

Learner Satisfaction in eTextbook Co-reading

A comparative study of internal and external forums

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Abstract—A textbook is a boundary object among students within given communities, in some instances, regions or the whole country. Students in such communities can engage collaboratively to study and gain better understanding of common content. While discussion forums have been an operative platform for social collaborations, learners are faced with the challenge of referencing their posts to linked informational resources. A system based on two chapters of a Python eTextbook was co-designed with students to evaluate its usefulness in supporting textbook based interactions. An experimental study compared the traditional external discussion forums to the developed internal forums which are embedded within eTextbooks. A systematic content analysis of learners' interactions demonstrates insights to their experiences, their needs and the potential benefits of combining discussion forums with eTextbooks to encourage more collaborations. Learners preferred internal forums.

Keywords-collaborations; eTextbook; forums; interactions.

I. INTRODUCTION

A textbook is a common resource that is consistently used by teachers and their students from various communities. Usually, for every course, there is a standard textbook that students rely on to study. This makes the textbook a boundary object; a boundary object is an entity of interest across school communities. Students tend to meet after school to collaborate on course materials [12]. Students who do not have the opportunity to study with others may now partake in collaborations using their mobile devices on virtual environments that have no time, space or cultural barriers [12]. This creates an opportunity to structure and frame a platform that brings students from various communities together, in order to build a shared understanding of textbook content. Although research states that there should be a significant move away from textbook dependence to adopting a variety of sources for teaching, many teachers and students still depend highly on textbooks [4].

Students are increasingly choosing to purchase eTextbooks for their mobile devices as an alternative to traditional textbooks because of their low cost, light weight and ease of use [9]. Although they provide a cheaper source to information they, however, do not improve learning outcomes as students sometimes may not comprehend what they read [3]. The flexibility of eTextbooks allows for the

exploration of interactive technologies to incorporate within digital textbooks to enable better understanding of content [11][18]. While individual digital reading has been the subject of much investigation [11], research into co-reading is scarce [9][14]. Co-reading normally occurs in classrooms, book-clubs, and in less coordinated ways through mass media yet it may also be explored for formal resources like eTextbooks [9][14].

Providing the student with an environment that cultivates a strong personal interest in constructing knowledge when given resources is the most effective way of learning [16]. Building effective mobile applications that encompass all aspects of collaborations instead of merely delivering resources to students is important [16]. In this paper, we ask the question: How should discussion forums be presented to promote the use of textbook based interactions? As a result, experiments in this paper explore the rationale for separating or combining resources like textbooks with their discussions for active collaborative learning.

The rest of this paper is organized as follows: Section II describes the background and related work. Section III describes the approach taken in the system design. Section IV presents and discusses results. Section V concludes the paper and gives future research guidelines.

II. BACKGROUND AND RELATED WORK

In this section we discuss how discussion forums have been utilized in learning environments and how they are linked to electronic resources which students discuss. The section is concluded by explaining the gap in the discussed literature.

A. Discussion Forums in Learning Environments

Several researchers agree that group learning as well as dialogue based instructional settings are key to learning. Students that are involved in group learning improve their problem solving and critical-thinking skills by deepening their understanding of concepts [13]. Problem solving is made easier when people work together because, within a group, everyone has something distinctive that they may contribute since people have their own unique ways of thinking. Exposure to multiple conceptual constructs helps create knowledge. Student engagement in networking platforms has been stated to be successfully measured by discussion forum posting [7].

Discussion forums are defined as threaded discussions that capture the exchange of asynchronous messages [7]. Forums are a primary means of interaction in most online distant learning platforms [13]. They are widely employed in e-learning setups to support social constructivism. Previous explorations of discussion forums have promoted active learning [10]. Traditionally, they are used within Course Management Systems (CMSs) like Moodle and Blackboard as a means for enabling dialog and collaboration among connected individuals [11]. Although forums facilitate better learning, in reference [13], they argue that forums are not good at managing a huge number of posts with fragmented topics over too many threads. They also state that forum usage is usually limited to a few participants. Also, peer answers to posts may be incorrect and counter-productive [15][18].

Although earlier studies indicated that discussion forums were not as effective for learning [17], a number of studies state that they are very essential to learning [1]. The effectiveness of threaded discussions has been discussed extensively in literature and results note their affordances in enhancing individual thinking capabilities, promoting participation, enabling reflection of peer contributions and allowing the sharing of diverse ideas [1][13]. Learners are also able to analyse their own ideas before sharing them, thereby improving the quality of discussions.

The popularity of MOOCS for larger student populations as well as CMSs for smaller student populations especially at University levels is indicative of the latest trends toward interactive online course related learning [11]. The discussion forums have become the knowledge source to the course work [10][18]. Reference [10] describes discussion forums as an integral part of online learning, however states that they are presented as an afterthought for students to use as they wish, which may make them dysfunctional. Reference [2] states that forums tend to attract many student complaints or topics focused on course administrative issues instead of focusing on course challenges. A more directed discussion forum may filter such posts. In reference [2], they conducted a study that identified if discussion forum posts were content related. Their study revealed that, of all the posts, only 28% were related to content even though the course offered other dedicated areas for asking on non-content related matters.

Reference [10] investigated the idea of producing high quality interactions through seeding the forum with content and varying the sections of comments revealed to students. Results from their study indicated that seeding, which is selecting prior-semester comments from stimulating topics and incorporating them into the new semester, inspired an above average amount of discussions. They found that the quality of annotations increased when sections were seeded.

Reference [19] attempted to improve the quality of posts by removing confusing posts that tend to lead to student drop outs or lack of participation. Other research focuses on encouraging more interactions. Reference [19] also states that making many posts improved learning while contradictory research argues that a high number of posts does not necessarily improve learning outcomes [13].

Reference [19] explores increased interactions through instructor's presence and the value of their input in directing the forum discussions.

B. The use of Interactive eTextbooks for Learning

Discussion forums are usually linked to various resources like course eTextbooks. eTextbook related studies have incorporated dictionaries within textbooks so that students do not have to exit the textbooks in order to seek word definitions in trying to understand the content. Various eTextbooks also incorporate automatic assessment through interactive exercises in order to help students test themselves as they read [11]. Content interactions through iPads and kindles exist, most research tends to focus on creating a great individual experience through the incorporation of videos, annotative features, etc. [11][14].

Electronic content with instructor annotations can also provide guidance to students beyond the classroom as they read a textbook [3][6]. This may improve the way that students interpret and understand content. Underlining and highlighting also contributes to recall [8]. Asking questions contributes to meta-cognitive monitoring, thereby improving learners' self-regulation, recall and comprehension [8]. Exercises are the most important pedagogical feature of interactivity since they provide a better experience on a topic, especially since students try exercises as they read [5]. In reference [5], they did a study which showed that a high number of completed exercises results in high performance on written tests.

Reference [3] states that other research projects have focused on redesigning the eTextbook because of its flexibility; the kindle and iPad provide new formats of presenting these books, with lots of multimedia. However, high costs of producing multimedia books makes them harder to scale for every textbook [3]. As a result, they suggest that it would make more sense to tailor existing eTextbooks to the needs of students at low cost. This means focusing on how students and their instructors interact with the content and each other and doing minimal redesigns.

C. The Gap in Literature

The literature above has demonstrated the importance of interactions, however the gap in the literature is in that the studies are not attempting to explore the way in which discussion forums are presented in trying to improve collaborations. A majority of research seeks to identify strategies for improving the quality and quantity of traditional forum posts. Discussion forums already provide a platform for interactions, however they are presented separately to resources as a choice for students to use [10]. In this paper, we attempt to create a discussion forum around the intellectual content of textbooks by limiting the distance between the forum and the resources to be discussed. In references [3] and [6], the researchers describe an idea of sharing annotations which may enable students to communicate with each other through their personal notes. In reference [6], they conducted an experiment that investigated on how to improve the quality of annotations for learning. However, little systematic research has been conducted to

explore the practicability of conversing instead of just sharing readable annotations within common content by integrating social interactive activities through discussion forums within eTextbooks in the hope that this promotes more collaborations. The design and presentation of discussion forums may have an effect on the way that students interact.

III. RESEARCH DESIGN

An experimental study was conducted with students. The aim of the experiment was to determine the feasibility of an internal discussion forum within an eTextbook. To achieve this, we created an internal forum as well as the traditional discussion forum, which we will refer to as the external forum in this paper.

A. System Design

An experimental system was designed by 15 university students in Computer Science who underwent a participatory design session in order to define the needs of a collaborative eTextbook system that could be relevant to them. The system was specifically designed to explore the possibility of including interactive discussions within eTextbooks. The design experiment helped outline how discussion forums can be presented inside eTextbooks to support interactions within books. The design session resulted in inline editing eTextbook paper sketches whereby various readers work together in group work sessions on mobile phones so as to understand the textbooks. In order to test the feasibility of this system, we developed two systems using a Python Web framework called Web2py. The first platform is the traditional external forum that has links to an eTextbook resource. The second platform is an internal forum, that is, an eTextbook with embedded interactions within it.

The two platforms were designed in a similar manner using similar eTextbook content, see Fig 1. The eTextbook used was a relevant support textbook found on the CMS for the Python course at the time. Two chapters (Loops and Strings) of the Python eTextbook that were being taught in parallel to the experiments were chosen for the system.

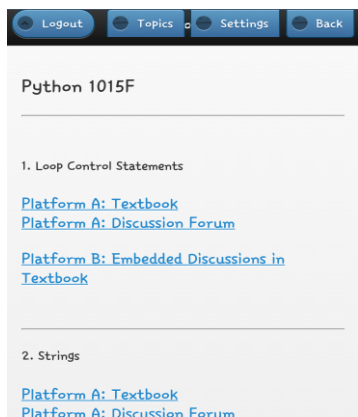


Figure 1. Initial page showing the two platforms.

From Fig. 1, one can see the topic of Loop Control Statements. Below that, there are three links. When a user clicks on the “Platform A: Textbook” link, it opens the book chapter. Otherwise, when a user clicks on the “Platform A: Discussion Forum” link, it opens a page where users can initiate and respond to discussions, see Fig. 2a for a clip of the discussion page. When a user clicks on the “Platform B: Embedded discussions in textbook“ link, it opens the book chapter whereby the user can read as well as initiate or participate in discussions that are found within the book chapter, see Fig. 2b for a clip of the book chapter with discussions within it.

The only differentiating variable between the two platforms is the location of the forums for conducting discussions. The external forum separates the eTextbook from the discussion forum while the internal forum integrates the eTextbook content together with discussion forums. The internal forum represents the controlled setup of the experiment. The purpose of having the two systems was to test whether including discussions in textbooks promotes better interactions for students thereby suggesting that the location of forums for discussions is important to the design of collaborative systems.

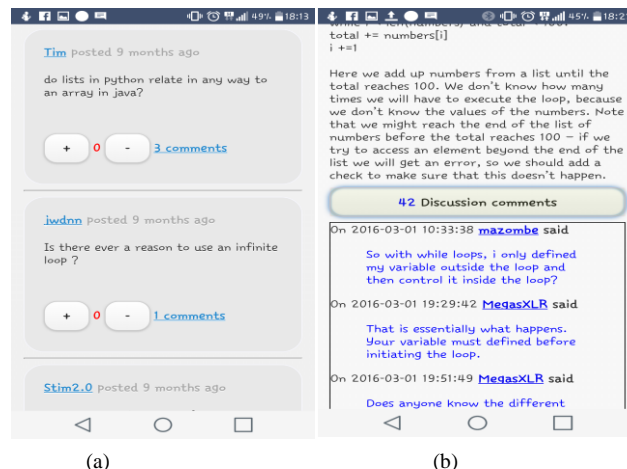


Figure 2. Snippets of (a) the external forum discussion page and (b) the internal forum of textbook with discussions within the text

B. Research Participants

Research participants were randomly recruited from approximately 200 first year Computer Science students enrolled in a Python programming course at the University of Cape Town. A call for participation was emailed to all the students in the Python class and the first 30 respondents were selected for the experiment. Only 24 participants completed the experiments.

C. Experimental Procedure

The experiment occurred over a period of two weeks. Two tasks were presented to the participants. Before the experiments commenced, a pre-questionnaire was given to all participants to assess their prior experiences about

eTextbooks, discussion forums and Internet usage on mobile devices. Each participant was given a token payment of approximately \$15 after participation. The amount of \$15 was considered a standard token of appreciation for students which is not too small for participants to lose interest in doing the experiment and yet not too large an amount for participants to only be interested in doing the experiment for monetary purposes. Following are the tasks performed by the participants:

1) Task 1

The first task was meant to give students the opportunity to have a feel of both platforms that were being compared. They therefore used both the external forum and the internal forum. The chapter topic of discussion was Loop control Statements. Students were asked to post at least two questions and respond or comment to any two other questions on each of the two platforms of the system per day for one full week. At the end of the week, the task was concluded by completing a survey that evaluated participants' experiences in using the two platforms.

2) Task 2

In the second week, participants were each asked to choose one of the two platforms they preferred using after experiencing both platforms in task 1. This means that they either chose to use the internal forum or the external forum. The topic of discussion for that week was Strings. They were asked to post two questions and respond or comment on any two other questions per day for a full week on the platform they selected. They ended the task by completing the task survey plus an overall usability questionnaire.

IV. RESULTS

According to the pre-questionnaire, all participants had used discussion forums as well as eTextbooks before. They had prior experience in using CMSs and social networking platforms. This means that they could easily participate in this experiment as they were technologically savvy enough to rate and compare the two platforms. Following are results of the experiment.

A. Using Alias names vs. real names on academic forums

Although on social media networks, people usually sign in using their real names for easy identification, in an academic platform this might not be preferred. Participants had the option of logging onto the system using their Facebook names which is usually the name that one is known to by friends or using an alias so as to be anonymous. Facebook was used as an easier way to centralise users without registrations. According to the results, 69% of the participants opted to use an alias name as opposed to their real name when using the system.

The findings showed that 31% of the participants used their real names and found it unnecessary to be anonymous on an academic platform, claiming that everyone was on the site to learn hence there was no need to hide identities. They also explained that being identifiable increased chances of possible meetups for face to face interactions. Although they were comfortable to share their identity online, they

emphasized that this experimental application should not post anything on their behalf on the Facebook platform. However, of the 69% that used alias names, the participants highlighted the need to be anonymous and to owning anonymous posts. Students like to protect their identity and have a sense of security and privacy as they tend to feel uncomfortable to share their identity with strangers. Also, they chose alias names to avoid feeling stupid, especially if they ask obvious questions or answer other posts wrongly. Some mentioned that using alias names for online activities had become a habit.

When the participants who opted for alias names were asked what their challenge would be in using their Facebook names on the platform, they stated that they feared being classed academically or being judged negatively by peers. Other participants stated that some students may become biased when answering their posts because they know them in person. Even people who would never help them in person had the opportunity to do so if they kept their identity anonymous. Others insisted on being anonymous because they were shy to express themselves freely, hence using a real name would result in fewer posts and comments from them. Students felt that using alias names improved their participation levels and gave them liberty in asking any types of questions. Students also felt much safer when hiding behind alias names.

1) Discussion

It is evident from the results above that the use of alias names should not be overlooked when creating academic online platforms. University students also have confidence challenges on online platforms. Not everyone prefers hidden identity, however for discussion forums to cater for everyone they should be presented such that students have the choice to be anonymous or not. CMSs tend to have discussion forums but, because the students have to be registered for the course, they can only use their real names. Often this is to protect against inappropriate posts. Although this is very important, 69% of the participants indicate their need to freely express themselves without being judged for better participation.

B. External Forum (Discussion forum plus a separate link to an etextbook)

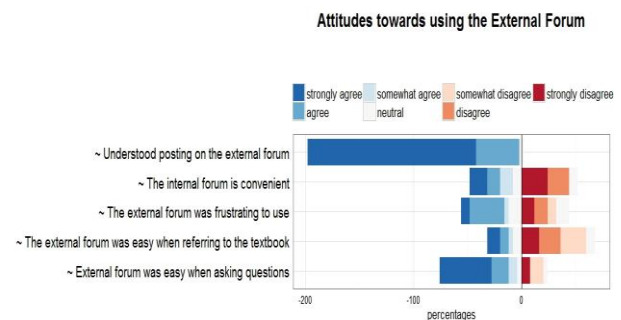


Figure 3. Experiences of participants when using the external forum

Fig. 3 above shows that participants had no challenges in using and understanding the external forum. Participants

found the platform easy to use. Some participants found the external forum frustrating to use and this was attributed to the fact that one had to switch back and forth from the forum to refer to the textbook and also the external forum presented different ungrouped topic posts. Not all the participants found it convenient to separate the textbook from the forum. Reasons were that sometimes one wanted to focus on the textbook without any distractions, hence separation encouraged focus to those participants. Some participants stated that they only used the discussion forum when they had finished reading, hence it was easy to refer to the textbook if they had written sections and challenges down.

Results highlight favourable qualities of the external forum to be the convenience of focusing on questions and answers without the interruption of the textbook. Participants highlighted that it is easier and faster to view all posts in separate dialogues and, since posts were easily identifiable, they could be answered much faster. Participants also liked that one has the freedom to identify and select questions of interest to them among many questions. This also enabled participants to respond to posts as they browsed questions they needed answers to. Another positive quality of the external forum is the promotion of general enquiries. Each question had its comments, which made it easier to scroll and identify answers to a post.

The not so favourable points of the external forum included the difficulty of switching from the forum to the eTextbook for referencing. They found the process of continuously exiting the forum to open the linked eTextbook cumbersome. The participants also stated that the forum ended up with many posts such that it was harder to navigate and easily identify relevant or particular posts as the forum posts were general and covered numerous topics. Participants also noted that if a response is delayed the post may never be answered as participants said they were usually biased to earlier posts and were reluctant to search for older posts. Participants also stated that they would have liked a notification system as it was sometimes hard to find particular questions to check if they had been answered.

Participants suggested incorporating Web links on comment boxes so as to share useful links that explained their answers. Other media, like videos, pictures and audios, were noted to aid users in providing explanations for their posts, although these options were provided on the system, learners did not utilize them. Participants also suggested

inserting a sidebar linked to the textbook for easy referral by tagging relevant sections of the textbook. Questions listed on the forum should also be categorized and grouped to avoid repeats.

C. Internal forum (eTextbook with embedded discussion forum)

Participants understood how the system worked without much training. A short demo was given when participants filled the pre-questionnaire. Fig. 4 above shows that some students found the internal platform frustrating to use and this is attributed to students who liked the external forum better. The frustration was because they could only ask questions related to the textbook and that the textbook had been altered. A large number of participants, however, found the internal forum easy to use when asking and answering posts. They also found the system to be highly convenient and referencing the textbook when making posts to be much easier.

Participants were asked what they liked most about their experience in using the internal forum. Results showed that dividing the textbook so that questioning and relevant content was sectioned made reading the book desirable and convenient. They highlighted the convenience of having the textbook and posts being combined. Each section of a textbook was directly above a discussion forum section, making it simpler to make references to the relevant textbook content for clarifications. According to the participants, viewing the internal forum comments based on textbook sections made it easy to verify and argue answers in response to other participant posts. The eTextbook was more flexible since examples were right next to exercises, making it easy to switch between the text and discussions when attempting to answer the exercises.

The internal forum system offered a platform to ask specific questions related to the topics at hand. Participants stated that the internal forum allowed for a more focused in-depth analysis of a given topic of the textbook as many had their own views to share per section. The direct approach of topic based discussions made it easier to find answers to similar problems. It was also easy to identify which section one had to read to attempt the questions before asking. Participants stated that having one area that centered on a particular topic promoted a wide range of posts, leading one to view the topic in many dimensions. The hub of questions related to a particular topic enabled participants to find answers to common challenges while also making students aware of hidden challenges. The highlight of the internal forum to many participants was the access to help from other users of the system being readily available as they read. Because one could easily verify answers from others or the textbook if in doubt, participants stated that most answers or opinions made sense. Participants also agreed that the discussions around a single topic flowed and were easy to understand. On this platform, they stated that it was easy to see what other people were saying about a given topic.

The internal forum was convenient in that there was no need to exit the eTextbook while reading so as to ask a question on another page. The organization of comments

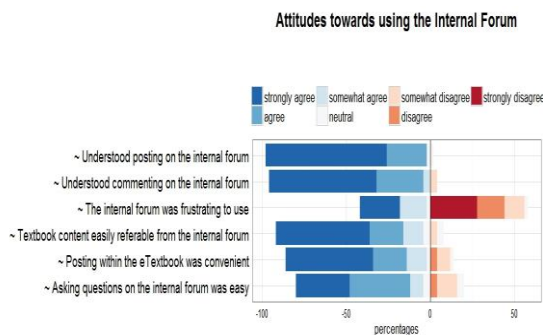


Figure 4. Experiences of participants in using the internal forum

below each section, aligned by topics, was easy to follow. Each section had few posts enabling one to first check if their question had been asked before asking the same question. One could also easily test if they understood a section by attempting to answer questions from others within that section of comment posts.

Some participants even stated that this platform enabled them to obtain help on some challenges that they were facing in class since the topics used in this experiment ran concurrently to the topics they were learning in class at the time. Some already made a comparison of this platform to an external forum and chose the internal forum, with embedded discussions, as their preference. Others also committed to using such a system as it provided a platform to easily collaborate while reading.

The internal forum system was designed such that people could comment below a section since one of the suggestions was to break down the book for easy reading on mobile devices. However, one was not able to comment on a comment. Most of the negatives about the internal forum centered on not being able to respond to a specific person below their post. The reason for this not being favourable was that a thread may deviate to other questions; as a result that thread may remain unanswered. Also, when a section has many comments where one cannot tell if a comment is a question or answer, the many comments may become cluttered and difficult to follow.

Suggestions for improving this platform included the ability to switch off the forum should one need to focus on the textbook. Participants also desired that the system would load faster despite the compressed images and comments on the pages.

D. External Forum vs. Internal Forum

The participants had the opportunity to compare the two platforms and select a platform that appealed to them. In Fig. 5, participants were in favour of the internal forum when compared to the external forum.

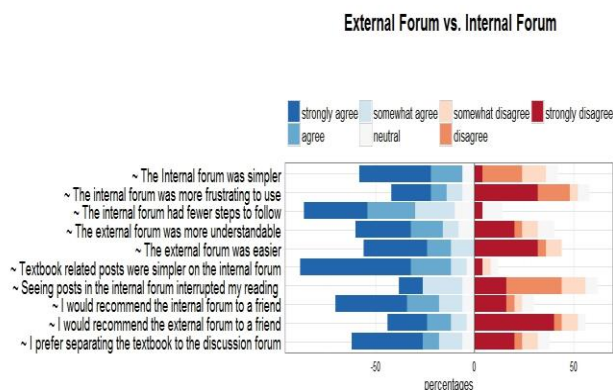


Figure 5. User comparison of experiences in using internal forums vs. external forums

They found it simpler and less frustrating to use, faster, with fewer steps to follow and easier to use than the external forum. The referral to the textbook was much easier. Some participants found combining the textbook with the forum to

be interruptive while a majority did not think it interrupted their reading. Many participants preferred not to separate the textbook from the discussion forum and stated that they would recommend the internal forum more than they would recommend the external forum.

In Task 2, 63% of the users preferred the internal forum to the external forum. Of the 37% who selected the external forum, they found their platform more user friendly with much freedom for editing posts. They found that it was easier to ask questions and answer questions. Some of the users found that the internal forum was unfavourable because having discussions got in the way of the textbook content. They stated that there were too many writings on the internal forum platform. Their main negativity of the internal forum was the lack of posting within a post so as to better organize comments within each section.

The majority of the users who selected internal forum for task 2 identified the platform as more focused, specific to textbook sections, much faster to use, simple, more user friendly and convenient in overall. Incorporating everything onto one platform is what made the system convenient for participants. They described the platform as easier to read since the readily visible questions and answers helped one to learn easily from peers. They found the conversations easy to understand and follow. The reasons that led them to not choose the external forum included that the platform was more challenging to follow since posts were very independent and sometimes one may be clueless as to what others are discussing. Referencing specific sections of the textbook was difficult and time consuming on the external forum. One had to direct their peers to browse through pages of the textbook in order to find the relevant section to the questions. Separating the textbook meant that a user had to switch to the separate discussion forum every time they had a question. They insisted that the external forum actually stopped the flow of reading as one could easily get distracted reading questions instead of reading the textbook or even in following new topics instead of reading. Since the questions on the external forum were unordered except by date and number of replies, one had to go through a lot of unrelated material, which could be distracting for people who wanted to focus on particular topics.

In order to improve both platforms, participants suggested emoticons as a mechanism of grading answers. Emoticons are exciting and require little effort from the user. A high number of clicks on the academic emoticon would show a consensus among readers about their thoughts on the post. Other suggestions stated that notifications would be important in reminding people to follow up on their posts, as well as keep users motivated to read.

E. Discussion of Internal vs. External Forums

In many CMS platforms, the forum is seen as one of the major support mechanisms for learning offered to students. Discussion forums are often confined to a minority hence many tools are being established to increase the number of interactions. The use of the eTextbook with embedded discussions in it was perceived to be the best at meeting the student learning needs and increasing interactions with an

average of 30 responses per thread. It is evident that perhaps we should investigate more about designing systems that allow co-reading within eTextbooks.

Since students had two weeks to use the platforms, they had ample time to learn and be able to choose what they figured was the most effective platform for their learning needs. There is an obvious difference between an internal forum and a traditional external forum. Despite the widespread use of traditional forums, there is still room for improving interactions and embedding discussions within textbooks as one of the strategies for improving engagement and locking students into a zone of relevant content to encourage participation. Perhaps more experiments should be conducted in figuring ways of presenting discussion forums. In this experiment, the addition of forums to the textbooks appealed to more learners. It is therefore evident from the results that students find it convenient to perform easier and faster tasks on collaborative platforms.

Even though preference was for the internal forum, those who preferred the external forum had valid arguments for separating the discussions with content. The structure of the independent external discussion forum encourages a question and answer kind of interaction, whereby people focus on receiving a response or asking a question. This was seen in the length of discussion forum threads, which tend to have an average of two or three responses only. Also, allowing the user to focus on the textbook without interruption is an important consideration. We therefore suggest a system that encompasses the best of both platforms evaluated in this experiment. Learners may toggle between having interactions within their textbooks and switching them off when they need to focus more on reading.

V. CONCLUSION AND FUTURE WORK

Increasing student interactions is of great importance to the future of active learning. In this study, we investigated the effectiveness of social interactions embedded within eTextbooks. We built an application to enable students to collaborate on a Python eTextbook chapter, which was in line with course content. Our results demonstrate that: (1) allowing hidden identity is key to socialised learning platforms as it gives students the liberty to respond to posts; (2) incorporating interactions within eTextbooks encourages content related discussions; (3) sectioning the textbook with a discussion forum below each section promotes easy revision, understanding and referencing of textbook content; and (4) although students may find embedding discussion forums on eTextbooks to be convenient, combining the different aspects of the two platforms may result in a more usable system that encourages discussions while also promoting individual studying. We therefore conclude that interactions may be increased by reducing the gap between what is being discussed to its content. Internal forums may propel students to focus on their studies. The results in this experiment suggests that we reconsider how we present discussion forums to students, not as an afterthought as part of CMSs but within eTextbooks to encourage student engagement. We anticipate that our study will contribute to the exploration of forums within textbooks for more effective

learning. Designers and operators of socialized learning platforms must therefore consider the possibility of presenting discussion forums in new ways that involves resources being discussed.

This work was conducted with Computer Science students at university level. Another experiment already evaluated high school students in the subject of mathematics. More experiments may test for other subjects. The experiment also does not test if internal forums promote better learning. Subsequent experiments could be conducted with a larger sample over a longer period of time like a full semester to promote the findings on this paper.

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REFERENCES

- [1] C. K. Cheng, D. E. Paré, L. M. Collimore, and S. Joordens, "Assessing the effectiveness of a voluntary online discussion forum on improving students' course performance," *Computers & Education*, vol. 56, no. 1, pp. 253–261, 2011.
- [2] Y. Cui and A. F. Wise, "Identifying Content-related threads in MOOC discussion forums," In *Proceedings of the second (2015) ACM Conference on Learning @ Scale*, pp. 299–303, 2015.
- [3] A. R. Dennis, K. O. McNamara, A. S. Morrone, and J. Plaskoff, "Improving learning with eTextbooks," In *System Sciences (HICSS) 2015 48th Hawaii international Conference on Systems Sciences*, IEEE, pp. 5253–5259, 2015.
- [4] R. Duschl, "Science education in three part- harmony: Balancing conceptual, epistemic, and social learning goals," *Review of research in education*, vol 32, no. 1, pp. 268–291, 2008.
- [5] E. Fouh, D. A. Breakiron, S. Hamouda, M. F. Farghally, and C. A. Shaffer, "Exploring students learning behaviour with an interactive eTextbook in computer science courses," *Computers in human behaviour*, vol. 41, pp. 478–485, 2014.
- [6] J. Jan, C. M. Chen, and P. H. Huang, "Enhancement of digital reading performance by using a novel web-based collaborate reading annotation filtering mechanisms," *International Journal of Human Computer Studies*, vol. 86, pp. 81–93, 2016.
- [7] R. F. Kizilcec, C. Piech, and E. Schneider, "Deconstructing disengagement: analysing learner subpopulations in massive open online courses," In *Proceedings of the 3rd International Conference on Learning Analytics and Knowledge*, ACM, pp.170–179, 2013.
- [8] H. W. Lee, K. Y. Lim, and B. L. Grabowski, "Improving Self-Regulation, Learning Strategy Use, and Achievement with Metacognitive Feedback," *Educational Technology Research and Development*, vol. 58, no. 6, pp. 629–648, 2010.
- [9] D. D. Matthew, "A call to embrace social reading in higher education," *Innovations in Education and Teaching International*, 2014, DOI:10.1080/14703297.2014.991934.
- [10] K. Miller, S. Zyto, D. Karger, and E. Mazur, "Improving online class forums by seeding discussions and managing section size," In *Proceedings of the first ACM conference on learning @ scale conference*, ACM, pp. 173–174, 2014.
- [11] T. Nakahara, T. Soga, Y. Nakamura, M. Mitani, and N. Kawana, "Development of an e-Textbook Connected with a Learning Management System and a Study of its Effective Use," In *EdMedia: World Conference on Educational Media and Technology*, vol 2014, no. 1, pp. 979–984, 2014.

- [12] S. P. Ncube and H. Suleman, "Complementing formal learning with mobile technology outside the classroom," In *Interactive Mobile Communication Technologies and Learning (IMCL) 2014 International Conference*, IEEE, pp. 51-56, 2014.
- [13] D. F. O. Daniel, J. Sinclair, and R. Boyatt, "Exploring the use of MOOC discussion forums," In *proceedings of London International Conference on Education (LICE-2014)*, pp. 1-4, 2014.
- [14] J. Pearson, T. Owen, H. Thimbleby, and G. R. Buchanan, "Co-reading: investigating collaborative group reading," In *proceedings of the 12th ACM/IEEE-CS joint conference on Digital Libraries*, ACM, pp. 325-334, 2012.
- [15] B. Schweizer, "Confessions of an Unreconstructed MOOC(h)er," *Thought & Action*, vol 61, pp. 61-68, 2013.
- [16] P. Thinley, S. Geva, and J. Reye, "Tablets (iPad) for m-learning in the context of social constructivism to institute an effective learning environment," *International Journal of Interactive Mobile Technologies (IJIM)*, vol. 8, pp. 16-20, 2014.
- [17] M. J. Thomas, "Learning within incoherent structures: The space of online discussion forums," *Journal of Computer Assisted Learning*, vol. 18. no. 3, pp. 351-366, 2002.
- [18] J. J. Williams et al., "Connecting collaborative & crowd work with online education," In *proceedings of the 18th ACM Conference Companion on Computer Supported Cooperative Work & Social Computing*, ACM, pp. 313-318, 2015.
- [19] D. Yang, M. Wen, I. Howley, R. Kraut, and C. Rose, "Exploring the effect of confusion in discussion forums of massive open online courses," In *proceedings of the Second ACM Conference on Learning @ Scale*, ACM, pp. 121-130, 2015.