



## Teachers and Technology - Be Aware or Beware?

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### Abstract

*Today, in the digital age, the emerging information and communication technologies (ICTs) reshape human life significantly. Fundamental changes reflect in humans' behavior and worldviews. In the field of education, the impact of ICTs manifests on the four components of education: teacher, learning environment, student and curriculum. Each of these components is affected by the digital age. The teachers' identity is a critical component, that can throw light and explain why the field of education is still far behind when it comes to digitization and reshaping education. In this paper, we apply a known SAMR (Substitution, Augmentation, Modification and Redefinition) model in order to assess the above components of education in the context of digitization. Teachers' testimonies are used to place each of the mentioned components at its specific SAMR level. The teachers' testimonies verify the major differences between the way the teachers adjust to the digital age and the way their students do. The criteria found to be the main implication in the interviews resonates why each of the mentioned components is in a different SAMR level. To succeed in reshaping education to fit the digital age, and reach digitalization, all the components described should reach the highest level of SAMR – redefinition. The difficulty lies within the contingent relations between the components. When one independently progresses, others are still behind blocking other components' progress as well.*

**Keywords:** *Teachers' Identity, Teachers' Worldview, Digital Age, SAMR Model, Science Teachers*

### 1. Introduction

The emerging of information and communication technologies (ICTs) reshape human behavior [1]. We live on the age of the digital revolution [2], which nature is not completely clear yet. Scientific revolutions yielded a substantial impact on human history; they involve the human consciousness and result in fundamental changes to peoples' worldviews [3]. The development of ICTs brings to blurred lines between the physical and digital worlds, which has an impact on the personal identity of individuals [4]. Education is going through a massive transformation because of the digital revolution [5]. Unfortunately, the transformation in education, as opposed to other fields that were affected by the digital revolution, is still far behind and education remains closer to its irrelevant, traditional form. Teachers' identities and worldviews are the key to understand how to reach the desired transformation in education [6]. Their experiences and skill sets are used by their students to prepare them for the real- world. New perceptions of the teacher's role are being consolidated [7], when teachers required to adjust to a new role [8]. The teacher has received an important mission, as the one who leads the transformation in education, therefore, teacher's readiness to this sort of shift is a crucial aspect to examine.

The technological enhancements change the way we learn; thus, education should refer to as a lifelong process, that happens inside and outside of the classroom, constantly, from anywhere at anytime. [5]. Seamless learning, which expresses this type of learning, is being acknowledged and supported as a successful approach for learning [9]. This phenomenon has a great impact on teachers, which should now be considered partners of learning outside of school; they are met on videos and social networks and contacted via text messages. The distance between them and their students changes and so does their professional identity that is going through a major transformation [10]. As partners of the process of learning, the teachers should be aware of the state of all involved components; the learning environment, the students and the curriculum.

The SAMR model states the four stages - Substitution, Augmentation, Modification and Redefinition - to achieve ICT integration [11,12]. Digitization in education will be achieved through the implementation of the fourth and highest level of the SAMR model - Redefinition. Using the reflection provided by the



teachers on themselves, on their students, on the learning environment and on the curriculum, we analyzed the current level of the four involved components and suggest a new aspect of the SAMR model levels to understand how redefinition in education can be achieved.

The purpose of the study was to (1) understand teachers' technology perception, (2) identify the differences between the teacher, student, environment and curriculum proposed by the teachers', and (3) identify the teachers' propositions on how to reconcile the differences.

## 2. Research Design and Methods

To understand the way teachers perceive technology, semi-structured interviews were conducted. The data collected in the semi structured interviews was analyzed using the SAMR model levels [11]. The research was conducted in Israel. Participants included 15 school science teachers, who participated in interviews, using a semi-structured protocol, with most interviews conducted over the phone and Skype calls. After conducting the interviews, we shifted to analyze the data using conceptual categories and to design a new aspect of the SAMR model levels.

## 3. Results

In table 1, two categories that were found to be the main characteristics of the teachers' technology perception are presented. The first category, "No better option but to fit in" characterizes teachers that have not happily accepted the technological transformation and described it as a change they are willing to accept; they describe it as a need, or an obligation. The second category "A will to fit in", characterizes teachers that demonstrated a desire to adjust and cannot imagine a situation in which they are not a part of the digital society.

	No better option but to fit in	A will to fit in
<b>The individual in the digital era</b>	<i>"I feel there are more minuses than pluses to it, but there is a sense of inevitability to fit and use it (technology)"</i>	<i>"Can not see life today without the digital society."</i>
	<i>"I appreciate the donation of it (technology) to our lives as an individual and as a society, and along with that, I find that we need to limit it so we will not degenerate as individuals."</i>	<i>"The 21 century is the digital century, and one who will not be technological, will be irrelevant."</i>
<b>The teacher in the digital era</b>	<i>"The teacher's role has changed and therefore, he has to adjust to the changes."</i>	<i>"The school must not be disconnected of real life"</i>
	<i>"The teacher does not have the privilege to ignore the world around him, as I see it, and it is true for any educator."</i>	<i>"You cannot challenge students in face to face lessons only."</i>

Table 1. Teacher perceptions of technology



Table 2 describes the differences in digitalization as described by the teachers between themselves, their students, the learning environment, and the curriculum. Teachers claim that students learn outside of school, they claim that they are constantly connected and use technology more than they do. Most of

Student focused	Role focused	Environment focused	Curriculum focused
<i>"They do not learn it in school, there are workshops in school, but their effect is minor compared to reality, when the experience it themselves."</i>	<i>"In an era where there are phones and I cannot get the students attention, I cannot teach them."</i>	<i>"The change should be human, not technological."</i>	<i>"We are under the pressure of the curriculum and the timetables to complete transferring all the content"</i>
<i>"Each student progresses in his own pace, not everyone at the same level. therefore, the teacher should be very flexible"</i>	<i>"If the teacher does not prepare a visual, virtual lesson, it is not working."</i>	<i>"There is a slide projector and speakers in every classroom."</i>	<i>"Eventually we need to align with the Minister of Education's curriculum"</i>
<i>"They are all the time on the phone, playing games, play and talk to their friend about the game, they use technologies more than me."</i>	<i>"The teacher today is not a character that the students are intimidated of like it used to be, and on the other hand, the limits are blurring. Sometimes it is hard to take over the class like that."</i>	<i>"Today we push a button and we are all connected to all of the videos etc."</i>	<i>"As teachers, we squeeze to align with the restrictions. It seems like there's this attempt to keep pushing more and more content, but what is the purpose?"</i>

Table 2. Differences between teacher, student, environment and curriculum

them considered the classroom as the main, if not the only, learning environment. They did not consider other locations or spaces as an environment where they have an influence. The teachers claim that they teach the curriculum that is provided to them by the Minister of Education; they have minor influence on the class plan. The two major concerns described by the teachers were their role, which is unclear to them and their students, who do not pay much attention during the lesson.

Table 3 demonstrates how teachers suggest reconciling the differences in digital progression between themselves, their students, the environment and the curriculum. They focus on equipping the classroom with more technological elements such as computers. They understand the need in role change and suggest connecting to their students via digital technology.

Student Habbits Change	Role Change	Environmental Change	Curriculum Change
<i>"We should listen to the students, they have a lot to say and they are bright, they are not deserve to be asked?"</i>	<i>"We cannot continue to complain that the student are not suitable for us. It is the teaching and the content that we teach should change."</i>	<i>"The availability of computers. Every classroom should contain working computers, with WIFI connection which I can use when ever I want."</i>	<i>"The time to teach languages is now, when they are young. Languages like Chinese develop and we should teach them those languages. It is something we are missing."</i>
<i>"Talking from experience, I believe that books help students, it is more focused. The Internet distracts them."</i>	<i>"Today I understand that I must accept it (digital technology)"</i>	<i>"There are still not enough Internet, not enough working computers."</i>	<i>"We should consult more with the students about the curriculum, they have so much to say."</i>
<i>"Some kids sits with a laptop or a computer, kids who are more connected to their phones. You need to know how to learn how to deal with it."</i>	<i>"I think that it is a matter of time until all subjects will be more about facilitating and less on granting knowledge."</i>	<i>"Schools should regulate the use of technology. Because we (teachers) have no control over it during the class."</i>	<i>"Teachers should start using all the available content there's on the web. There are many reliable content suppliers."</i>

Table 3. Teachers propositions on how to reconcile the differences





#### 4. Conclusion

The study aimed to understand teachers' technological perception in order to identify the differences in the level of SAMR model among the four components of education: teacher, student, environment and curriculum. From looking into teachers answers and experiences, two dominant groups of teachers were recognized. The teachers attributed to the first category accept technology as a “no-other-choice” perception and present a state of acceptance, unwillingly. The teachers attributed to the second category showed a desire to accept technology, relate to it and presented a generally positive approach towards it; they believe that the world should adjust to technology. One major finding of this study is that both groups of teachers think that technology should be accepted and practiced which throws light on the way technology is perceived.

Additional finding of the study is that the education components varies in their level of SAMR model. From the way that the teachers reflect on the relationship between the four components, it appears that there are almost no interface points between them. The teachers are concerned mostly about the new problems they deal with regarding students, describe their students as digital, connected individuals and even imply that learning happens outside of school, but do not identify themselves with those symptoms of digitization. Most of the teachers still limit their teaching to the classroom, while describing it as lacking in resources; their major concern is how to add more technology to their lessons, even though they cannot implement it in the curriculum. It is clear that teachers are more focused on transferring the content of the lesson as planned, rather than on the learning process, and do not take into consideration all the components as a whole. Their attempt to “hit” as many targets as possible, such as technology integration, student’s satisfaction and completion of the material in time for exams is recognized; deep learning approach and attempt to act toward learning redefinition does not. When the teachers describe their students, they bring up their concerns regarding the use of smartphones in class and the students’ lack of attention. Only a few clarify that they do not wish to fight the phenomenon but do not know which adjustments are needed to succeed in teaching the students in the current situation. The study identified the teachers propositions on how to reconcile the differences between themselves, their students, the environment and the curriculum. The majority of teachers suggested to listen to students, to change the school environment and curriculum, and redefine the teacher’s role as a facilitator.

In order to handle the main issue that should be addressed, we propose to use the SAMR model. As presented in Figure 1, all the components are behind the desired level of SAMR – redefinition, while each component is at a different level.

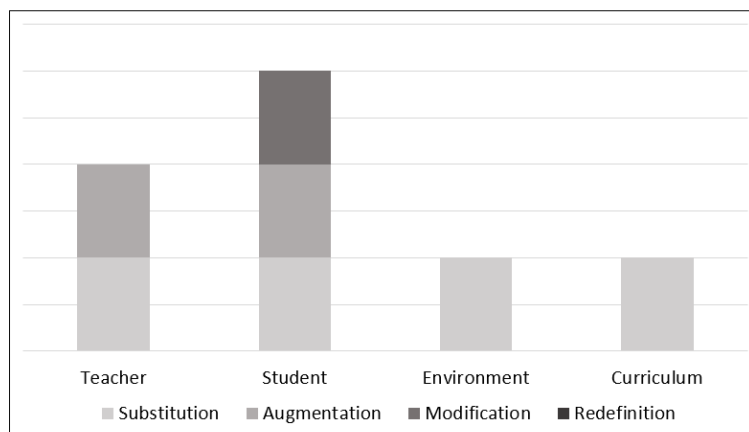


Figure 1. The level of SAMR model of each of the four education components

The main contribution of the paper is our conclusion that in order to achieve the digitization of education, all components should meet at the same SAMR level, the level of redefinition. We believe that the proposed approach has both theoretical and practical significance on the way of the digitization of education.



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