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APPLICATIONS OF MICROSOFT ONENOTE® AND EVERNOTE ® SOFTWARE IN ANATOMY EDUCATION – A COMPARATIVE ANALYSIS

Anatomy

Dinesh Kumar. V Assistant Professor, Department of Anatomy, Jawaharlal Institute of Postgraduate Medical Education and Research, Puducherry – 605006

Yogesh Ashok Sontakke* Associate Professor, Department of Anatomy, Jawaharlal Institute of Postgraduate Medical Education and Research, Puducherry – 605006 *Corresponding Author

Dharmaraj Wamanrao Tamgire Associate Professor, Department of Anatomy, Jawaharlal Institute of Postgraduate Medical Education and Research, Puducherry – 605006

ABSTRACT

INTRODUCTION: Creating personalized learning environments with the set of tools and spaces defined by the user in order to make the best of the learner's educational experience is the ulterior motive of 21st century educators. The content delivery, implemented by adjunctive tools, enables the learner to engage in an asynchronous manner i.e., where the traditional boundaries in a learning environment are erased. The aim of the article is to consider the utility of these two applications over the full scope of anatomy education and generating best practices for supplementing education.

METHODS: The scope, entire gamut and the technical utilities of the two commonly used note taking applications namely Microsoft OneNote® AND EverNote ®are described in all possible parameters.

RESULTS: The advantages, disadvantages, features comparison and requirements for endeavouring optimal personalized learning environment are described along with the learning outcomes of the personalized learning applications.

DISCUSSION AND CONCLUSION: The versatility and complexity offered by these personalized learning apps possibly increase the degrees of freedom available for the learner. The appropriate utility of the abovementioned apps would promote self-regulated learning and reduced barriers to the pursuit of internally motivated learning. This would also suffice the essential components of self-regulated learning such as self-monitoring and evaluation.

KEYWORDS

Note taking applications, Microsoft OneNote®, EverNote ®, personalized learning environment, educational software

INTRODUCTION:

With the rapid increase in the availability of technologies to aid the in-class facilitation of knowledge transfer, one could witness an unprecedented flexibility and accessibility of the learning content, particularly in large group settings. On the other hand, many medical schools particularly in developing countries express the concerns regarding the lack of much needed immediate physical infrastructure for asynchronous learning. Even though, many modalities exist for online learning and each of these have a spectrum of educational applications, the development of best practices for these modalities is still in its infancy (Ellman MS et al., 2016). An ideal tool should allow the learner to engage in the iterative process of building mental models from the existing and new information and thereby fill the learning gaps (Michael J et al., 2003).

Providing the millennial generation learner with the advantage of interacting with tools according to their learning needs would place them in the zone of proximal development where they metacognitively manage their learning process (Vygotsky LS, 1978).The content delivery could be implemented by adjunctive tools such as podcast which enables the learner to engage asynchronously or disruptive, where the traditional boundaries in a learning environment are erased. In other words (Eraut M, 2004), active learning in a classroom should encourage the students to think of their own, have a higher level of discretion over choice of methods and organization of tasks. In the same context, '*elaborated thinking*' can be defined as a further stage of thinking that involves acquiring organized knowledge and using it to deduce rules or concepts (Hattie J, 2009)

According to *Brown* (Brown M, 2012), the process of systematically collecting and analysing information from various sources for the purpose of improving learning processes is called *learning analytics* (LA). Despite enthusiastic adoption of learning technologies, research haven't revealed sustainable yielding results because of various factors (Garrison DR et al., 2010). The challenge of utilizing information technology supports in pedagogical approaches borrowed from the conventional classroom is obviously a difficult undertaking (Albion PR et al, 2006). In general, e-learning environment includes four subcomponents (Colace et al., 2006): 1) the *platform* that is useful for physical storage and transferring of the learning content 2) the *learning management system* (LMS) that integrates and manages teaching and learning activities (for example, internet based software that tracks the e-learning across the institution) 3) the *learning content management system* (LCMS) for exclusive management of the content and 4) learning tools responsible for distributing content and providing interaction functions. Learning delivery is the most often cited advantage because it can increase the accessibility to information, provide personalized and standardized content with increased accountability (Rosenberg M, 2001; Wentling T, 2000).

In visual oriented subjects such as anatomy, the learning content often ranges in complexity from discrete schematic diagrams to sequential instructional models. The '*one-size'* fit for all approach followed by the educators do not respond to the heterogeneous needs of the learners and this calls for the customization of learning at the levels of curricular design and of the instructor-learner dyads. Particularly, in the time crunched curricula, there is an absence of rich interactions that forces the instructors to device methodologies to incorporate important '*ingredients*' to engage and retain students (Bollinger DU et al., 2004). The relevance of instructional content and its applicability is important to adult learners and students are required to connect academic content and assignments to their professional environments, and identify problems of practice (Brown J et al., 1989).

Table 1: Commonly used technologies in modern education platforms (Elkins D, 2015; EDUCASE 2015-1; Torre DM et al., 2013; EDUCASE-2015-2)

S. No	Purpose	Commonly used options
1	Promoting asynchronous discussion and feedback (enabling audio and video)	IdeaScale VoiceThread
2	Bookmarking (saving websites for organization of content)	Delicious Diigo
3	Brainstorming and affinity diagrams	Memosort Noteapp
4	Synthesizing the learned content by creating concept maps and other graphic presentations	C-map Mindmeister
5	Aggregating hyperlinks in a specified topic	Pinterest Scoopit

6	Note taking for sharing the resources and revisiting later (personalized learning management)	Microsoft OneNote EverNote
7	Integrating contents for synchronous discussion and facilitating just-in-time teaching	Blackboard Wikispaces

Creating personalized learning environments with the set of tools and spaces defined by the user in order to make the best of the learner's educational experience is the ulterior motive of 21st century educators. We perceive that rather than shrinking it as a set of software tools, it should be defined as an idea that integrates the new approaches to learning, the habit of lifelong learning and learning styles (Merzouk A et al., 2014). The core concept should be to integrate both formal and informal learning episodes into a single experience and effective utilization of range of resources beyond institutional confinement within a personally managed space (Attwell G, 2007). In anatomy, students learn gross anatomy, histology and embryology of specified organ systems at varied intervals. The learner needs to assemble discrete pieces of knowledge provided, analyse and generate the '*big picture*' within himself. This process can be shouldered sufficiently by the note taking apps and prescribing the appropriate ones is of paramount importance in first year of medical education. To make the best use of the app in corresponding settings, every medical educator should know about the advantages, limitations.

The aim of the article is to consider the utility of these two applications over the full scope of anatomy education and generating best practices for supplementing education. Exploring the advantages and challenges would be helpful for every medical educator to implement in their corresponding settings. This gains importance because of the historical absence of analytics that describe student activities with respect to these content management devices or their relationship to theoretically relevant constructs which grossly limits our understanding in this domain. Compared to other tools which require larger coordination and meticulous execution, Microsoft Office OneNote® and Evernote ® are easier to be utilized in resource constrained settings. Therefore, present analysis compares the utility of Microsoft Office OneNote® and EverNote in classroom settings.

METHODS:

Microsoft Office OneNote® is a component of the entry-level Office suite (see: http://office.microsoft.com/en-gb/onenote/Ha101656661033. aspx). It allows the learner to download the PowerPoint® presentation directly into the app and annotate the pictures via stylus. After typing, the presentation can be transferred to other platforms. It also has a web clipping feature and audio addition facilities that would be helpful for visual preferential learners. Any form of contents including hyperlinks can be dragged and pasted over the pages and eventually, the '*personalized*' notebook including various sections can be created **[Table 2]** It also allows the dynamic reorganization of the gained content and rapid searching of the warranted page according to the convenience.

Steps for using Microsoft Office OneNote® in anatomy classroom

1. Create notebook [instruction command: File/New/Notebook] and name the notebook (for example.: anatomy of bone)
2. Open the first section and rename it [instruction command: right click section tab and name] (for example.: general anatomy of bone)
3. Add the desired additional sections [instruction command: File/New/Section] and if needed various colour codes can be used (for example: histology of bone and developing bone)
4. Mark the individual pages and add contents to those pages [instruction command: drag and drop the required files]
5. Print the contents in required formats [instruction command: Print/OneNote] and drag it to necessary sections

Table 2: Example for ideal composite structure of the learning resources in Microsoft Office OneNote®

Section heading	Key component	Utility
Hand written notes	Enlisting the objectives and salient notes of the topic	Used to give overview of the topic and fill gaps in knowledge
PowerPoint presentation	Presentation on that particular topic	Allows students to get asynchronous access to learning content
Images and media	Unlabelled images and videos related to the topic	Helps in self-assessment later and 3-D orientation of certain topics

Utilities of EverNote ®

For Students:

1. Organize notes, schedules and task lists
2. Scan or take pictures of paper hand-outs, diagrams, discussion notes, concept maps

For Faculty:

1. Organize course content
2. Communicate with students
3. Voice record a lecture and share it
4. Provide voice and written feedback to students.

Scope of EverNote ®in anatomy classroom:

1. It allows the digital capture of audio and images directly into EverNote®. This facility would be extremely useful for revisiting the demonstration of gross anatomy specimens or embryology models. The learner can create the audio note, attach the image to it and these organizing these materials could create an efficient personalized content base.
2. Web-clipper is an add-in utility which allows to snap the content from any webpage. This is very useful for seminars and projects where can grab in information from various resources.
3. Similar to Microsoft Office OneNote®, it helps in organizing the stacks, creating notes and shortcuts in an easily retrievable format.

Technical requirements and effective usage of Microsoft Office OneNote® and EverNote®:

It is necessary for the students to have access to personalized digital assistants and the search engines, applications such as Microsoft Word, Microsoft Power Point® and Portable Document File viewer. Seminars and assignments could be given to a group of students (optimal size: 3) with well-defined objectives and list of reference resources. Preparation could be assisted by the faculty who oversees the entire process and finally evaluates the entire product.

RESULTS:

Technically note taking apps (Microsoft OneNote® and EverNote®) have their own advantages and disadvantages **[Table 3]**:

Table 3: Advantages and disadvantages of teaching using note taking applications (Cook DA, 2007)

ADVANTAGES	DISADVANTAGES
1. Ubiquitous learning	1. Social isolation that can potentially hamper communication skills
2. Individualized learning	2. Implementation takes lot of effort and time
3. Resources can be easily perpetuated and updated	3. Achieving integration between formal and informal learning experiences is difficult to achieve
4. Flexible and asynchronous discussion is possible	4. Requires committed faculty to monitor the instructional activities.
5. Students can monitor their own learning and organize the content	5. Hugely dependant on level of motivation of learners and falters if students perceive it as undue load
6. Allows retrieval of content when required	6. Chances for students becoming inattentive in formal classes / lectures
7. Cost effective compared to learning management systems	7. Requires high level of technical expertise and training the user base

It is pertinent to compare the pros and cons **[Table 4]** of both apps in the technological upfront before choosing the most appropriate one.

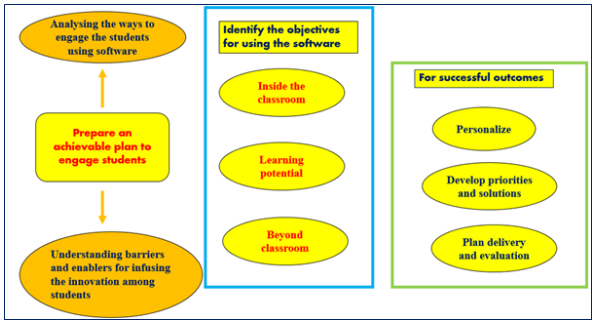
Table 4: Comparison of Microsoft Office OneNote® and EverNote ®apps pertaining to technical features

Features	Microsoft Office OneNote®	EverNote ®
1. Adding content from web pages	Present -1	Present -1
2. Attach files to notes	Present -1	Present -1
3. Print files to notes	Present -1	Absent -0

4. Add images to notes	Present -1	Present -1
5. Record audio to note	Present -1	Present -1
6. Record video to note	Present -1	Absent-0
7. Free hand drawing	Present -1	Absent-0
8. Handwriting on touchscreen devices	Absent-0	Absent-0
9. Adding text to Microsoft office files	Present -1	Absent (in free version)-0
10. Search across notes and adding tags	Present -1	Present -1
11. Share a single note with other users	Absent-0	Yes-1
12. Share the entire notebook with other users	Present-1	Present -1
	Total score: 10/12	**Total score: 7/12**

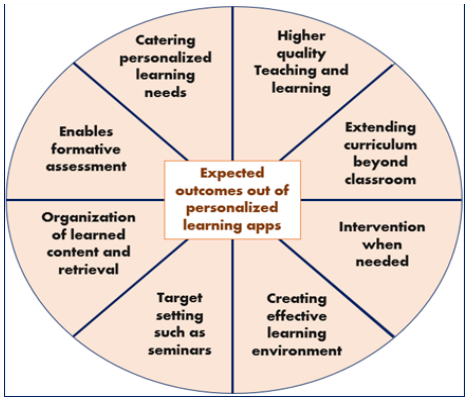
The successful outcomes of using apps largely depends upon the dynamics prevailing in the learning environment **[Fig. 1].** A medical educator, who is keen in implementing, should analyse the potential ways for utilizing it and work upon understanding the barriers / enables in corresponding settings, identify the specific objectives to be fulfilled by using these applications. For this, it is critical to analyse the learning potential of the students, instruct them what they need to do in and beyond the classroom. Subsequently, with its implementation, the execution needs to be personalized according to the learning needs and based on the evaluation, priorities should be established.

Figure 1: Requirements for effective usage of software in classroom settings



If used effectively, the personalized learning apps can bring out a spectrum of outcomes **[Figure 2],** even those which are beyond the purview of face to face classes.

Figure 2: Expected outcomes of personalized learning apps



DISCUSSION

Among the several forms available to deliver and support the curricula, the basic form involves developing adjunct tools for learners that helps them to engage asynchronously with content delivered in a lecture. These adjunct tools, if used effectively, aids in re-examining areas of a lecture which are unclear and also organize the content. The versatility and complexity offered by these personalized learning apps possibly increase the degrees of freedom available for the learner. Furthermore, translating written materials to an online format that was considered to be difficult might be maximized with these technologies and cater for a variety of individual differences and external commitments (Grant MR et al., 200; Rovai AP et al., 2010).

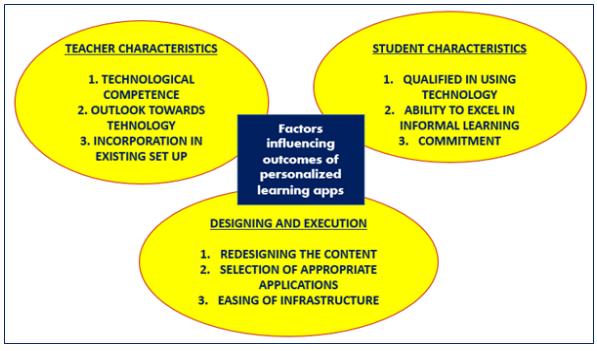
In the contemporary medical education, self-regulated learning, where students use meta-cognitive skills to plan, execute and reflect on individual learning have been increasingly associated with better academic achievements (Johnson GM, 2015). Making the students to actively engage in academic materials and is interrelated to their successful learning (Pullan M, 2011). The ultimate aim of the apps is to create an environment that allows them to shape their own learning spaces, to create, remix and share material (Attwell G, 2007). By this, learners could have control over the content, learning sequence, pace of learning and tailor their experience to meet personal learning objectives (Chodorow S, 1996).

From self-regulated learning perspective, these tools could increase the self-monitoring of students. Literature (Schmitz B et al., 2011; Schellings G et al., 2011) have shown that learning diaries could be used to monitor one's own learning process. A student plans his/her learning actions within a diary before beginning the activity and, after finishing, reflect upon it. For effective self-regulated learning to take place the learner must choose the cognitive / metacognitive strategies and based on that frame the goals according to the resources deployed (Boekaerts M, 1999). In digital natives, technical aspects of system usability will have a great influence on self-regulated learning, as they could influence the learners' motivation (Faghih B et al., 2013).

Equating the theory to Microsoft Office OneNote® and EverNote®, it can serve great for capturing metadata, interpretations and summarised notes (Barber CG et al., 2009; Behesti MV et al., 2010). Because of its facility to organize the notes provided in the class and utilize according to individual needs, it had gained wide popularity among students of western medical schools. Furthermore, it can allow the faculty to preselect important materials and organize them in a way that enhances learning. EverNote® is comparatively more robust note taking platform which, if properly utilized can create a wide range of impact in anatomy education. Apart from notes organizing facility, it can add notes while searching on a research topic on the internet. The diagrams drawn can be scanned and the photos can be uploaded to be retrieved at a later time. Owing to the web-based nature of the program, it helps in accessing from any computer with an Internet connection. Within the circumscribed space students can experience first-hand ability to share synchronized information on their personalized digital assistants.

In this way, the appropriate utility of the abovementioned apps would promote self-regulated learning and reduced barriers to the pursuit of internally motivated learning. This would also suffice the essential components of self-regulated learning such as self-monitoring and evaluation.

Figure 3: Factors influencing the outcomes of personalized learning apps (Selim HM, 2007; Khan BH, 2004)



The best practice for implementation typically includes TPACK framework, encompassing content and learning goals to be addressed (CK), determining pedagogical strategies (PK), identifying appropriate activities and assessments related to the learning goals (PCK), and matching technology tools (TK) to content (TCK) and pedagogical decisions (TPK, TPACK) (Hofer M et al., 2010; Mishra P et al., 2006). The ability of the instructor to utilize the technology based on these components and giving a responsive feedback are critical in determining the success of educational technologies [Fig. 3]. In addition, the dynamics should be open to re-negotiation as personal needs and circumstances change, and the environment progresses. Thus, instructor training is critical and unless the teachers develop a range of skills required to implement these effectively, online environment turns out to be a whimsical bubble.

One more theoretical concern would be that the emphasis on these media might make students reliant on the app and not retain important basic facts since they know they can rely on their app (Lau C et al., 2017). As with other innovations, these personalized apps present a range of challenges to both learners and faculty. Lack of accountability, commitment and motivation on either ends could limit the usefulness by large extent. Secondly, it is difficult to manage the learning content in large groups and this would impair the much needed utility of personalized overseeing. Human errors in editing, if not corrected might lead to the passage of wrong information across groups. However, these limitations have not proven sufficient impediment and considering the usage, could be easily ignored.

CONCLUSION:

Adaptive learning is the critical skill required for an ultimate learner-centred experience. Effective incorporation of technology in preclinical medical education helps in individualizing a unique learning path for each learner. The main aim of the article is to throw light on the potential promises and perils of note taking apps in catering the learning needs of the millennial generation learners. Eventually, it is the degree of intrinsic motivation on either sides i.e. students and faculty which determine the learning process by taking full advantage of the technology and foster self-regulatory skills. The requirement for individual disciplines vary and thereby a 'one size fit for all' approach cannot be suggested. However, we expect that further studies would elucidate the outcomes associated with it in various possibilities. It is the role of the medical educator to define the pathways of integrating useful technology into medical education in a timely and thoughtful manner.

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