEC initiatives to be well thought-out and for ongoing support mechanisms to be put in place. This will help educators overcome obstacles in their way. Considering these challenges, the findings emphasize the potential transformational applications of the SAMR model in the context of education. By creating a scaffold for technology integration, experimentation, and collaboration where teachers are free to explore different pedagogies and leverage technology as a tool for enhancing student learning.

In short, the SAMR model can be seen as a catalytic method in the transformation of educational technology, providing a guide for transformative learning experiences for both students and teachers. Its gradual path to technology integration challenges students to deepen their thinking while motivating themselves to update their actions to meet transformative learning outcomes because it creates an open environment for students to learn and create. As education practitioners gradually embrace educational technology and construct a new educational philosophy for learning alongside technology, the SAMR model, with its emphasis on learning-leading technology, will continue to shine as an example of inspiration.

5 Conclusion

In conclusion, the SAMR model provides a systematic method for incorporating technology into education, assisting educators in progressing through a range of transformative behaviors (Puentedura, 2006). Educators may use technology to create

interactive and stimulating learning experiences for students by advancing the stages of replacement, augmentation, modification, and redefinition (Puentedura, 2006)

Several case studies and research findings have demonstrated that the SAMR paradigm has a significant impact on student engagement and motivation (Hamilton, Rosenberg, & Akcaoglu, 2016). Technology integration boosts intrinsic motivation and promotes a higher degree of student engagement in the learning process through active learning, customization, and creative possibilities (Zheng, Warschauer, Lin, & Chang, 2016). Challenges, including technical literacy, reluctance to change, and time restrictions, emphasize the need for continuous professional development and support for educators (Ertmer et.al., 2012). Further study and development of the SAMR model are crucial to fully utilize its potential to influence the future of education (Puentedura, 2012). The SAMR approach acts as a catalyst for innovation, inspiring educators to rethink digital teaching and learning (Puentedura, 2012). The SAMR model remains a fundamental tool for educators looking to use the transformational potential of technology for student learning and achievement as technology advances (Puentedura, 2012).

The SAMR framework provides a systematic method for incorporating technology into education; however, it has some drawbacks (Ertmer et.al., 2012). It is necessary to explore the generalizability of its effectiveness across different educational contexts to confirm its relevance and usefulness in multiple settings (Ertmer et.al., 2012). Longitudinal studies are required to evaluate the long-term effects of the SAMR model on students' learning outcomes (Zheng, Warschauer, Lin, & Chang, 2016). The use of self-reported and qualitative measurements to evaluate the model's effectiveness emphasizes the need for established and verified quantitative assessment instruments. The efficacy of the SAMR model depends on the competency levels and training requirements of educators, thus highlighting the need for customized professional development programs (Zheng, Warschauer, Lin, & Chang, 2016). Future research should explore the effectiveness of the SAMR model in various disciplines; its impact on student learning; teachers' perceptions and practices of technology integration; its potential to address equity and access issues; and how emerging technologies can be integrated within the SAMR framework. By filling these research gaps, we can improve the application of the SAMR model, maximize its effectiveness, and enhance teaching and learning methods in the digital era (Zheng, Warschauer, Lin, & Chang, 2016).

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