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Using Tablets for Technology Integration in Classroom Differentiation

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Abstract

Differentiation works on both individual and social levels; the immediate outcomes in the classroom have an influence on the whole life of the society. The learning process could be differentiated in terms of content, process, and product by taking students' readiness, interest, and needs into account. Our research has shown that using tablets in classrooms provides a useful implementation tool for differentiation. However, attitudes and beliefs of teachers are as important as experimental studies to understand the advantages of using tablets to ensure the differentiated curriculum and its implementation. Participants' ideas on using tablets in classrooms for differentiating the classroom were documented in a bootcamp that includes ICT, English, Math, and class teachers who use tablets, ICT experts, and academicians. Questions included topics like the need for differentiation, the advantages and disadvantages of using tablets for implementing the differentiated curriculum, and the teachers' attitudes on using tablets. They pointed out that differentiation via technology is able to meet the different needs of students. They reported that technology degradation and tablets were useful tools for differentiation. However, they all agreed that a successful organization was needed to be able to include technology to the existing practice and curriculum.

Keywords: differentiation, using tablet, technology integration, TPACK, TABLIO

1. Introduction

Today's modern world caters for a great variety in applications and practices for education. The development of technologies and the Internet has also diversified the opportunities for students and teachers in this context. The students who are attending the schools are more diverse and come from various segments of the societies. This is more demanding on the side of the schools and teachers, and one size fits them all does not work in this respect. The awareness of the learner differences has risen among all societies and educational circles, and thus curricula have been changing more rapidly. In Turkey, for example, the curricula for all levels have been changed almost every 4 years now. Previously, the curricula changes were taking place in almost every 10 years [1].

The changes of curricula are necessary because the diversity of the students and the learning styles of those students need to be recognized. However, the recognition of the learning preferences is not enough in itself and requires taking more action.

groups with different needs like learning disabilities, some disorders, and various disabilities. In this way the teachers can help students with special needs succeed personally in school and in their community. Students with these kinds of special needs are likely to benefit from additional educational services such as different approaches to teaching, the use of technology, a specifically adapted teaching area, or a resource room. Teachers can also design *remedial programs and extracurricular acceleration programs* in small groups such as developmental education, basic skills education, compensatory education, preparatory education, and academic upgrading as well as sports, music, arts, academic clubs and many other after-school activities [21].

Educational differentiation necessitates taking both *students' readiness, interest, and profiles* and teachers into account. Students' readiness is about students' previous knowledge or skills. Students' interest areas could be used to increase the motivation toward learning and create links between the content and the student; finally students' learning profiles are their preferred way of learning.

When teachers are considered in the differentiation process, what they can differentiate first is *content*. Content-oriented differentiation reflects the ways of modifying the content and also varying methods of presentation. Content is dependent on subject, text, and age of the learners. Content information should be provided through a variety of sensory inputs, e.g., audio, visual, or kinesthetic. To differentiate the content, [22] recommends designing activities around Bloom's taxonomy including remembering, understanding, applying, analyzing, evaluating, and creating. Some students can prefer to learn in certain ways. Thus, delivering the content materials by taking the learning preferences such as visual, auditory, and kinesthetic into account makes up a successful *process* differentiation. The process-oriented differentiation could be achieved by letting students explore the content in pairs, in small groups, or individually. The students should be given multiple options for taking in information and making sense of concepts to be learned. In the end of the learning process, students are expected to produce outcomes to evaluate their takeaway from the content. This *product* could be differentiated as well. These products could be in the form of tests, projects, reports, portfolio, performance assignments, concept maps, structured grids, self-evaluation, or peer evaluation.

Terwel views schools as places where the task of guiding students to learn to think for themselves and creating conditions for developing this "disciplined intelligence" as a habit of mind are emphasized. This of course necessitates different approaches to the function of the curriculum that emphasizes one fit for all. Thus, offering different curricula to different groups of students is becoming more and more common in modern education. In Germany and in many other European countries, students from the age of 10 are selected into different school types or streams according to ability and career perspectives. Streaming, tracking, and ability grouping are the most persistent issues in curriculum theory and practice [24]. Furthermore, in the context of gifted students, [25] identified four ways that the curriculum can be modified to address the needs of learners:

- Acceleration: adjusting the pace of learning
- Enrichment: allowing for more depth and exploration within the content area
- Sophistication: bringing more complexity and abstraction to the subject
- Novelty: providing for learning opportunities not generally included in the curriculum, often through self-directed, interest-based projects

5. Pedagogical design principles on classroom differentiation with tablets

Tablets could be a very practical way for differentiation in the classroom. Pedagogical implications relating to the tablets are that they can work on all content, process, and product differentiation phases. The apps that can be used on tablets are various, and this very nature of the tablets enables a diverse use in the classroom. Differentiation needs to be proactive and should allow many stakeholders in the process to be successful. Differentiation with tablets is student-centered in nature, and being aware of the many differences in the group could be considered a significant influencer in achieving inclusion of all students. Thus, differentiation entails quality rather than quantity. This is not a static concept but rather an organic, dynamic process.

The tablets could be used to differentiate the *content* by using a varied set of learning materials, such as various apps for various presentation types. It will also be wise to use materials that are meaningful for the students and are also reflecting authenticity. Student-generated content as learning materials for other students or classes could also help in varying the content and to break the course book domination. When *process* is taken into account, the teachers should approach the students with a coaching attitude and should support their students where needed. Moreover, peer teaching can also be part of the classroom as well as streaming, and different grouping techniques could be used variously. Teachers can vary the learning environment by changing places around the school as well as outside the classroom in real-life environments and even virtual environments. Students should be stimulated to assess themselves and their peers; the teachers should also give timely and concrete feedback to students and therefore integrate ICT tools as a solution. *Product* differentiation across the learning process could encompass the use of alternative assessment techniques in addition to traditional assessment techniques in order to adapt more to individual needs, changes, and differences. The products need to enable the students to use higher-level thinking skills. These can be made apparent by using transparent evaluation rubrics. The final products of the lessons should reflect students' different characters, needs, levels, and preferences, and the teachers should be prepared to allow for a variety and perform summative and formative assessments interchangeably. Teachers should take advantage of the available ICT tools for assessment as well. Teachers should be aware of differences between students based on special needs, gender, culture, linguistic preferences, strengths and weaknesses, confidence, self-awareness, and self-efficacy [21].

When tablets or other mobile devices are planned to be used for differentiation in the classroom, teachers should be aware that implementing those devices requires some considerations to be taken. The first of those could be the security of the devices; the use of mobile devices for differentiated learning should comply with the policies, legalities, guidelines, protocols, and structures that are aimed at protecting the health and well-being of both the learner and the teacher. Both the students and the teachers should be media and digital literate, and if they are not, they should be given previous training. In all levels, teachers should inform the parents and the school management and get permissions for profiles and other online accounts and shares. The teachers should provide secure online and digital environments. If a school decides to use tablets, a clear policy on privacy, security, and storing/deleting user content has to be ensured. A multi-platform approach should be adopted, and apps that function platform independently should be favored.

When apps are selected to be used, there has to be previous consideration on app availability and access; the choice of the right app for learning should be influenced by the differentiated needs of the learners. It is suggested to use the apps that work well

on all devices. Flexible approach to apps is also advisable as when an app is getting old-fashioned, teachers should consider a change. Initially free apps should be preferred, and if they do not meet the differentiation needs, paid apps can be selected as well. A group of teachers can come together to decide what the common educational needs are and adapt the apps that will be used. A “line of apps” could be an interesting approach in order to have alignment within a grade and across grades. The school can provide the tablets and the apps as well as BOYD approach. The Internet and Wi-Fi infrastructure should be reliable and robust. Students and teachers should take account of the restrictions associated with individual mobile devices such as screen size, memory to save apps, and outputs such as images and infrastructural limitations, e.g., bandwidth, availability of Wi-Fi, etc. There has to be clear statements about what student may and may not do with the tablet, during classes, but also in between classes [21].

6. Differentiation examples

The differentiation scenarios have been designed according to the deficiencies teachers who attended the 3-day TABLIO Project Bootcamp have observed in their classrooms, schools, and curriculum. The practical workshops included three full-day meetings with classroom, English, and mathematics teachers. The first meeting introduced the TABLIO Project concept map about the integration of tablets for differentiation. The second meeting was held a month later and required the teachers to work in groups and design their own lesson and action plans based on their needs and contexts. The last meeting that was held a month later was about reporting, evaluation, and reflection on their experience with their lesson plans. The differentiation scenarios which the classroom, English, and mathematics teachers have designed and organized during the TABLIO Project Bootcamp have been included in this section.

6.1 Differentiation examples for classroom teachers

6.1.1 Learning objectives

Topic: fractions

- The teacher shows the whole, half, and quarter with suitable models and explains the relationship between whole, half, and quarter.
- The students use fractional representations of all half and quarter models.
- The students identify simple, compound, and integer fractions and models.
- Students show the whole, half, and quarter with suitable models and explain the relationship between whole, half, and quarter.
- Students compare and sort the unit fractions.
- Students make adding and subtracting with fractions with equal denominators.

6.1.2 Student profiles

Grade 2, Grade 3, and Grade 4 students.

Group work will be done since there is no tablet in each class.

6.1.3 Process differentiation: learning activities

- An animation prepared with “Scratch” will be used in the teaching process.
- “Fraction for Kids” and “Simply Fractions 2” will be used as an activity. Both applications can work without an Internet connection.
- “Kahoot!” and “Learning Apps” applications will be used in the evaluation process.

Space adventure animation will be prepared with “Scratch” by coding. In the animation, two characters are going into space. There is a problem about the food. They have little bread and try to share the bread. In this process, the characters who use the concepts of full, half, and quarter will try to teach these concepts. At the same time, concepts such as equality and justice will be emphasized.

In the practice phase, Kahoot!, Plickers, and Learning Apps will be used to reinforce the concepts of full, half, and quarter.

During the evaluation process, a test created by the teacher on Kahoot! will be used to measure the learning outcomes. The teacher will make observations during the application and perform video recordings. The teacher will note down the important events and situations.

Applications that are going to be used during the application will be announced to the parents via WhatsApp, and the apps will be uploaded to the tablets in advance. Applications vary depending on the versions or brands of some tablets. It is important for the teacher to make checks before the class to avoid any problems during the course. During the teaching-learning process, videos that are uploaded to the “Padlet” will be monitored. Then, the link for the “Padlet” will be shared with the QR code. The animation that is prepared with Scratch will be watched in the class. “Dot Day” coloring page 2 will be used in the Quiver application (I say - you guess). The special information given in the videos will be repeated. Because of slow Internet speed, “Fractions for Kids” and “Plickers” (instant student evaluation) will be used for individual study. “Learning Apps” will be used as a group work in the classroom with the multi-connection tool. The game pins and extensions of “Kahoot!” and “Learning Apps” work will be announced to parents for use at home and to perform evaluation again. Students will be asked for a product like movie posters, etc. (any application that the students prefer can be used) during the evaluation process. The products that are delivered to the teacher will be shared on “ClassDojo” as an example to other students and parents. Each student will be asked to express his/her understanding. The goal here is not to prepare a homework but to learn in a fun way and self-realize themselves.



6.1.4 Content differentiation: teaching materials and educational technologies

- Technological devices: tablet
- Tablet applications:

📱 Scratch

📱 Fraction for Kids

📱 Simply Fractions 2

📱 Kahoot!

📱 Learning Apps

📱 Padlet

📱 Plickers

📱 Quiver

📱 Inigma

6.1.5 Content differentiation: accessibility and availability

Applications (Fraction for Kids, Simply Fractions 2) are downloadable and executable to Android devices.

Fraction for Kids and Simply Fractions 2 applications are available without an Internet connection.

The course content produced with the Scratch application will be output as video.

Kahoot!, Flickers, and Learning Apps are applications that can be used on all devices because they are applications that are open on the web.

The applications are designed so that the elementary school students can easily adapt and use them.

6.1.6 Product differentiation: evaluation and progress control

Kahoot! will be used during the evaluation phase. The students' achievement as a group will be determined with the Kahoot!, and additional activities will be done with the groups that cannot reach the desired level.

Evaluation will also be done using videos and "Learning Apps." The videos will be used as a tool for the students to transfer their learning as individual homework.

6.2 Differentiation example for English teachers

6.2.1 Learning objectives

1. To increase the participation of students in speaking activities
2. Minimizing errors in pronunciation

6.2.5 Content differentiation: accessibility and availability

Applications are compatible with different operating systems (iOS and Android), and students can use them easily when they have Internet and tablets.

6.2.6 Product differentiation: evaluation and progress control

Applications created with “Toontastic” or “Voki” are shared in the classroom with the “Padlet” app, and students are allowed to comment and like. In this evaluation, it is aimed not to repeat the mechanical errors.

“Quiver” or “Flipgrid” can also be used for the evaluation phase.

Students can use “Toontastic” to produce a film of their own and to practice language more self-confidently.

6.3 Differentiation example for mathematics lesson

6.3.1 Learning objectives

- Students can understand that the integer fraction is the sum of a natural number and a simple fraction.
- Students can convert an integer fraction into a compound fraction and a compound fraction into an integer fraction.
- Students can make calculations of simplification and expansion on integer fractions and compound fractions.
- Students can perform addition and subtraction of fractions with or without equal denominators.

6.3.2 Student profiles

Differentiation scenarios were prepared for the 4th, 5th, and 6th grade students. Students are experiencing problems in Grades 5 and 6 because they cannot conceptualize the concept “full-half-quarter” that they learned in the Fractions Unit in the 4th Grade. Not every student has a tablet. Therefore, group work can be done. Each tablet has access to the Internet.

6.3.3 Process differentiation: learning activities

1. With the “Edpuzzle” program, students are given quizzes. Students watch a question-and-answer video, and students’ quiz results are presented as a graphic.
2. Stories are combined in the “Storybird” editing program and turned into a book.
3. The mind map of differentiated education is created with the “Xmind” or “MindMeister” programs. Students create a concept map on fractions.
4. An activity is gamified and applied within the class.
5. An animation is created on “Morpho” program.
6. Course feedback is taken with the “Plickers” program.

