

Knowledge Enrichment Through Technology

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The technology has changed a lot over the years. It is now difficult to estimate the changes that started before 20 years it is because, the change is so drastic and the number of technology that came up also huge in number. This itself shows that the human life is changing so fast and the technology also grows faster than human thinks. This statement is made based on the technological advancement that happened in various countries. We have travelled from an era of no technology to an era of technology developed era. It is worth to look back how far we have travelled. The technological development started with the innovation of Windows. 'Windows' the first version was released in 1995. This was one of the most popular operating systems in Desktop. This innovation started as part of digital era. Microsoft was the brain behind this innovation. They introduced 'Taskbar' and 'Start' button through advertising campaign. The next innovation which got popularity was 'Java'. 1996 was the year when java was introduced. It was an object oriented programming with high performance level of execution. The text innovation was 'Google' in 1998. The company began from a garage with one employee. Followed by 'Microsoft Net' also came into picture. This was introduced in 2002. This came as a standardized method for programming for applications. 2004 also witnessed an innovation that is called 'Facebook'. Initially it was limited to college students but then later it got wide acceptance in all the countries. The next discovery was 'Blu-ray Disc'. Followed by Steve Jobs introduced 'iPhone' in 2007. The next innovation was in 2009 that was '3D Printer'.

2013 also witnessed one discovery that is 'Samsung Galaxy Gear' and the operating system was Android. The term 'Internet of things' came into

prominence in 2014. Several companies came forward to capitalize the smart device. Samsung's 'SmartThings Technology' and Apple's 'HomeKit' also got introduced in 2015. These are some of the innovation which changed the face of each country. The technological advancement also affected the educational sector in a positive way. There are many technologies used in educational sector to improve students' knowledge. Now there is also a term called 'Educational Technology' used very often in educational sector. The term means enrichment of knowledge by using technological resources. Nowadays online courses, tools and software are also place an important role when it comes to knowledge expansion. The society already accepted the term 'EdTech' that means 'education' and 'technology'. 'Smart classroom' is also one of the developments in the field of education. Now classrooms are equipped with various technologies to make the learning interesting. This research paper mainly deals with one of the tools that was used in the educational sector. The name of the tool that used in order to check students' improvement was 'Engineering Note Book'. The technology is also prevalent in most of the professional companies. This method was used in MSIT which comes under the control of International Institute of Information Technology in Hyderabad. The full form of MSIT is Master of Science in Information Technology. The students who participated in the research were graduates in Information Technology and they were pursuing M. Tech Degree at the institute. This is an experimental study where the researcher observed the students' development through this method.

Hypotheses

1. Engineering Notebook helps students to remember about the work that they have already done.
2. It also helps students to learn systematically.
3. Engineering Notebook helps students to learn better compared to other methods used in educational setting.
4. It acts as a proof for innovation.

110 were participated in the data collection and the evaluation of the students were done based on the assignments submitted through the software called Moodle. Moodle was the one of the prominent software used by IIIT in their educational scenario. The information like syllabus, teaching materials, notes, and assignments were submitted through this software. The institute were following paperless method that means use of less paper in education scenario and they gave importance to Gmail with which they could share any piece information. Since it is a technological institute, the campus also gave importance to technology. Engineering notebook is used in a professional scenario more often. It is a known fact that Edison, Picasso, Newton, Darwin, Einstein and Bill Gates used different types of notebooks in order to remember things in chronological order. This kind of notebooks helped them to be more systematic in their life. To some extent we can say that, they were successful it was because of their systematic notetaking. Engineering notebook is one of these kind. Usually Engineering Notebooks are used in organizations to manage their intellectual property. Carter gives a good example to explain why Engineering Notebook is important. He comes with an example of commercial pilot. He uses a check list which is used to check when the landing gear is lowered. Why does the pilot use checklist to do that? He uses check list method it is not because of his lack of knowledge or not because of his lack of skills or not because of any understanding issue. He uses this checklist it is because sometimes he might be interrupted by alarm, sound, talk, unusual events etc. during his job so in order to remember things in an order he uses the checklist. It is also part of their professional setting. The Engineering Notebook which used at the institute consisted of following questions which students had to answer.

1. What did you do?
2. How did you do?
3. What worked?
4. What did not work?
5. Data used
6. How did you use?
7. Results of the work

The above mentioned points are very crucial when it comes to notebook making. This helps the person to keep track of his work and if he commits some mistakes then the notebook helps him to go back and check in the notebook where he has gone wrong. There are some important entries that students had to enter in order to make the Engineering Notebook more effective. Those points are

1. Activity- what is the activity that the person did today by using different resources and tools?
2. Status- What is the current status of the work? How far the person could complete the work? How much working is remaining? Was there any problem in the task? Was there any concern in the task?
3. Efforts- What was the effort taken to complete the task? If a person had completed various work, then what was the effort taken to complete each task?
4. Reflection- What all are the sections working properly and mention about the other sections which are not working properly?
5. Date and Time- Date and time to check the duration of time taken to complete the task.

These are some of the important entries used in Engineering Notebook.

Engineering Notebook was one of the tasks given to students and this task was related to one of the major modules that was 'Software Engineering Foundations'(SEF). The definition for this SEF was given by Carter that is Software Engineering Foundations means "A systematic approach to creation, development, production, operation, maintenance and retirement of software

intensive systems for the benefit of society". The course mainly dealt with innovation of software by students. One of the technology that they were asked to come up with was the formation of digital calculator. The Engineering Notebook was introduced to check whether students' work properly to develop calculator by using different software. Students had to submit their Engineering Notebook every day before 7 am. They submitted the ENB through Moodle. Before submitting the Engineering Notebook, students had to fill the default form which was already sent to them. There were many sections in the Engineering Notebook. The Engineering Notebook can be divided into different sections.

- Activity for the day
- Plan for this week
- Deliverable status
- Plan for next week
- Lesson Learned Reflection
- Evidences

The following picture shows an example for Engineering notebook used in MSIT. MSIT was following Prof. Lynn Robert Carter's Model of Engineering Notebook. (Table 1)

First of all, they have to fill their name then, they have to fill the activity that they did. When they fill the activity, they have to give one heading for the activity at first then, they have to give a small description about the activity. They also have to mention what did they learn from the task. Followed by they have to mention the start time and the end time. This was the first section. Teachers insisted to register the time it's because teacher could check whether they had utilized the time properly or not. So these were the main points students had to remember when they fill the form. The Next section was plan for this week where students had to fill the task details which students are going to complete. The following table shows the template for the plan for this week. (Table 2)

One of the important aspect of this notebook is 'Deliverables'. 'Deliverable' means the students' intention to attain the task by performing the specified activity. 'Plan for this week' is evaluated

only at the end of the week. But the default Engineering Notebook is evaluated and given feedback every day. The next important section in Engineering Notebook is that 'Deliverable Status' Which students have to submit every day. The following table is an example for the deliverable status (Table 3).

The first column consists of deliverable's name and the second column consists of "What did you plan to accomplish?". This talks about the students' plan about the task and the next column talks about "What did you actually accomplish". This means how far the students could complete the activity? The next column shows the size of the data that you have accomplished and the last column shows the time taken to perform the activity. The last time shown in the table is the effort that is taken to start and complete the task. These data help when the students do the similar task. They can check their past work and complete the task within a shorter time.

The next section in Engineering Note Book is "The plan for Next week". The following table shows the plan for next week (Table 4).

The table shows the format for the Engineering Notebook used for the plan for the next week. The most important part of Engineering Notebook is that there should be connectivity between each deliverable. So the deliverables mentioned in the 'Plan for next week' should be there in the next week's checklist. The next section is 'Lesson Learned Reflection'. The following table shows the template for this task (Table 5). Students have to mention what they have learned from their task. Sometimes they get surprised when they find out the result. So then, they can write down how they have found out the answer and if they go wrong then they have to reflect on the task and try to find out the solution for the task. This section mainly talks about the methods implemented to find out the results. The last section for this Engineering Notebook is that students have to attach the evidence of their work. They can project their work in terms of table, photos, scanned copy or in terms of pictures. So it is important to attach the evidence when they send for the submission. These are the main components of the Engineering Notebook.

Course: ITW1609 Engineering Notebook		
Engineer: Sample ENB	Date: 2017/04/03	
Notes: (Record key insights from videos, web pages, readings, discussions, experiments, and project tasks.)		
Activity: Introduction with carter sir, Installed eclipse software	Start: 9:30 am	Stop: 10:45 am
Reference from : https://www.eclipse.org/efxclipse/install.html		
Activity: watched video 2(Professional deliverables)	Start: 10:50 am	Stop: 11:15 am
Better knowing of deliverables.		

Table 1

<u>Plan for this Week:</u> (These items should appear in the deliverable status for the next week.)	
Deliverable	What do you intend to accomplish and why
ENB	Advantages in maintaining notes. What is ENB? In what way the professional career is effected by using ENB
Template of ENB	To learned how the structure is maintained in ENB
Peer review	What is peer reviewing and how it is helpful in software development?
ENB submission	To maintain record of what we have done and how we managed time.

Table 2

<u>Deliverable Status</u>				
Deliverables	What did you plan to accomplish	What did you actually accomplish	Size	Effort
Notes vs engineering notes	<ul style="list-style-type: none"> To know the importance of engineering notes. 	<ul style="list-style-type: none"> Understood the differences between school and engineering notes and its importance. 	28 min	20 min
Sample ENB evaluation	<ul style="list-style-type: none"> How ENB should be maintained. 	<ul style="list-style-type: none"> Knowing what not to do in and what to do in ENB. 	28 min	25 min
Peer review	<ul style="list-style-type: none"> To understand the importance of peer reviewing. 	<ul style="list-style-type: none"> Learned how peer reviewing is important in development of software. 	8 min	25 min

Table 3

<u>Plan for the Next Week:</u> (These items should appear in the deliverable status for the next week.)	
Deliverable	What do you intend to accomplish and why
Story Design Brainstorm	To know what is Story Design Brainstorm and its importance?
FSM	Enhancing the error messages a FSM can produce.

Table 4

<u>Lessons Learned Reflection</u>	
Context (e.g. The gap between plan and actual)	Lesson

Table 5

The advantages of Engineering Notebook

- The first and foremost advantages of Engineering Notebook is that it helps to remember what students have done in the past. Students also agree with the fact that it is a useful tool which helps them to keep track of their work. So the first hypothesis of the study is right.
- It also helps to remember better compared to any other methods it is because students write their Engineering Notebook so when they write things that imprint the knowledge in their mind.
- It is a kind of practice which helps to perform in professional scenario. These days the Engineering Notebook is common in many organizations.
- Engineering Notebook helps to organize the task. This leads to systematic life style. So the second hypothesis is also right that is Engineering Notebook helps to learn things more systematic way.
- It also serves as a concrete evidence of innovation. It can prove when innovations are made. It serves as an evidence.
- It also equips others to complete the same task in a faster mode.
- It also helps students to track their errors. The engineering notebook helps students to understand where they had gone wrong.
- It is a powerful mode of study material from which students can learn various things.
- Engineering Notebook also helps to reduce the duplication of individual work.
- It also gives explicit idea about each deliverables.
- By using Engineering Notebook Students can come up with various methods to solve the task and arrive in their results.
- It also helps to follow a disciplined way of completing the task. So the third hypothesis is also correct which talks that Engineering Notebooks helps to learn better.

- Reviewing and enhancing is one of the best advantages of Engineering Notebook.

These are some of the advantages of Engineering Notebook. This was a successful method adopted at MSIT and the results also proved the same. That is why this paper advocates for this innovative method for learning. This is also a popular method adopted in many organizations to help the employers so that they don't want to waste so much of their time and energy.

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