

## **Integrate the iPad, Apple Pencil, and Goodnotes, to enhance teaching effectiveness.**

**Prof. Arzu Susoglu, SUNY Farmingdale**

Arzu Susoglu is currently pursuing a PhD in Computer Science and Engineering at Bridgeport University, with an expected completion in 2025. She earned her master's degree in Electrical and Computer Engineering from the New York Institute of Technology in 2010. After several years in the IT field, Arzu transitioned to academia in 2016, driven by her passion for teaching. She now serves as an Assistant Professor in the Computer Security Department at Farmingdale State College, where she teaches courses in data security, cryptography, computer forensics, and senior project writing. Her research interests include machine learning, artificial intelligence, cryptography, steganography, and security. Arzu focuses on providing hands-on learning experiences and integrating real-world applications into her curriculum, ensuring her students gain the skills needed for successful careers in technology and security fields.

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## Abstract

Using multimedia such as slides, diagrams, charts, and videos as visual aids during lectures has proved to be highly effective in teaching. These tools not only help teachers stay organized but also improve students' learning experiences. Visual aids clarify complex information and help maintain student's attention.

Traditional notetaking, where students copied what teachers wrote on the board while adding their own notes, has successfully been replaced by slide show presentations. Over the past few decades, slide shows such as PowerPoint presentations, have been used to structure lectures, allowing students to write less and focus more on the content. This approach also enables teachers to concentrate more on their teaching, adding notes as they go through the slides, and incorporate additional strategies such as discussions and group work. These materials can then be saved and shared with students afterward.

Although a clicker might help, a teacher must stay close to the computer to add notes to the slides while teaching. In addition, the teacher is responsible to then save the annotated slides and reshare it with students.

This paper advocated the use of hand-held devices, such as the iPad Air or iPad Pro, paired with a smartpen, and a note-taking App like Goodnotes, to enhance teaching, particularly in design- and math- heavy courses. Additionally, it suggests that note-taking apps such as Goodnotes should be updated to be more teacher friendly. These tools enable teachers to review slides, draw diagrams and add handwritten or typed notes in assorted colors and fonts, edit, highlight, and use laser features - all while having the flexibility to move around and position themselves anywhere in the classroom.

Additionally, these tools allow teachers to share a link to the digital notebook they are working on, enabling students to view its content in real-time from any device at any location. Students can flexibly navigate any page of the notebook on their screens, while working on problems or in groups. Those who miss class will also have instant access to content. Teachers do not need to upload anything, sharing the link once and using the same notebook is sufficient.

Note-taking App, Smart Pen, Goodnotes, Active learning strategies, Flipped classroom, PBL, Blended Learning, LMS.

## Introduction

For several years now, students have been using note-taking apps such as GoodNotes and Notability to take notes during classes. These apps allow students to add PDFs, images, and

slideshows to their notebooks. Using smart pens, such as Apple Pen, they can take notes and annotate elements with built-in pens, pencils, highlighters, where the colors, thickness and size can be easily adjusted. It is apparent that these apps are designed with students in mind, offering collaboration features by sharing a link to the notebook with equal editing rights.

Recently, the GoodNotes Classroom app was launched, with built-in AI tool for classroom settings, where every user must have digital devices to participate in classroom activities. This setup seems more feasible for K-12 schools where districts provide these expensive devices to each student. However, in college setting, it does not seem realistic to require students to own such devices. Most colleges and universities offer classes in labs equipped with computers, and students own personal computers within their budgets.

To extend this, it would be more feasible to update the GoodNotes 6.0 app to be more teacher friendly. This would allow students to view teachers' notes on any browsers and use their own device, regardless of the make, model or brand or even use traditional paper if they prefer. Students will always have access to teachers' notes as long as they have a device, browser and an internet connection.

## Active Learning Strategies

A typical classroom activity in higher education consists of lectures, classwork, and assessments. In a traditional college course, students attend lectures, take notes at school, and then complete assignments at home. Educators have been developing active learning strategies to enhance the learning experience.

According to Canavesi and Ravarini (2024), the most effective active learning strategies include writing, large group discussions, group work, peer assessment, case studies, flipped classroom, quizzes, gamification, game-based learning, business simulations, role-playing, jigsaw discussions, problem-based learning, project-based learning, site visits, learning by doing, and debate [1]. Blended learning would be a great addition to this list. In the following sections of this paper, a few of these major strategies will be discussed

## Flipped Classroom

The concept of the flipped classroom challenges this traditional model. It suggests that attending lectures does not necessarily require being in a classroom full of students. Instead, students can watch lectures outside of scheduled class time at their own convenience, freeing up in-class time for assignments and group work. For math- and design- heavy courses such as engineering courses, the flipped classroom approach can be particularly effective. During class, students can focus on peer instruction, collaborative activities, and working on their assigned tasks, knowing that help is available [2] [3].

One key benefit is the ability for students to access the teacher's notes independently. They can navigate to the specific pages they need without being "forced" to follow the same part of the notes as their peers. This is especially convenient for students collaborating at different levels or working on different parts of the problem or design. With any device that has a web browser and an internet connection, students can individually view the notes they need.

### Problem/project-based learning

Another concept that challenges the transitional model is problem- and/or –project-based learning. In this approach, students learn by applying their knowledge to solve a problem or work on a project. As students encounter challenges during the process, they learn the underlying concepts by addressing these challenges one at a time. Unlike the traditional setting, where material is taught first, this approach allows students to learn through trial and error as they work through real-world problems [4][5].

Similar to flipped classroom approach, this approach allocates time for students to work in groups and engage in collaborative problem-solving by sharing ideas and learning from each other. The proposed technology will be extremely helpful in this context we well.

### Blended learning

Blended learning setting is a strategy where learning takes place independent of location, and, in some cases, time. This approach is highly dependent on technology and internet availability. Students may complete a part or all their learning activities remotely and submit their work through the provided Learning Management System (LMS). Teachers can conduct remote synchronous classes, utilizing media and screen sharing through meetings apps. In real-time students can follow these lectures, which, when enhanced with proper notetaking and annotation tools, closely resemble in-person classes. This provides students' location independence. Additionally, most meeting apps offer recording features, allowing students to review the material at their convenience, making remote learning time-independent or asynchronous [6][7].

For teachers using proper notetaking and annotation tools is very crucial in this case. In addition, providing instant access and ensuring the security of the content is essential.

### Proposed improvements for Goodnotes.

The note-taking app Goodnotes is an excellent tool for courses, allowing users to create single or multiple notebooks. The user-interface effectively mimics the real-time pen-and-paper experience [8]. With a few upgrades in the latest version, GoodNotes 6.0 could further enhance its impact in a classroom setting.

To begin with, Goodnotes has the capability to generate a sharable link to a notebook, which then can be shared with anyone who has access to the link. This feature is convenient for instructors to share class notes with both in-person and remote students almost instantly. Everyone accessing the link now has equal rights. While this is useful for collaboration between students and colleagues, it poses a challenge for teachers who want to use GoodNotes as a platform for distributing notes. In such cases, allowing students the ability to potentially make changes to the notes is not desirable due to security and classroom privacy concerns.

It would be beneficial if notebook owners had the ability to limit accessibility based on student emails or limit it to only students enrolled in the course. Unfortunately, this feature is currently not available. Similar to OneDrive and Google Drive, it would be ideal if GoodNotes included different levels of access. For instance, a teacher sharing content with students would prefer students to view the content without the ability to alter, edit, or remove it. At present, GoodNotes only allows for full access or no access, which limits its flexibility for classroom use, in particular at college level.

Another improvement would be allowing the owner of the notebook to assign specific pages to individual students or groups of students. These pages could be set as 'View only' or 'invisible' for the rest of the class while providing 'edit' rights to the assigned group. The ability to grant various levels of access and visibility per page within a class notebook would be a valuable improvement for facilitating group projects.

## Conclusion

GoodNotes offers a variety of features such as built-in pens, pencils, highlighter, erasers, a ruler, handwriting recognition and much more. Its notebook-like interface and wide range of page options make it particularly appealing for classroom use. With a connector, instructors can project their notebook onto any classroom screen. Additionally, using a wireless dongle, instructors can mirror their notebook wirelessly, allowing them the freedom to move around the classroom without being confined to a single spot.

The flexibility to move freely while delivering lectures and annotating slides or notes with a wireless iPad and Smart Pen brings a new level of engagement to teaching. In the past, teachers were restricted to the teacher station. Using a clicker allowed teachers to move around the classroom while going through PowerPoint presentation. However, to annotate slides they had to go back to their station. Now, using iPad and dongle, instructors can navigate their notes, make annotations, and move around the classroom simultaneously. Even for remote students, this setup is ideal, as they can follow along by viewing the shared screen and, if they have the link to the notebook, they have direct access to the content the teacher is covering in real-time.

## References

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## Appendix: Sample Good Note pages.

The image displays three sample Good Notes pages. The left page shows a 'Feistel Cipher Encryption Structure' diagram and handwritten calculations for rounds 1, 2, and 3, including XOR operations and key schedules. The middle page features a 'Key Schedule (2)' diagram and a table of round keys, with handwritten notes explaining the permutation process. The right page contains handwritten mathematical derivations for the encryption function  $E(x) = ax + b \pmod{26}$  and its inverse  $D(y) = a^{-1}(y - b) \pmod{26}$ , including a worked example for  $a=5, b=3$  and the calculation of the modular inverse of 5 modulo 26.