LEARNOVATE

Almanac Evaluation Report

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Core Research Report

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Contents

Executive Summary

Introduction

Almanac is a tablet based application designed to support both formal and non-formal learning experiences through the just in time composition of multimedia content from a range of different sources to address the learners immediate learning needs. The learning experiences generated by Almanac are intended to provide the learner with a safe learning environment in which their learning is pedagogically scaffolded so that it is appropriate for their individual prior knowledge and experience. Additionally, as Almanac is designed to deliver learning experiences based on a corpus of trusted content, the learner can be confident that the information in those experiences is accurate.

Almanac was designed in response to three key industry challenges as identified by the Learnovate Centre Industry Partners. The first of these challenges was in the area of mobile learning where the growth in the mobile market and the increasing pervasiveness of these devices across all sectors from corporate to K12 represents new platforms and new opportunities for mobile learning. The second challenge was to investigate how just in time approaches to the dynamic composition of content can be applied to support a learner's learning needs in a non-formal learning context. The need for smaller or shorter learning experiences was also expressed as a challenge by our industry partners, which aligns with both the needs of mobile and non-formal learners. The third key challenge was that of content reuse in order to reuse and remonetise existing knowledge assets. Other aspects of content reuse challenge were the extraction of metadata from legacy content as well as the curation of relevant and appropriate content from existing libraries.

The aim in developing Almanac was not only to create a demonstrator application as a showcase for the approached and technologies that it encompasses but also to provide an evaluation of a platform that could be used to evaluate those approaches and technologies in a real world environment. This report describes the evaluation of the Almanac tablet app and supporting technologies in a K12 context, which was carried out in February/March 2015 in an Irish secondary school.

The objectives of this K12 trial were to determine:

- The overall usability of Almanac
- The overall effectiveness of the composition strategy within Almanac
- The effect of Almanac on the learner's perceived classroom readiness
- The pedagogical viability of Almanac in an authentic classroom setting

This report first provides an overview of the Almanac tablet app including a summary of the user experience provided by the app. This is supported by a high level overview of the Almanac system architecture, which is intended to orientate the reader with respect to the key technical features of Almanac. The Almanac user trial is then described with details of the specific context in which the trial was carried out as well as the methodology that was applied in the trial. The results obtained from the trial are then reported both from an app usage perspective and also a qualitative survey of the trial participants. Based on the quantitative and qualitative results of the trial, an analysis of the usability of Almanac is presented followed by a discussion of the findings from the trail.

A secondary short trial of Almanac was also carried out with learners from a fee paying secondary school for students with dyslexia, located in the Eastern United States. The

context of this trail was significantly different from that of the main trial carried out with students from the school in Ireland and as such the results are reported separately.

Overview of the Almanac Application

One of the key aims of Almanac was to demonstrate how existing or legacy publisher content could be used to generate new learning experiences that felt like native to the mobile/tablet environment. In other words that they would feel natural to the user given the features and constraints of the device. This drove two of the key features of the Almanac application, the first is the layout of the learning experiences generated by Almanac, which was intended to give a more informal experience to the learner through the use of a magazine style layout. The second was the use of third party sources of multimedia as a means of uplifting existing publisher content. By incorporating additional images and videos into Almanac's dynamically composed learning experiences, publisher content could be kept modern and fresh without the need to edit or refactor the content itself.

Through Almanac, a learner can access dynamically generated learning experiences by searching for a specific topic that they are interested in. This topic can be anything for which content is available within the Almanac system. For example, the trial of Almanac described in this report utilised geography content provided by a Learnovate Centre industry partner in the publishing sector, A learner might enter a simple search query such as 'soil' or 'meanders'. Almanac will then present the learner with a set of possible learning experiences or 'articles' that can be generated from the available content for that topic.

Almanac allows the learner to personalise their learning experience through the use of two adaptation controls, which can be used to influence both the complexity of the learning experience and its length. Rather than being 'adaptive' in the traditional sense, Almanac is 'adaptable' as it does not change the adaption attributes/axes automatically. Instead Almanac empowers the Learner to take control of their own learning experiences by explicitly influencing the process of composing a learning experience through the use of simple controls. An additional motivating factor in this design decision was the non formal nature of the Almanac learning experience. There was an expectation that Almanac would have no prior knowledge of the individual learner prior to the learner carrying out a search.

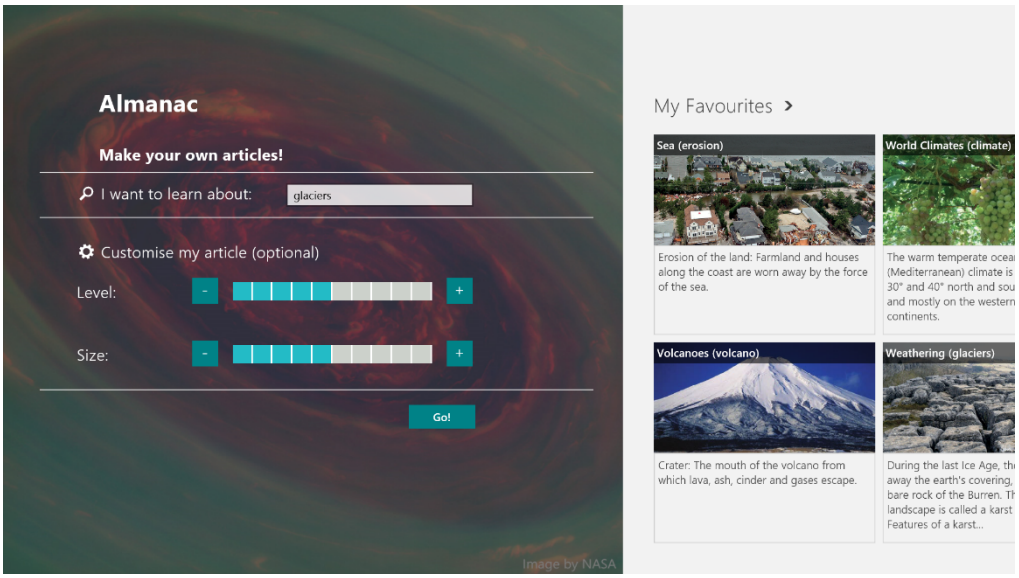


Figure 1 Almanac Windows 8 Tablet App Home Screen

Although the Almanac composition technologies are agnostic to the specific needs of a target user group, As the Almanac tablet application used in this trial was designed developed with 12-14 year old learners in mind. One of the design choices made with this in mind was that the names for the adaptation controls was kept quite simple with the complexity control referred to as the 'Level' while the time/duration control was referred to as the 'Size'. By adjusting the Level control, the learner can change the underlying composition strategy used by Almanac to generate learning experiences. A low value for Level is inferred by the system to mean that the learner has a lower level of prior knowledge in the subject they are searching for and as such Almanac generates a highly scaffolded learning experience that will guide the learner through the concepts. If the learner sets a higher Level value then Almanac will generate a more open learning experience in which the Learner must apply their comprehension skills as well as their existing prior knowledge. If at any stage the Learner feels that the learning experience is too easy or difficult they can use the adaptation controls to change their learning experience. The Size control allows the Learner to control whether they get a shorter or longer learning experience. This can also be considered as an indication of how much time the Learner has available to learn about the subject. Do they have 5 minutes and want a quick overview or do they have 30 minutes and want to delve deeper into a subject.

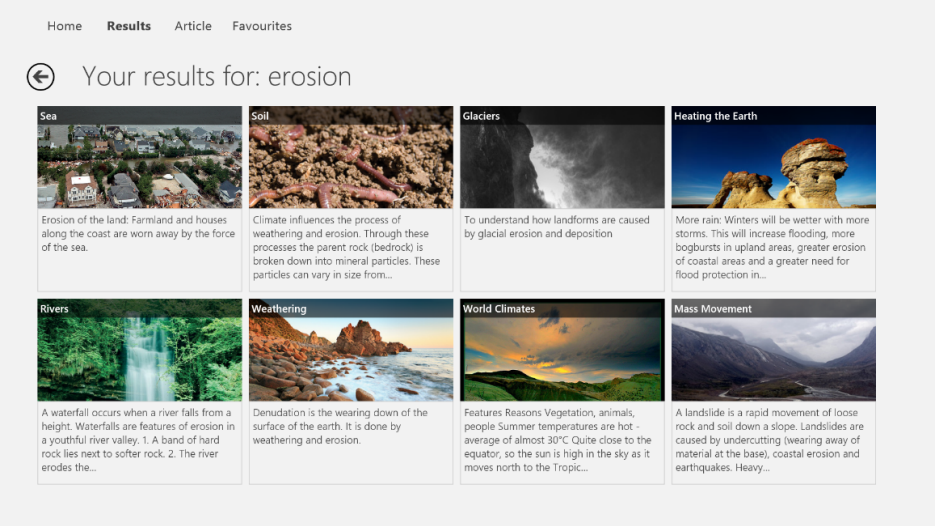


Figure Almanac Windows 8 App Search Results for 'Soil'

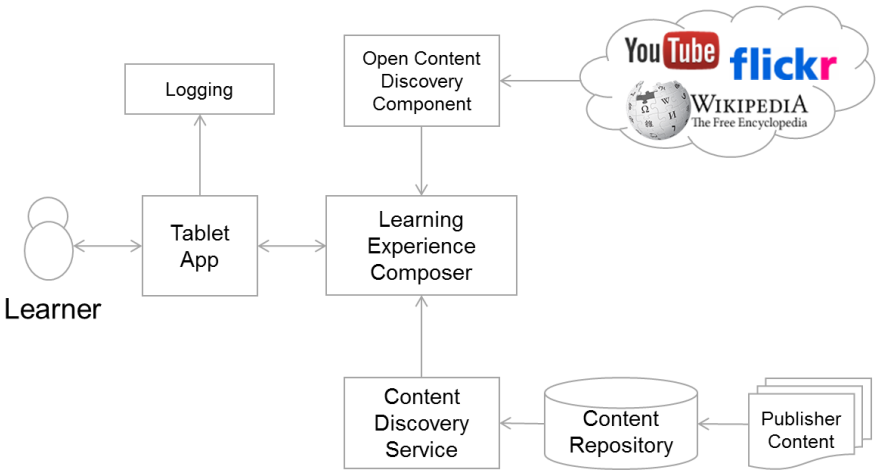
Almanac System Architecture

Almanac consists of a number of components that work together to deliver the desired user experience. The user interacts with Almanac through a client application, this application can take any desired form web based, desktop, mobile, etc. The prototype demonstrator system developed was in the form of a tablet application. The client application is responsible for providing the user with appropriate controls to enable them to enter a 'search' query and to specify their desired complexity and length of composition. The client application then needs to allow the user to select their referred article topic from the search results and to render the generated composition.

The client application interacts with the Composition Service through a simple RESTful API that supports the two main functionalities, searching for available/possible compositions and

generating a composition. The Composition Service interacts with the Open Media Search Service, which is responsible for searching across the available content sources, both open media and publisher, to facilitate the discovery of appropriate content that can be composed into a learning experience for the end user. The composition process is driven by one or more Composition Strategies, which describe how a learning experience can be generated including the appropriate structure/sequencing and how a composition can be tailored based on the available information (complexity/duration).

Figure 2 Almanac Architecture



The Open Media Search Service provides a RESTful API that supports searching across the sources that are available to it. Although the service does provide APIs to search across specific content sources the primary query mechanism is to search across all services that provide a specific content type at the same time. For example as part of the composition process the Composition Service might carry out a search for images of ‘volcanoes’, which would result is searches being carried out on both Wikipedia and Flickr for images of volcanoes. Any number of different media services could be added to the system to provide additional sources of image and videos. The demonstrator system relies on media sources that are publically available but this is not a requirement. Any service that provides an API through which media can be searched for could be incorporated into the system. Commercial services could be integrated in this way assuming that the necessary commercial licensing agreements were in place.

To facilitate the discovery of appropriate publisher content from the repository of available content Almanac uses the Apache SOLR search engine. The use of this search engine reduces the requirement for detailed metadata describing the content to be made available as basic information about the topics covered by the content can be automatically extracted. Almanac does however rely on some higher value metadata describing the appropriate pedagogical context for each slice of content. Currently this metadata must be generated by hand with the help of a web based tagging tool, however it is proposed that the pedagogical tagging metadata generated for the current demonstrator version of Almanac could be used as training data for a Bayesian classifier that could automatically generate pedagogical tags.

The Almanac Trial

Trial Overview

To meet the trial objectives of Almanac within the context of the K12 setting, the Almanac trial took place within a secondary school geography classroom.

Specifically, the main Almanac trial participants were from a non fee-paying co-educational secondary school in County Galway. 386 1st and 2nd year Junior Cycle geography students (ages 12-14) and two classroom teachers participated in the trial from the 23rd February until 27th March 2015. Use was integrated by the teacher into regular classroom studies and students accessed Almanac through Microsoft Surface devices or Lenovo Netbooks.

Within this main trial, both a TEST and a CONTROL group existed, the difference which is detailed in the following section.

Each group took a Readiness Assessment Test (RAT Test) prior to using Almanac. As measuring learning gain or uplift through the use of Almanac in the trial scenario would be problematic for various reasons, this assessment was chosen as a measure of perceived readiness.

First in regards to the problematic nature of measuring learning gain or uplift, due to the extent of the various learning and content paths available to learners as well as the need for some standardization of classroom experience so that no learner is perceived as being disadvantaged, the number of assessments needed to be generated to cover all paths was beyond the scope of this project.

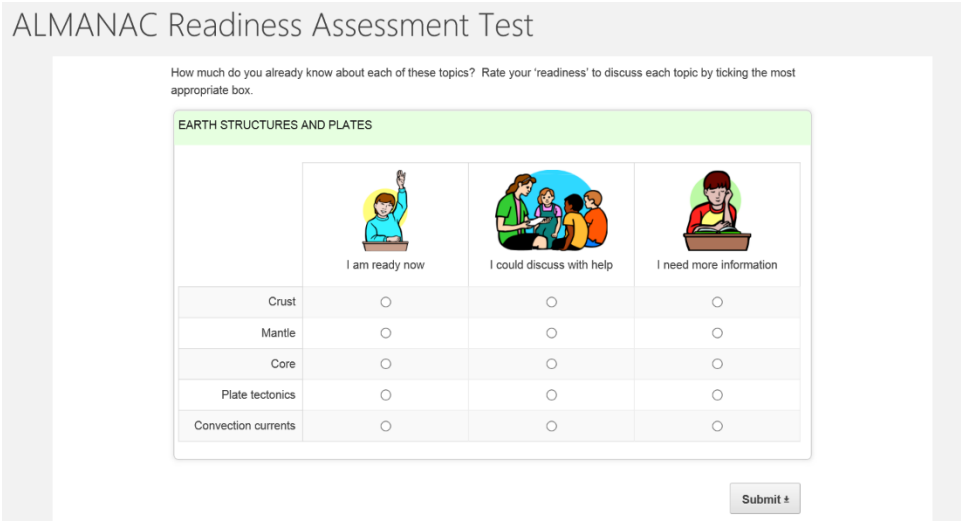


Figure Example Pre/Post Readiness Assessment Test (RAT)

The RAT tests then, in measuring perceived readiness, presented topics from the content and asked the learners to rate how prepared they felt to discuss the topic (ratings were as follows: I am ready now, I could be ready with teacher help, I need more information). Learners then took the same test at the end of Almanac use and before teacher intervention. The RAT tests were accessed through the search bar of Almanac and each different test (based on content unit) was assigned a randomly generated code.

In addition to this main trial, a secondary Almanac trial geared towards data around general usability, took place within a fee paying secondary school for dyslexic students located in upstate New York, USA. 20 students (ages 11- 14) took part in the trial, conducted on 10th April 2015. As there is not a dedicated geography class for this age group within the USA, student and teacher participants use was not integrated within regular classroom study and specific time was set aside to trial the system. Within this trial, students only used the TEST version of Almanac and accessed the app through an iOS operating system.

In regards to how Almanac was incorporated into the classroom setting, it should be noted that the original pedagogical conceptual design/trial objective was around Almanac as a tool to support the flipped classroom model as an instructional strategy. However, due to teacher's lack of familiarity with the model as well the ability for Almanac to fully support the model in the authentic classroom setting, the decision was made to replace this specific contextualization of Almanac with a more general and realistic usage scenario.

Specifically, the choice was made to move the pedagogical exploration of Almanac to the larger and more familiar pedagogical model and instructional strategy under which the flipped classroom model falls, that of differentiated instruction. This move allowed for trial results to include how effective Almanac was at facilitating differentiated instruction which in turn supports Almanac as a tool to aid a variety of instructional strategies and multiple uses within the classroom.

Test and Control Groups

One of the primary aims of the Almanac user trial was to evaluate the appropriateness and effectiveness of the just in time approach to the composition of personalised learning experiences. As such it was necessary to be able to evaluate this aspect of Almanac independently of other possible variables. This was achieved by splitting the participants in the Almanac user trial into a test group and control group. The test group used the full featured Almanac tablet app with its associated just in time composition functionality. The control group used a simplified version of the Almanac tablet app which did not generate pedagogically structured learning experiences or provide the learner with adaptation controls. Instead the control group version of Almanac provided the learner with access to the same publisher content and multimedia resources from Flickr, Wikipedia and YouTube but without any structure or sequencing. Essentially the control group users had a more traditional search experience in which each result represented a separate document. The differences, from the users perspective, between the test and control apps used in the Almanac trial are detailed in the user guides created for the test and control group participants, which are provided in Appendix A and B of this report respectively. The key requirements for the control group version of Almanac were to give users an experience that was consistent with the test group (dynamic composition) version with a focus on the following aspects:

- **Device:** In designing the Almanac trial it was important that the control groups experience was as close to that of the test group as possible, including the device used. We did not want to set up a situation in which the test group were asked to use a tablet device while the test group used desktop/laptop computers that they might perceive to be less exciting or modern.
- **User Interface:** The Almanac trial was also designed to provide both the test and control group with an application in which the overall look and feel of the application along with the basic modes of interaction were consistent. The aim was to provide both groups with an experience that was not dramatically different such as would be

the case if, for example, the control group were asked to use a web based search engine.

- **Content:** It was also vital that both the test and control groups had access to the same content. As the trial was based on existing content from a publisher that was developed specifically for the age range of the trial participants it was expected that this would have the potential to be of a better quality to some content that participants might ordinarily have access to on the web. Additionally, it was also considered important that the control group participants had access to the same multimedia assets as the control group.
- **Overall User Experience:** Another consideration was the need to ensure that the control group participants were provided with a learning experience that did not introduce additional complexity. For example it was considered that comparing the Almanac app against a web based search using a popular search engine would not be a fair comparison as the control group participants would have to deal with filtering out search results that were not relevant.

Trial Context Limitations

In considering the research questions as well as the trial objectives, the choice was made to conduct the main Almanac trial within an authentic classroom setting (versus a strictly controlled trial environment) appropriate for the age (secondary school) and ability (mixed) of the participants as well as and for the content contained with the application (Junior Cycle geography). While this context facilitated the trial objectives, it also offered specific challenges to data collection.

These challenges are particular to this specific context (the classroom) and participants (students aged 12-14) as well as to the power dynamic (teacher-student) within this setting and are not seen as transferable to other contexts.

Within the context, to facilitate the authenticity of this setting, the classroom teacher was in charge of orienting students to Almanac, incorporating Almanac in to ongoing instruction, fielding student-user queries as well as generally running the day-to-day of the trial. These means that teachers adapted app usage to fit within their own methodologies, opinions and preferences, teaching style and classroom atmosphere, all of which would have influenced student's usage, the treatment of the RAT tests, and overall perception of the app. Additionally, while Almanac was originally built to be a more individual informal learning platform, the reality of this within a classroom context is very difficult to achieve. This authentic classroom context also lend challenges in regards to student attendance, content demands, school timetabling, shortened periods, etc.

Additionally, considering the participants, this age student is traditionally more dependent on the teacher and their cognitive development, identified ability, personal responsibility and maturity level are not yet fully developed nor consistent across the user group. As the app was used within the authentic classroom setting, the student participants would have used it within these narrow parameters.

Another challenge of this particular trial setting is the natural power dynamic which exists within a classroom setting where the teacher is seen as the authority figure and the student acts in response to what the teacher tells them. Such a dynamic may have limited how students used the app, explored the app and reported their usage of the app.

Trial Methodology

Pre-Trial

Teachers were provided with both a one-to-one briefing and an orientation packet which contained various trial resources, including: administrative documents (consent forms, how to split users in to TEST/CONTROL groupings, how to upload the app to the device), documents for preparing students to use Almanac (discussion on being a contributor to research, the tasks involved with using Almanac, an Almanac user guide), documents on the instructional sequence (teacher action, student action), and resource documents (sample questionnaire, focus group questions, instructions for Readiness Assessment Tests).

Trial

The main trial was run over an extended period of time. Within this time frame, the following steps were given on how to run the trial of Almanac:

TEACHER ACTION:

First Use of Almanac (Steps 1 – 5):

1. **Find appropriate pre-/post- RAT survey and matching identifier codes based on current topic of study.** The appropriate content based RAT can be identified using the RAT Appendix provided.

2. ****Give pre-RAT identifier code to students.** The student accesses the appropriate RAT by typing the identifier in Almanac's search bar. It should take the student 1-3 minutes to complete this survey.

3. **Incorporate Almanac into instruction.** Almanac is a tool that can support differentiated instruction.

4. ****Give post-RAT identifier code to students.** The student accesses the appropriate RAT by typing the identifier in Almanac's search bar. It should take the student 1-3 minutes to complete this survey.

5. **Record how Almanac supported instruction.** Record how Almanac was used to support instruction (methodology used: jigsaw, group presentation, flipped classroom, etc.) on the provided **METHODS OF USE TEMPLATE (Appendix A)**.

At the end of the trial, after the last use of Almanac:

6. **^^Fill out questionnaire.** The **TEACHER QUESTIONNAIRE (Appendix B)** may be found in the resources provided.

7. **Participate in focus group (optional).** Participation in a focus group is optional. If there is need for a focus group, you will be asked by the researchers what you liked and didn't like about Almanac as well as what they would change. Answers will be recorded.

** The RAT only needs to be given during the first lesson Almanac is used in. While you may give them with subsequent lessons, and while we would appreciate the extra valuable data, it is not necessary.

^^If you use Almanac for more than one lesson, the questionnaire should be filled out at the end of your use and not the end of a singular lesson.

STUDENT ACTION:

1. **Access Almanac**
2. **Take pre-RAT** (1-3 minutes)
3. **Use Almanac**
4. **Take post- RAT** (1-3 minutes)

   At the end of the trial, after the last use of Almanac:
5. **Fill out questionnaire** (15 minutes)
6. **Participate in focus group** (optional)

Post-Trial

After the trial was conducted, both students and teachers filled out questionnaires. The student questionnaire consisted of 16 statements that students were asked to respond to using a 5 point Likert scale with the following possible responses:

1. Strongly Agree
2. Agree
3. Undecided
4. Disagree
5. Strongly Disagree

In addition, there was a free text entry question for a total of 17 questions. Two questions in the user survey were specific to the adaptation controls that were only present in the version of the app provided to the Test group. Only students in the test group were presented with these statements as part of the questionnaire. The post trail questionnaire was designed to elicit feedback from the students in the areas of the general usability of Almanac, the affordances of Almanac as a tool for learning and the quality of the content both in terms of the underlying content and as sequenced compositions.

Both the Test and Control groups completed the post-trial user survey on their tablet devices from within the Almanac app. The questionnaire itself was created using the Limesurvey[1] web based survey management software and hosted on a TCD web server. A customised theme for Limesurvey was used to improve its usability on a touch device as illustrated in Figure 4. The complete survey questionnaire is provided in Appendix E – Student Questionnaire.

[1] https://www.limesurvey.org/en/

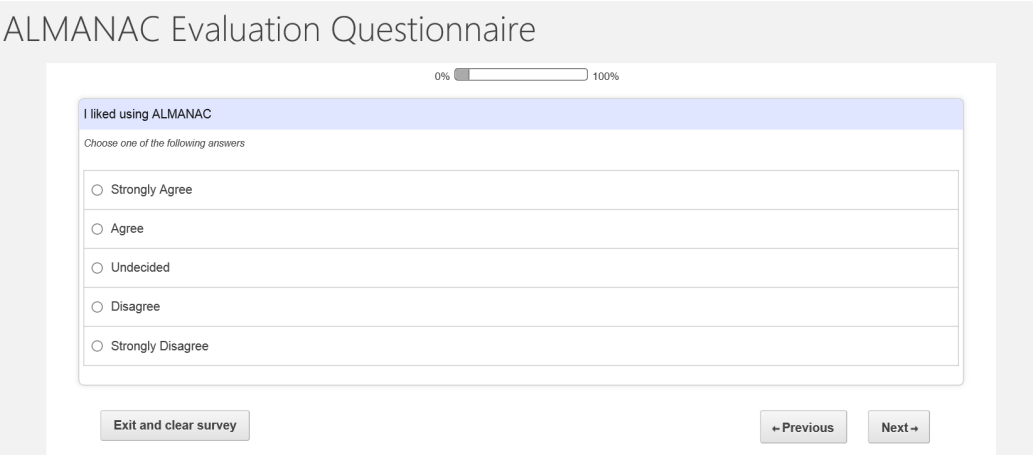


Figure 4 Example post-trial questionnaire as displayed on students tablet device

Additionally, interviews were conducted with both a sample of TEST and CONTROL student users as well as with the classroom teachers.

Trial Results

Usage Statistics

The Almanac trial ran in a non-fee paying Irish coeducational secondary school over a 5 week period between February 24 and March 27 2015. As stated previously the trial participants were drawn from first and second year students at the school and used a mix of Microsoft Surface Pro 2 tablet devices with keyboard covers and Lenovo netbooks[2]. Both the tablets and netbooks ran Windows 8.1.

337 students participated in the trial with 230 in the test group and 107 in the control group. The uneven distribution of participants across the test and control groups was the result of….

Figure 5 provides a graphical illustration of the usage of the Almanac app by the test group, the group that used the actual Almanac application, over the 5 week period of the trial. The graph plots the total number of searches, compositions (articles generated) and page views per day. Also shown is a bar graph plotting the number of unique users per day. This can be used to provide context for the usage statistics. In the test group the average number of searches carried out per participant was 14.2 with 8.4 articles generated per participant. The average number of pages viewed per article generated was 6.2.

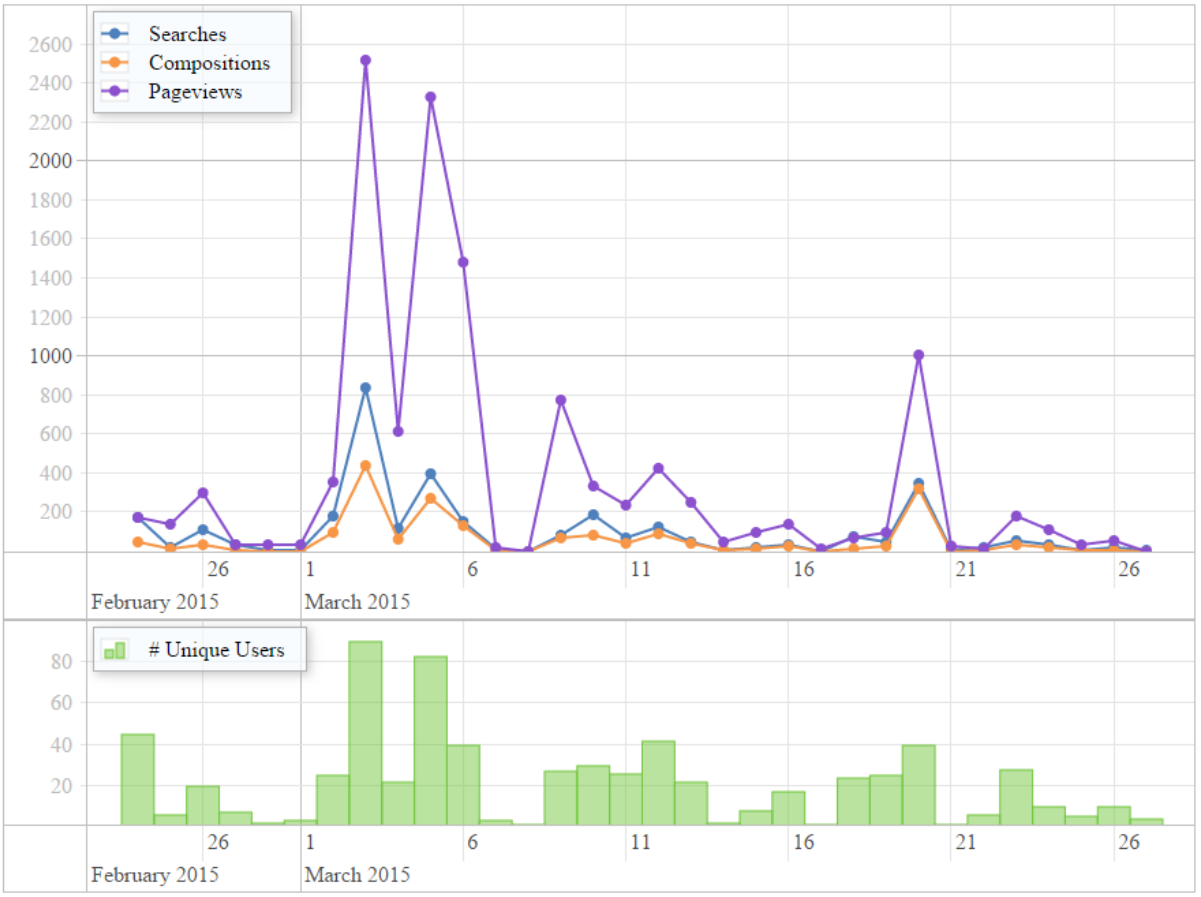


Figure 5 Test group usage per day

[2] First year students used Surface tablet devices with Type covers while second year students used netbooks.

As described previously, the trial methodology involved the use of the Almanac app as part of classroom activities. This is reflected in the usage statistics over the trial period which show very distinct spikes in usage on specific days.

For the control group the high level usage statistics are limited to the number of searches as the control group did not generate compositions

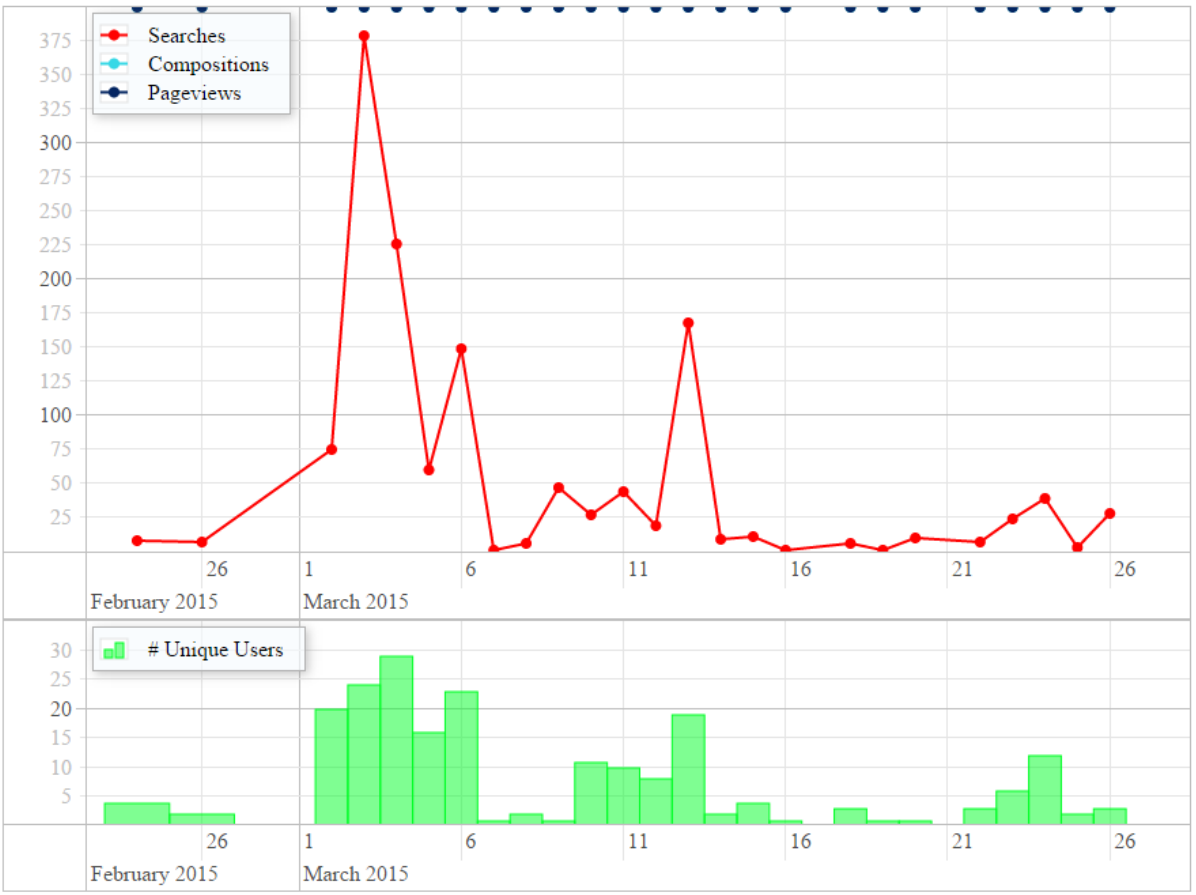
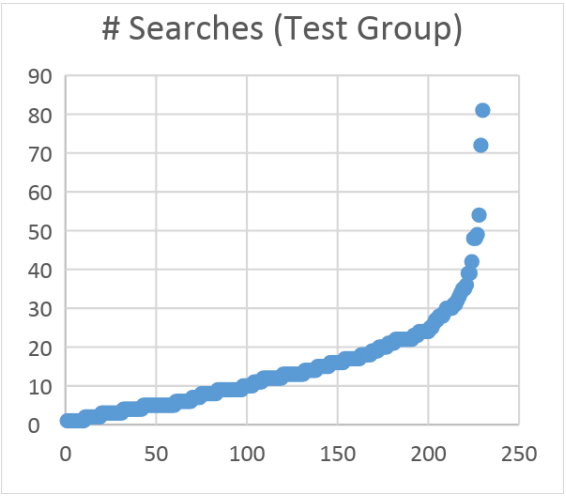
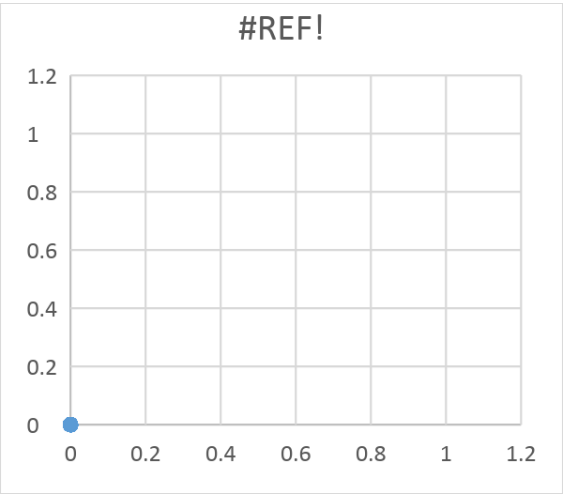


Figure 6 Control group usage by day





Search Queries

Over the trial period 615 unique search queries were used by the trial participants in the test group. Of those 64 can be discounted as they were variations on the keywords used by the

students to access the Readiness Assessment Tests. For example, the students would try to search for ‘pool34’ or ‘pool25’ to see if they could access other tests. Similarly, 61 other queries were for topics that were not geography related such as ‘metallica’, ‘horse chestnut’, ‘hedgehog’ and ‘facebook’. The remaining search queries used by the trial participants were broadly in line with the two topics, rivers and rocks, chosen by the teachers participating in the trial based on where their classes were in their course of study once the Almanac trial commenced, with the most common search terms being rocks with 670 queries and rivers with 586.

Although some participants were simply testing the boundaries of the system by searching for things such as ‘facebook’ and ‘youtube’, possibly trying to circumvent their school’s internet filters or just to see what would happen when they searched for ‘choo choo’. Other search terms appear to indicate that some participants were try to use Almanac to access material that they were interested in. For example, there were a set of searches relating to the solar eclipse, which was a topic in the media at the time of the trial.

Adaptation Controls

One of the affordances of the dynamic composition approach to the delivery of learning experiences in Almanac is the ability to adapt the generated compositions to the needs of the individual. Almanac allows the learner to influence the composition process through the ‘Size’ and ‘Level’ controls.

Figure 7 provides a visual overview of the usage of the two adaptation controls for the 3275 searches carried out over the trial period by the Test group. The diagram adopts a ‘heat map’ style representation showing the total number of searches carried out for a given ‘Level’ and ‘Size’ setting. The Level and Size settings are both numbered from 0 to 9 as the users were provide with a UI control that allowed them to set the Level and Size within a 10-point range. The colour scheme used in the diagram ranges from green to red, with green indicating a high number of searches and red indicating no searches.

Size \ Level	0	1	2	3	4	5	6	7	8	9
0	47	4	3	4	7	2	3	1	1	23
1	3	3	0	0	0	0	0	0	0	3
2	0	0	6	0	1	3	3	0	0	2
3	8	1	2	29	19	2	0	3	0	5
4	16	16	11	36	2180	45	17	12	11	46
5	2	1	2	3	23	53	17	8	7	12
6	1	4	1	0	17	5	2	3	1	7
7	6	1	0	3	22	1	2	2	1	8
8	2	0	2	4	6	2	9	1	1	3
9	52	6	3	2	110	9	18	2	7	243

Figure 7 Adaptation control usage

Looking at the break down of searches across the range of possible values it is immediately clear that two thirds of all searches were carried out with the Size and Level both set to 4. These were the default values set with the tablet app so we see that for 2 out of every 3 searches carried out the user did not change the settings at all. This might seem to be a disappointing result but there are some factors that come into play here. First we must consider the trial participants themselves and the context of the trial itself. Being 11-12 year old secondary school students it is expected that the participants in the trail would not be immediately comfortable with the use of such adaptation controls as it requires a certain degree of metacognitive ability as a learner to determine how much you think you know about a subject. Additionally, Almanac was being trialled in a classroom context in which it was the primary source of information on a subject domain that the students had not previously covered. The students are used to being provided with the information that they need without the need to first consider what they need. Given the expected challenges in trialling the approach taken in Almanac in this context a simple user guide was developed and provided to the teachers to give to the students using Almanac at the beginning of the trail. However, this did not happen and so the students had difficulty in understanding what the adaptation controls actually did. This is reflected in the feedback provided by the students in the interviews discussed later in ???

Although there are notable issues in utilising this sort of ‘adaptable’ application with users in this age range it is still interesting to note that the trial participants did utilise the adaptation controls in one out of three searches. We can see large spikes in the extremes where users were possibly playing with the settings to see what the effect would be, for example by setting the Level and Size to 0 [0,0] or both to 9, [9,9]. Similarly, there are spikes at [0,9], [4,9] and [9,4]. The other notable feature is the set of searches in which the participants left one setting the same, for example leaving Level unchanged and modified the Size setting or vice versa.

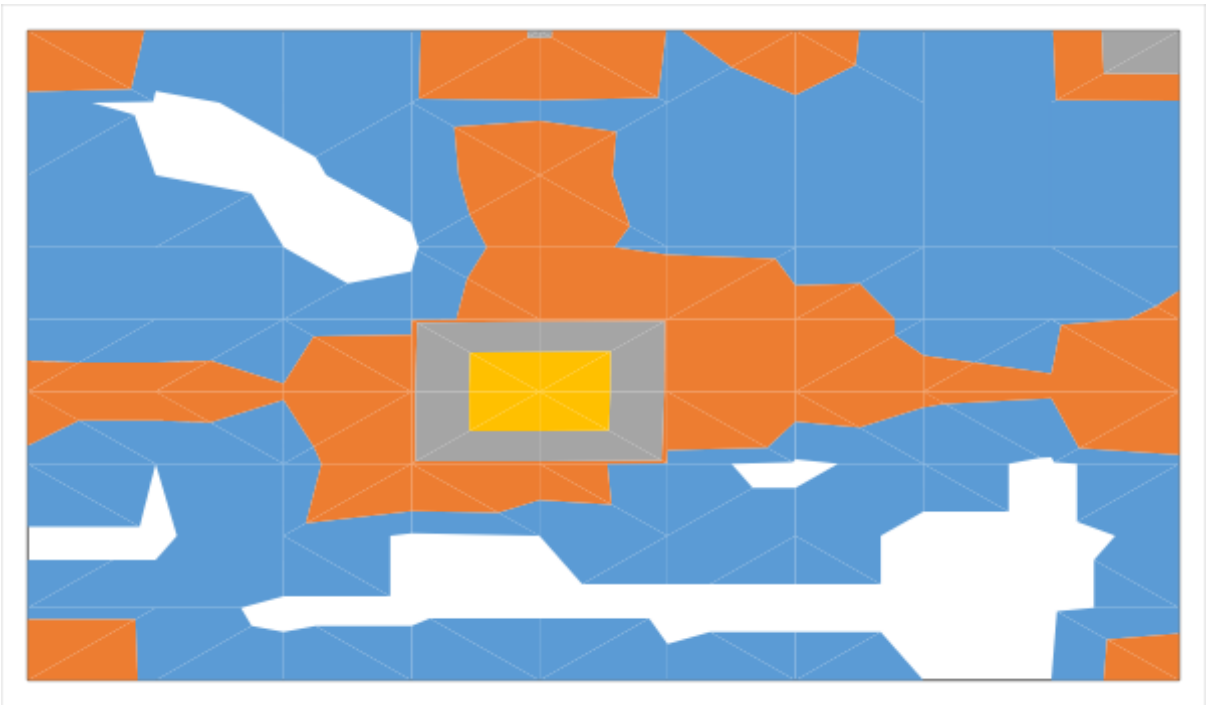


Figure 8

Interestingly, there did not appear to be any bias amongst the trial participants towards either adaptation control with both controls being used equally. Searches in which the level or size were modified from the default were 890 and 885 respectively while the number of search in which either the Level or Size were left at their default while the other setting was changed were 205 and 210 respectively.

Student Survey

There were a total of 186 completed survey responses from students. This consisted of 139 test group responses and 47 control group responses. The complete survey results are detailed in

Appendix G. In this section, the data is aggregated to more clearly identify and compare the relationship between the test and control groups. This aggregation consisted of combining the “Agree” with “Strongly Agree” responses and “Disagree” with “Strongly Disagree” responses. This allows for results to be categorised and visualised around positive, neutral and negative responses to the survey statements.

As shown in Figure 9, the first and second statements “I liked using Almanac” and “Almanac was easy to use” show as increase of positive responses between control and test groups of approximately 16% and 20% respectively. A particularly positive finding is that 75% of students in the test group agreed that the Almanac was easy to use.

S1: I liked using Almanac

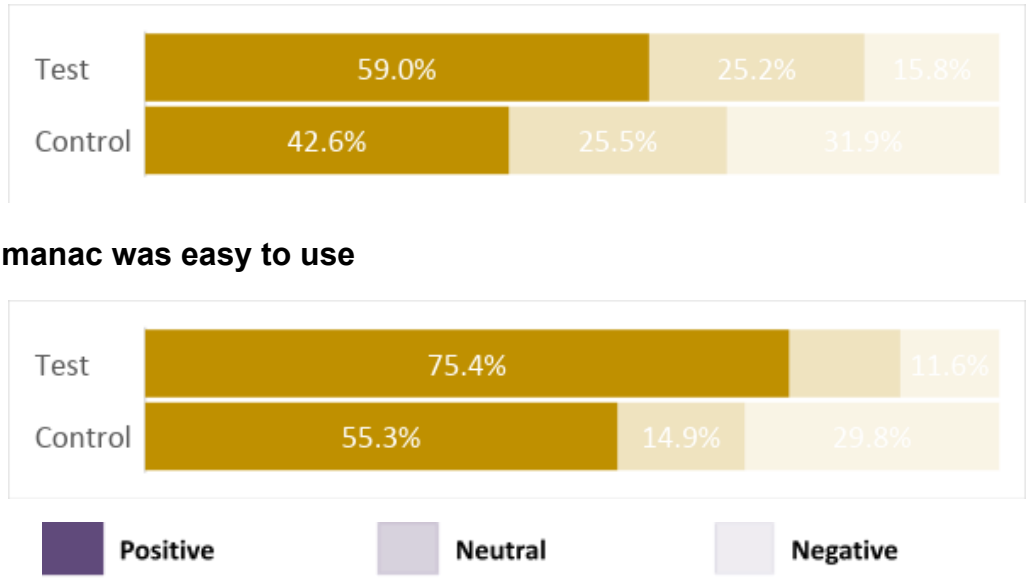
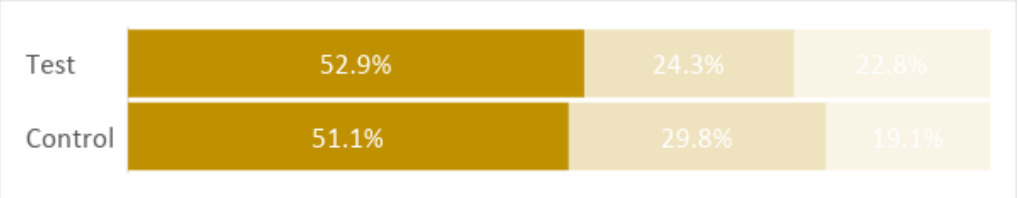


Figure 9: Responses to survey statements 1 & 2

As shown in Figure 10, the third statement “The look of Almanac was visually appealing” shows a more evenly distributed result for both control and test groups. This indicates that both versions of the app were deemed similar in terms of visual quality. One of the objectives of the trial was to have two versions of app of approximately the same visual quality in order to identify the impact of the personalised composition features. This is a positive result in terms of the effectiveness of the trial and its implementation. The result for the fourth statement, “The articles contained a good mix of text, pictures and/or videos” shows an increase in positive responses of 26%. This result suggests that the longer articles in the test group version of the app where seen as more appropriate by the participants.

S3: The look of Almanac was visually appealing



S4: Articles contained a good mix of text, pictures and/or videos

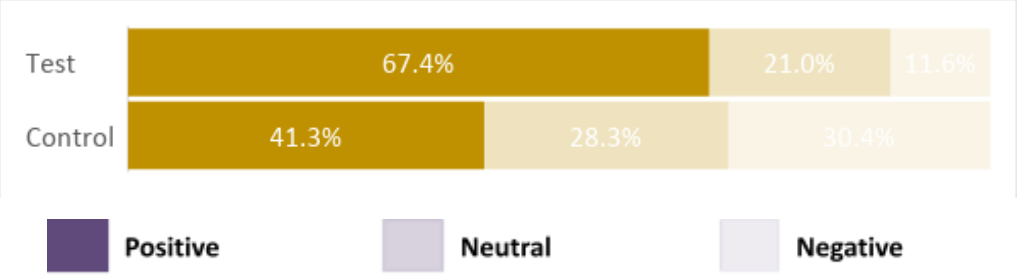
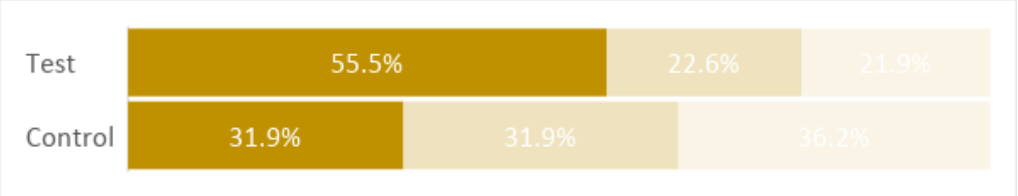


Figure 10: Responses to survey statements 3 & 4

Figure 11 presents the responses to the statement "The articles contained the information I was looking for" and shows an increase of 24% between control and test group. Statement 6, "It was hard to find the information I was looking for" shows an 18% decrease in agreement from control to test group. These results indicate that the longer article compositions in the test group contained more of the required information in one location and made it easier to find than searching across multiple shorter articles in the control group.

S5: Articles contained the information I was looking for



S6: It was hard to find the information I was looking for in the articles

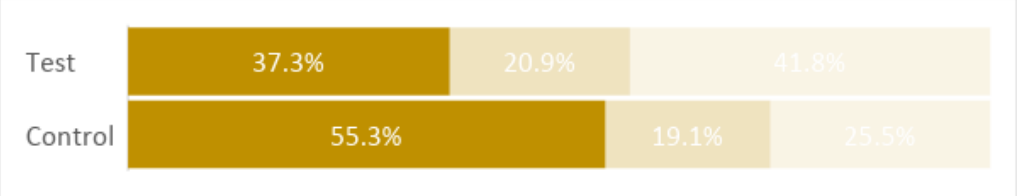
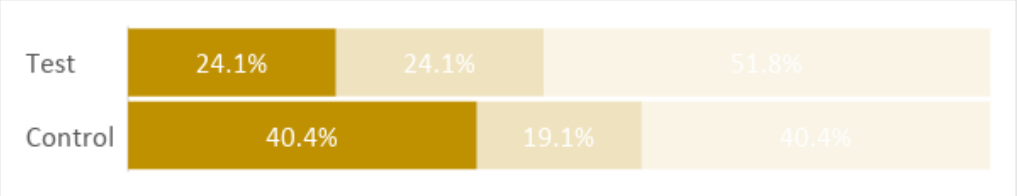


Figure 11: Responses to survey statements 5 & 6

For statement 7 "The way the information in the articles is presented was confusing", the responses show a 16% decrease between control group and test group. This suggests that the personalised article compositions reduced the difficulty for the user when compared to the multiple individual articles in the control group. For statement 8, there is a 19% increase

in agreement with the statement that “Almanac prepared me for class” between test and control groups.

S7: The way the information in the articles is presented was confusing



S8: Almanac prepared me for class

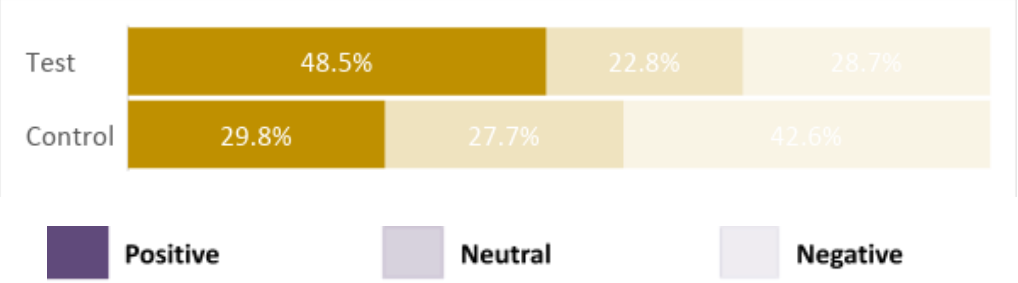


Figure 12: Responses to survey statements 7 & 8

For the next question ”Which features of Almanac did you like”, 118 participants within the test group (85%) and 41 participants with the control group (87%) provided open text responses. These responses were analysed qualitatively, with seven general categories of response emerging from the data (with responses being categorised multiple times if necessary).

For the test group, the categories of response included, in order of frequency: 1. Learning, 2. Ease of Use, 3. Media Content, 4. Design, 5. Search, 6. Other, and 7. Personalisation

For the control group, the categories of response included, in order of frequency: 1. Learning and Other (tied), 3. Media and Design (tied), 5. Ease of Use, 6. Search. Expectedly, the category of personalisation did not appear in the control group responses.

The category with the most noteworthy marked difference in number of responses was that of Other, with 7% of the test group and 26% of the control group responses being categorised as such.

When looking at the responses within this category, the test group responses either fell broadly into a response of ‘nothing’ or ‘all of it’. In the control group, however, while there were also responses of ‘nothing’, there were also detailed responses on what specifically the user did not like about, or found problematic within, Almanac (see below).

The second category with a notable marked difference in number of responses was that of Ease of Use, with 22% of the test group and 13% of the control group responses being categorised as such. In looking at the response there is no trend of response to explain this difference.

All other categories had a nominal difference.

While the full categorisation of the textual responses are detailed in Appendices I, J and K, a sampling of student user responses from each category is given below. It should be noted

that all responses are reported as given [*sic*] and have not been edited for grammar, spelling, clarity, etc.

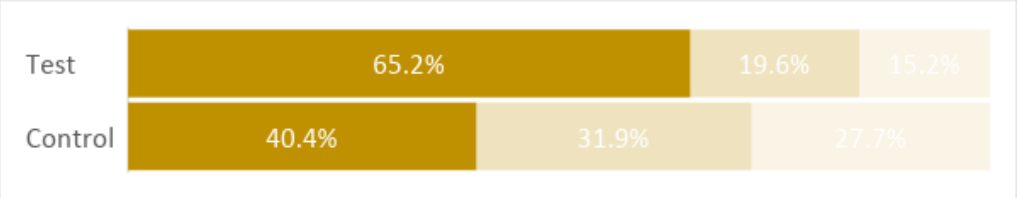
TEST GROUP – QUESTION 9 'Which features of Almanac did you like?'	
LEARNING	● The amount of relative information presented to me after researching a specific topic. ● Helps you learn better ● I could learn new things outside of class
EASE OF USE	● How the information was so easy to access and it had everything i needed ● I liked the way you could just type in what you wanted to know and everything that you needed to know came up straight away ● it was easy to find all the info
MEDIA CONTENT	● the fact you could look up something and it would come up as information and pictures, not just information. ● I liked they way it had pictures and videos in the articles ● I liked the pictures and videos
DESIGN	● Just the way it is laid out and presented ● the look of the app ● The setup of the information and how it was layed out
SEARCH	● the way you can search anything ● the features I liked was the search the way when you just put in what you want and search it ● I enjoyed searching for the information.
OTHER	● None ● Nothing ● The one about rocks
PERSONALISATION	● Different levels and sizes ● I liked the slidey part when you were looking through information and I liked the layout of the images ● i liked how you could choose your size

CONTROL GROUP – QUESTION 9 'Which features of Almanac did you like?'	
LEARNING	● Everything is trustworthy ● I like that it is all summarised and that there is no excess information ● I liked it because it helps with projects and researching things.
OTHER	● There wasn't much I liked because whenever I tried to search something all that came up was videos and not the stuff I wanted to find out so I didn't like that ● I liked how there was a few articles , but the problem was there wasn't anything in them. ● I disliked every single aspect of ALMANAC!
MEDIA CONTENT	● There was good images ● I liked that there was videos so it shows you an example instead of just words. I liked that things are easy to find ● I liked that ALMANAC had lots of pictures and videos
DESIGN	● The simple interface ● the layout ● I like how their was a choice between videos and articles.
EASE OF USE	● It was handy to just go on to ● How it is so easy to find the information with the help of the titles and pictures and the search engine at the beginning ● Information was easy to find
SEARCH	● I liked that you could type in what you wanted to know and that they gave lots of options to chose from

For statement 10, in the test group, 65% of students in the test group felt that the length of the articles was good and only 15% disagreed with this statement. This result is interesting as the test group version of the Almanac app provided longer articles whose length was influenced by the personalisation selections made by the user when performing a search. The results would suggest that the users did not see the variance in article length as a negative aspect of the app. In the control group version of Almanac, the responses are more evenly distributed most likely due to the multiple shorter individual articles presented to the user.

The results for statement 11 show that for both control and test groups the user largely disagreed with the statement that the information in the articles was too easy. This is a positive result as the information in the articles was the same across both groups and the result validates this aspect of the trial and its implementation.

S10: The length of articles was good



S11: The information in the articles was too easy

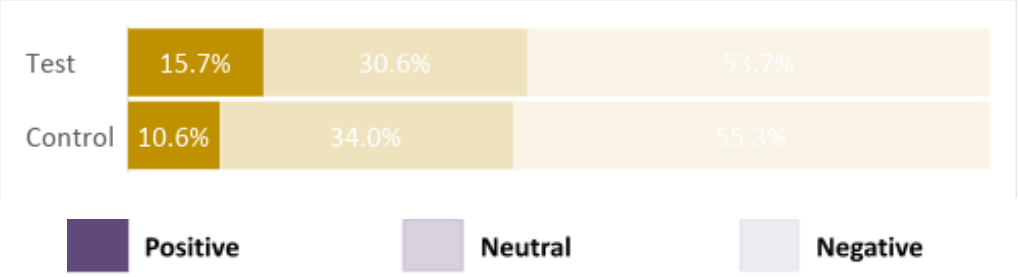
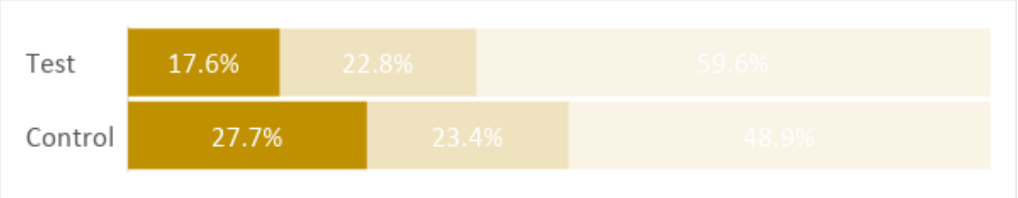


Figure 13: Responses to survey statements 10 & 11

For statement 12 “The information in the articles was difficult to understand”, there is only 28% and 18% agreement in the control group and test group respectively. This suggests that the content was not difficult for the age group of the participants in either group. There is a 10% decrease in agreement between control and test group. However, as detailed later in this section this difference is deemed to be not statistically significant. This consistency between groups is a positive trial outcome because both versions of the Almanac app used the same content.

For statement 13, the results show a 22% increase in agreement with the statement “My overall experience using Almanac was positive”. This size of increase indicates that participants experience using the test group version of Almanac app was significantly better than the control group. This is a very positive result when compared with previous results that showed equality in terms of the visual aspects and content of both versions of the Almanac app.

S12: The Information in the articles was difficult to understand



S13: My overall experience was positive

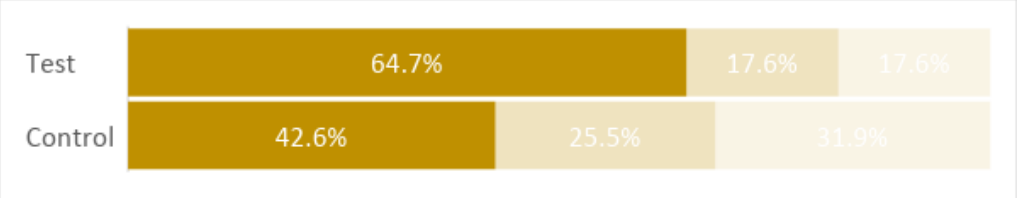


Figure 14: Responses to survey statements 12 & 13

Figure 15 shows the responses to statements 14 and 15 which were concerned with the use of the level and size personalisation controls. These features were only provided in the test group version of the Almanac app and therefore were only included in the survey given to the test group participants. The results indicate that 47% of users understood what the controls were for. However, 53% either disagreed or were neutral about this statement suggesting that there was some lack of understanding about the controls amongst the students. 42% of students agreed that the level and size controls affected the generated articles. However, 58% were neutral or disagreed indicating that for some participants there was a lack of understanding about how the controls worked and affected the generated articles. One potential explanation for these findings are that the controls were not explained to the participants in enough detail during the trial. However, they do indicate that some further refinement of how these controls are presented in the app is required.

S14: I understood the purpose of the level and size controls

S15: Using the level and size controls affected the article that was generated

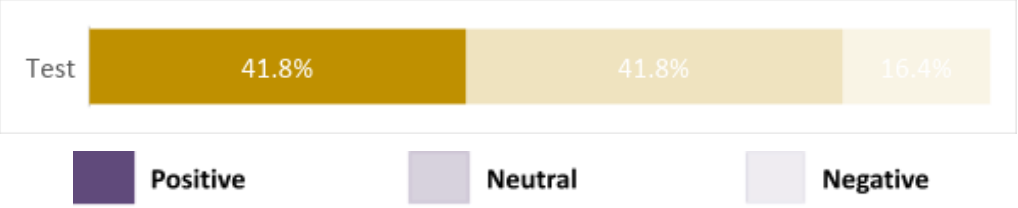
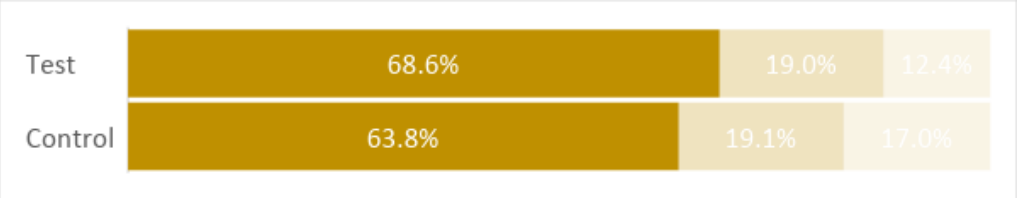


Figure 15: Responses to survey statements 14 & 15

Figure 16 shows the participants indicated a strong agreement with the statement “The images and videos I received help me to learn about the topic”. The results were similar across both the test and control group versions of the app. This is a positive outcome that indicates the effectiveness of the trial setup because the same images and videos were provided to both sets of users. The result is consistent with the comments that were received in response to question 9 and in the follow-up participant interviews. Overall, the students expressed a strong preference for more visual and engaging forms of content to support their learning.

For the control group, the majority of the participants stated they did not think Almanac was better or more enjoyable than searching on the web. However, these results are significantly different for the test group version of the Almanac app. In this case, the majority of users stated that Almanac was better or more enjoyable than searching on the web. Again, this is supported by comments made in the participant interviews. This very positive result indicates that the use of personalised composition to deliver mixed content articles can provide beneficial learning experiences when compared to common search-based approaches.

S16: The images and videos I received helped me to learn about the topic



S17: For my school work, ALMANAC was better or more enjoyable than searching on the web

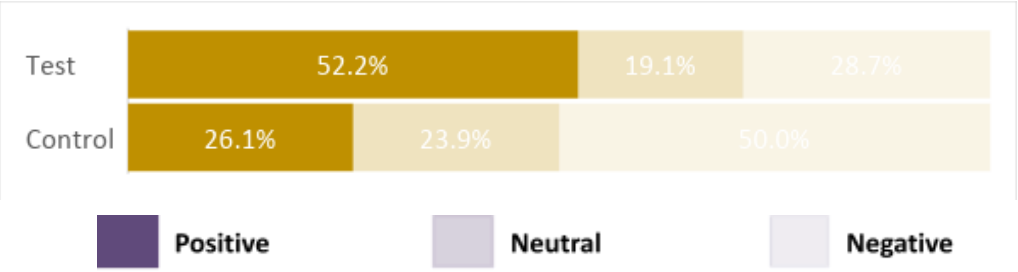


Figure 16: Responses to survey statements 16 & 17

To analyse the survey results in more detail, statistical analysis of the results was performed. The mean score was calculated for each survey question and the results are presented in Figure 17. The results indicate similar findings to the percentage distributions presented previously. To determine the statistically significance of the responses paired t-tests were conducted on the mean scores. The complete list of results is presented in

Appendix G. The results show that there is a significant difference ($p<0.05$) between control and test groups in all questions with the exception of the following statements:

- Statement 3: The look of Almanac was visually appealing
- Statement 11: The information in the articles was too easy
- Statement 12: The information in the articles was difficult to understand
- Statement 16: The images and videos I received helped me to learn about the topic

These questions are concerned with visual design of Almanac and the content that was delivered to the users. It was an objective of the trial to have consistency between the test and control group versions of the app at the visual and content levels. This would allow for more consistent assessment of the personalised composition features. As a result, the findings for these questions are positive as they show parity between the two different versions of apps. The participants viewed both apps as approximately equal from both a visual and content perspective. This supports the other findings from the trial and reduces the possibility that any differences found were influenced by inconsistencies in the design and content of the two trial versions of Almanac.

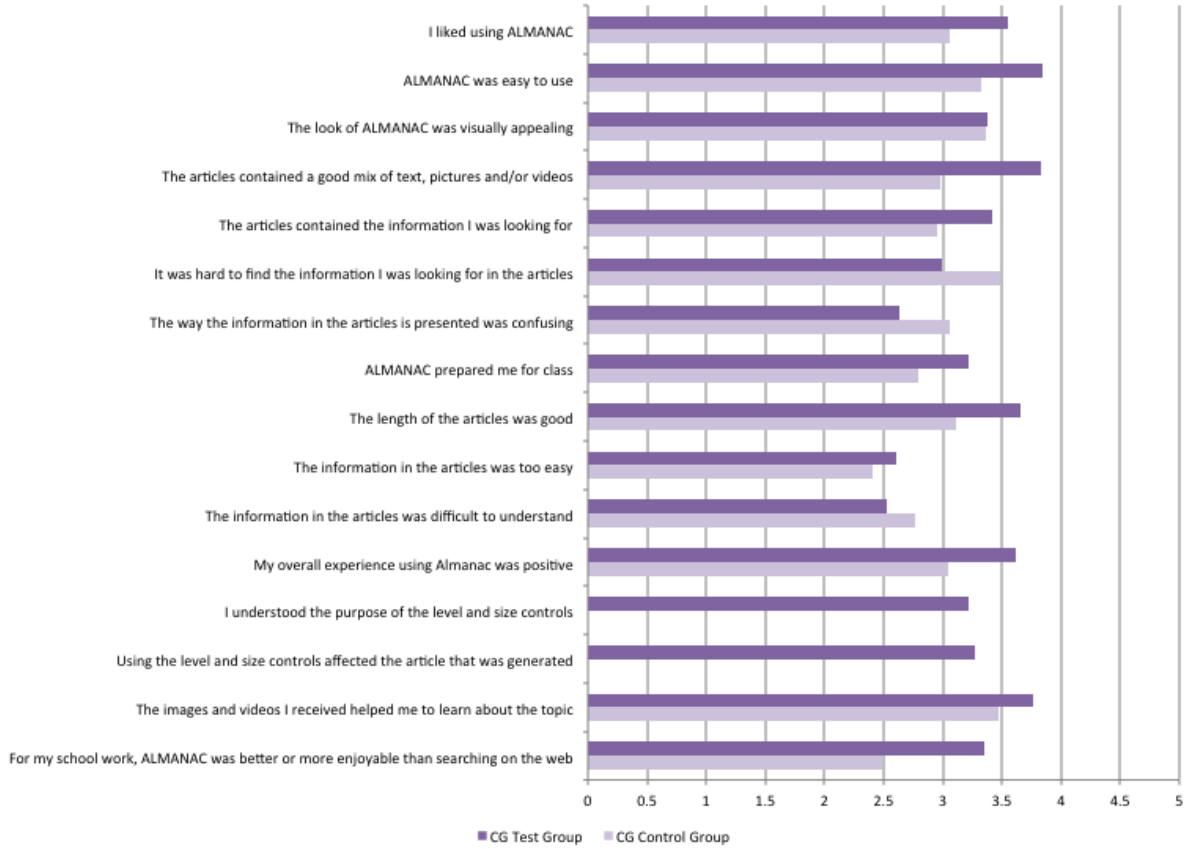


Figure 17: Mean scores for survey questions

Readiness Assessment Tests

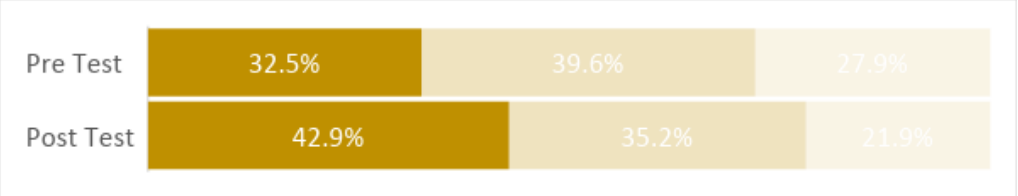
There were a total of 598 completed RAT test responses from students during the course of the trial. This consisted of pre- and post tests post-tests across both the test and control groups. Participants also used one of two different topics, “Rivers” or “Rocks”. The responses are detailed in Table 1.

Test/Control	Pre/Post	Topic	Responses
Test	Pre	Rivers	124
Test	Post	Rivers	101
Control	Pre	Rivers	22
Control	Post	Rivers	15
Test	Pre	Rocks	92
Test	Post	Rocks	94
Control	Pre	Rocks	76
Control	Post	Rocks	74

Table 1: RAT test responses

Figure 18 shows the percentage of responses for the topic “Rivers”. In the control group, there is an increase of approximately 10% in agreement with the statement “I am ready now” between the pre- and post-test. In the test group, there is an increase of approximately 8% between pre- and post- tests. Overall, the results are broadly similar and suggest that users do perceive some learning benefit from both versions of the Almanac app. However, the results do not provide any conclusive evidence of a difference in perceived learning by the users between the test and control groups.

Control Group - Rivers



Test Group – Rivers

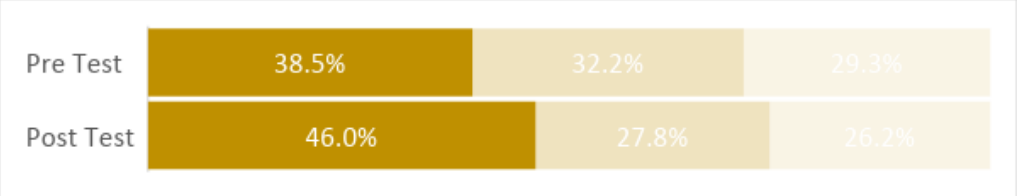


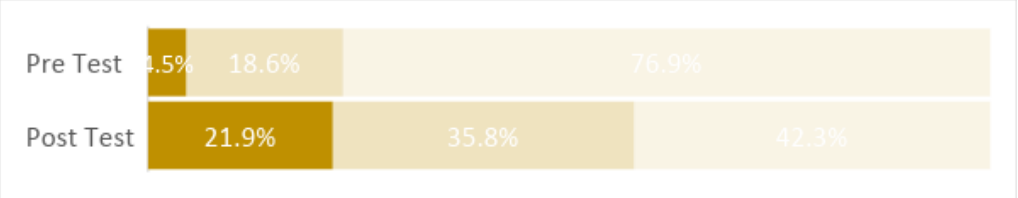
Figure 18: RAT tests - Rivers

Figure 19 shows the percentage of responses for the topic “Rocks”. These results show different percentages rates for each response when compared to the “Rivers” topic. There are significantly lower percentages of students, 5% and 2%, who agreed with the statement “I am ready now”. The large majority of students in the pre-test, 77% and 87%, agreed with the statement “I need more information”. This could be due to a number of factors such as the relative difficulty of the topics and the terms selected to represent the topic. There is a

perceived benefit of 17% between pre- and post-tests in both the test and control group versions of Almanac. However, the results do not indicate any perceived learning benefit between the test and group sets of users.

Overall, the RAT test results would suggest that personalised content composition does not improve the user's perceived learning benefit when compared to a search-based approach. It should be noted that this may be due to issues with the implementation of the RAT tests from both the capability of the schools' network connectivity system and with teachers and students following the needed sequence of instruction to properly effectuate the RAT tests. However, it does not impact negatively and can be considered as a viable alternative approach to provide learning content.

Control Group – Rocks



Test Group – Rocks

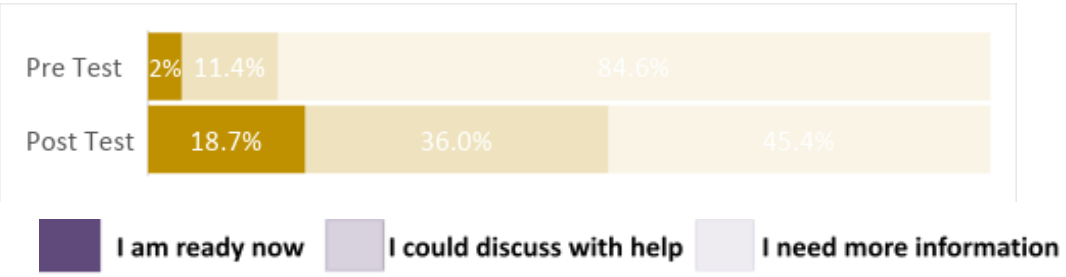


Figure 19: RAT tests - Rocks

Student and Teacher Interviews

Student Interviews

In addition to the student survey, end of trial interviews were conducted with a sampling of student participants from both the test and control groups. Each interview had five student participants all of whom were volunteers. While four interviews were conducted in total, two with test participants and two with control participants, it should be noted that as two of the files were corrupted before transcription (one for test, one for control) and interviewer notes from these interviews will be used to supplement.

The questions selected for the interview were based on the research objectives, the survey questions as well as an understanding of the user group demographics. Specifically, students in both the test and control group were asked:

1. What did you like about Almanac?
2. What was confusing/difficult/problematic with Almanac? What didn't you like?
3. What would you change to improve Almanac?

Additionally, as based on teacher feedback that students did not understand the 'Level' and 'Size' controls, students in the test group were asked for their thoughts on these.

Responses are thematically categorized.

What did you like about Almanac?

Test Group

In response to the question 'What did you like about Almanac?', student response from the test group was positive and enthusiastic around Almanac as a tool for the classroom.

Responses to this question generally fell in to two main categories, that of 'Learning' and that of 'Ease of Use', categories also used to classify the free text survey responses. Based on the full interview, subcategories are offered within each of these categories to provide greater context and relevance to the student responses:

1. LEARNING:
   - age appropriate: *put to your own standard* and *you know every word, there aren't fancy words*
   - a trusted source: *it is from people who know what they are talking about*
   - content: *type in topic and it was all there in a couple of pages and videos and image to help; get the answer straight away, you can just skim through it*
   - categorised: *easy at the start and harder as it went along*

2. EASE OF USE:
   - organised: *nice and organised*
   - convenience: *handy at home for homework*
   - accessibility*: good because it wasn't as confusing as some things and picture helped* and *there wasn't a load of writing;*

These responses correlate to the free text survey responses to the same question, giving more depth to the categorizations of 'Learning' and 'Ease of Use' and helping to contextual the quantitative data as well as the students experience of not only using the app but in which ways the app was useful.

Control Group

In response to the question 'What did you like about Almanac?', student response from the control group was positive around Almanac as a tool for the classroom.

Specifically, students spoke about liking that Almanac was:

1. LEARNING:
   - age appropriate: *on Google you get a lot words you don't know; this is really simple so you understand it more, on Google we don't understand; simple not with loads of information that's not needed*
   - a trusted source: *know the information is right [unlike Wikipedia*]
2. EASE OF USE
   - convenience: *A lot easier than having a book; you wouldn't have to flick through loads of pages; gives you a simple summary; on one website;*
   - accessibility: *Really easy to research; typed in what you needed it was just there; very easy to read; we are used to that set up*
3. DESIGN:
   - overall appearance: *how it looked*

In comparing the test group responses to the control group responses the similarities between them can be seen to correlate that there was no difference in the perception of experience by the different groups.

What was confusing/difficult/problematic with Almanac? What didn't you like?

Test Group

In response to the question 'What was confusing/difficult/problematic with Almanac? What didn't you like?' student response was very focused on specific key issues.

The issues identified by the students fell in to two distinct subcategories within the category of 'Ease of Use'. Specifically, students spoke on issues with Almanac in regards to:

1. EASE OF USE:
   - intuitive use: *didn't understand how to use it at the start (needed to be told); didn't understand the standard or the bars until told; needed instructions; wouldn't have been able to start doing it at home*; *the level…at the start…if I did the first block would that be way to easy and if I did the last block would it be way too hard like university level; it wasn't really labelled how easy or hard; or the size, if you want down to the bottom, was that a half a page and up to the very top 11 pages…you didn't know…very hard to judge when you didn't know what you were judging on.*
   - accessibility: *kind of annoying if you typed in rocks and you wanted to say types of rocks and then the rocks just deleted itself*

These responses can be linked back to both the nature of Almanac as a demonstrator, and not a fully developed experience, as well as the trial being teacher-led, where teachers made

the choice to not give the students the user instructions that had been created to help supplement the experience.

These responses also highlight the nature of the user group (age demographic) as well as the context of the trail (within a classroom setting with predefined learning expectations).

Additionally, these responses give insight into the selected pedagogical method of personalising the experience based on prior knowledge and amount of information and that these may not have been the best fit for this user group in this context.

Control Group

In response to the question 'What was confusing/difficult/problematic with Almanac? What didn't you like?' student response was very general and limited.

The only comments on this question in the interview were that students said that they didn't find anything confusing/difficult/problematic as it was *pretty simple and straightforward.*

This response is interesting for two different reasons.

Firstly, when comparing and contrasting to the test group responses, it highlights the lack of clarity and direction around the personalisation settings had on the students overall perceived experience within the test group.

Secondly, this is an interesting contrast to the free text responses within the survey as student respondents from the control group were much more emphatic in expressing confusing/difficult/problematic features within Almanac, such as the content being lacking.

What would you change to improve Almanac?

Test Group

In response to the question 'What would you change to improve Almanac?' student responses were numerous and have been categorized using the prevalent emergent themes. Responses to this question covered a range of categories and offers insight not only into what the student users felt could be improved but also may be seen to implicitly reveal what they felt was lacking, difficult, challenging or problematic.

1. DESIGN:
   - customisation: *ask a couple of questions about you at the start – what is your fav colour, what type of learner are you, say your name, pick background; Put in your personality at start, say welcome back, has slide show of different pictures, recent searches displayed; ability to change the font; a personalization tab makes everything more fun*
2. EASE OF USE:
   - intuitive use: *help tab, few simple instructions; Button to save the page so if you went back you would have a shortcut to go back to the page you were on before (didn't know you could favourite article); some of the buttons weren't labelled so you didn't know what they did (teacher did not give instruction guide at the beginning)*
   - organised: *recent tab or history tab so they know what they just did; teacher could have a page where she has topics recommended for you and you could click on those*

3. LEARNING:
    - accessibility: *click on words and get definition of it; use key words to get link to definition; dictionary separate to subject to use; dictionary tab; or at the very end any words that would be difficult to understand have definitions at the end;*
    - personalised: *ability to highlight the text you want out of the article and the highlighted bit would get saved so you could come back to just that so you know what you need to learn cuz if you don't have something saved you will forget about it; save it and x out all of the other things you didn't want (copy bit you wanted and have a notepad)*
    - content: *Wasn't enough content; couldn't get very specific; couldn't just get to what you wanted you had to read the whole article; just show you the paragraph with the word and not the whole article*; *Publisher have a channel with updated information*
4. OTHER:
    - social aspect: *when you are logging in to app – have a 'most searched today' - what did other people (friends) look at; help each other and share information with each other; I found a good article; button down the bottom to send the article to form group; group room to send things or post things…but not chat so no silly things; ability to comment or rate article with thumbs up*
5. PERSONALISATION:
    - settings: *have beginner, intermediate and advanced; have a multiple choice toggle – like if you only wanted the videos or just the pictures or the text; when you are searching, something that sets your age or year or school or labelled with 6th class this is where you go to learn your information, says leaving cert information; have to say what year first and then have ranges within it*

These comments provide more insight in to the test groups' particular experience with Almanac, clarifying certain likes and dislikes. Additionally, they provide an insight into user expectation and ability as well as particular features of the authentic classroom context.

Control Group

In response to the question 'What would you change to improve Almanac?' student responses were minimal and focused on what could be added to the demonstrator.

The recommendations given were all within the category of 'Learning' and include: *linking to websites that you know are 'good'; games to test yourself and check your knowledge; putting in revision questions.*

In comparing and contrasting the test group responses to that of the control group it must be noted that the numerous suggestions given in the test group may be more reflective of the personalities of the students who were participating in the interview than their experience using Almanac. What can be noted from both interview sets, with the control group responses specifically highlighting this, is that both user groups very definitely viewed Almanac as a formal tool for learning.

In summary

In considering the interview data as a whole from both the test and control groups, it is clear that both groups used Almanac within the authentic classroom setting with enough regularity

that their expectations and perceptions of the app were such that it was no longer viewed as a demonstrator or ‘test product’ but a viable classroom tool.

It is also clear that as a viable classroom tool, the test group experienced certain issues with Almanac, specifically their understanding of the personalisation controls, but were still able to view their experience in using the app as a positive one with both personal benefit and learning benefit.

Teacher Interviews

End of trial surveys were given to the teachers in charge of running the Almanac trial and supplemental interviews were conducted to provide greater context and understanding to their responses.

Each survey question asked for a Likert scale response from Strongly Disagree to Strongly Agree and interview questions were open ended and generically framed around the survey questions. As with the student interviews, one teacher interview file was corrupted and so supplemental notes are being used.

Almanac was easy to incorporate into lessons

Questions 1 asked the teacher if 'Almanac was easy to incorporate into lessons' with both Teacher 1 and Teacher 2 selecting *strongly agree*. Teacher 1 mentioned that because Almanac was treated as part of the classroom resources and fit within the school's computer based model of teaching and learning, Almanac was easy to incorporate into the existing classroom structure. Teacher 2 felt that because Almanac was easy to use and easy to explore it was something that teachers would love to use and kids found easy to use.

Almanac supported differentiation

Question 2 asked the teacher if 'Almanac supported differentiation' with Teacher 1 selecting *agree* and Teacher 2 selecting *strongly agree*. Teacher 1 said that the premise of Almanac was interesting in regards to being a tool that could possibly support differentiation (with the addition of more content and clarification of the personalisation settings for this age user). Teacher 2 thought that Almanac was a really good help for differentiation as it created the differentiation for the teacher but also felt that there would be better ways to differentiate then size and level to help support both the stronger and weaker students.

Almanac was difficult for students to use

Question 3 asked the teacher if 'Almanac was difficult for students to use' with both Teacher 1 and Teacher 2 selecting *disagree.* Teacher 1 felt that students were generally able to understand how to used Almanac (the same way in which a class would understand anything that was new). Teacher 2 felt that students did not understand the wording or phrasing of level and size and that this made it difficult for students to use.

Almanac prepared students for class, The articles contained the information students were looking for & The articles contained expected information and examples for the content

Question 4 asked the teacher if 'Almanac prepared students for class' with Teacher 1 selecting *agree* and Teacher 2 selecting *agree.* Question 5 asked the teacher if 'The articles contained the information students were looking for' with Teacher 1 selecting *neutral* and Teacher 2 selecting *strongly agree.* Question 6 asked the teacher if 'The articles contained expected information and examples for the content' with Teacher 1 selecting *neutral* and Teacher 2 selecting *agree.* In considering all three of these questions as content based questions, both teachers cited that there was not enough content within Almanac for students to explore in both a specific and supplemental way or so that Almanac could be used as a

primary resource. Teacher 2 additionally spoke on the fact that Almanac was a trusted source so students knew the information was going to be appropriate and relevant to class.

The information in the articles was scaled appropriately

Question 7 asked the teacher if 'The information in the articles was scaled appropriately' with Teacher 1 selecting *agree* and Teacher 2 selecting *strongly agree.* As both teachers knew that the content was taken from an age appropriate content text book, they agreed that the information was pitched at the right level. The only exceptions around this question was in regards to the student scaling of information and, as Teacher 1 felt that the fact that students 'didn't get' the level and size differentiators nor was that 'the best way to go' to scale and scaffold information.

The images and videos supported student learning on the topic

Question 8 asked the teacher if 'The images and videos supported student learning on the topic' with Teacher 1 selecting *agree* Teacher 2 selecting *strongly agree*. Both teacher were very enthusiastic about the inclusion of supporting images and videos, agreeing that it made the experience much more enjoyable for the students. Specifically, Teacher 1 said that many students mentioned the videos in class as being 'good' and Teacher 2 talked about the video clips going away from standard practice to something else that wasn't Google but was dedicated to the content and how favourable this was.

In summary

Both teachers found Almanac as a favourable classroom tool that was easy to integrate within the authentic classroom dynamic and for students to use as it conceptually supported differentiated instruction. They were both appreciative of the personalised element contained within Almanac and the possible impact it could have on classroom learning while expressing reservations over the specific ways in which this version could be used for first and second year students. Additionally, they were very positive of the incorporation of the open media content and very appreciative of the learning experience this created for students.

Review of Usability

This section presents the finding with regard to the usability of the Almanac application. The section firstly describes some usage patterns that are related to the application's usability, then presents how usable Almanac was perceived to be by its users, and finally correlates the usage patterns with the users' activity. Overall, Almanac performed well and the Test group reported higher ease of use than the control group, as expected. No major usability issues were identified.

Usage

One can see from the Almanac usage graphs shown in Figure 5 and Figure 6 that Almanac was used consistently. That is, the number of searches, compositions, and page views rises when more users exist in the system for both the test and the control group. The correlation between user presence and user activity is slightly higher for the test group.

Moreover, in 34.3% of the searches the users placed the adaptation controls in positions other than the default {level: 4, size: 4}. Of the searches that placed the controls in the default position, it is difficult to know which percentage of the learners did not want to use the controls and which preferred to search for the default article size and level.

Users adopted an exploratory approach to the adaptive controls, as extreme values of level or size were quite common, while intermediate values were less explored and some pairs were never chosen (such as {level: 2, size: 1}).

These usage metrics show that there was no impediment for the targeted age group with regard to successfully accomplishing the tasks of the trial. The following sections present evidence about how easy it was for the users to accomplish the said tasks.

Perceived Usability

Usability, being a quality, is difficult to define universally. In this report usability will be measured by means of survey responses about the perceived ease of use of Almanac, and of comments and interviews that captured aspects of the student user experience during using Almanac.

Survey

The survey consisted of 17 questions, some of which were about usability and some were about pedagogy, and some overlapped both areas. Out of these questions, 14 were common for both the control and the test group, and 9 of them yielded statistically significant—or very significant—results.

Please note that statistical significance does not imply importance. For instance, for the question "The look of Almanac was visually appealing", both groups replied positively and there was not a significant difference between them. That means that the look and feel of Almanac was pleasant to both groups and apparently did not interfere with the objectives of the trial; in this case, the low difference is a positive result.

In contrast, the questions "The articles contained a good mix of text, pictures and/or videos" and "For my school work, Almanac was better or more enjoyable than searching on the web", had a very statistical significant difference (T-test value<0.001) between the control and the

test group. That is, the content composition of the test group seemed to affect the outcome more positively than the one of the control group.

From a usability point of view, it seems that the test group found Almanac more usable than the control group. Indeed, survey questions about the content and the learning aspects of the app yielded smaller difference between the two groups than the questions about usability. The answers in the questions concerning the learner experience, the mixed-media compositions, the ease of information discovery, and the enjoyability of search, provide evidence that the dynamic content re-composition in Almanac improved the overall learning experience of the learners.

A secondary, from the usability point of view, survey was given to the teachers and included the question “Almanac was difficult for students to use”, to which both teachers disagreed.

Comments

With regard to the open-ended question of the survey (“Which features of Almanac did you like?”), the following holds true. Out of the 47 users of the control group who filled in the survey, 10 left negative comments in the open-ended question, 6 left no or undecided comments, and 31 left positive comments. Out of the 139 users of the test group, 6 left negative comments, 22 left no or undecided comments, and 111 left positive comments.

User Group/(%)	Negative	Neutral	Positive
Control Group (n=47)	21.27%	12.76%	65.96%
Test Group (n=139)	4.32%	15.83%	79.86%

Table 2

The negative comments were usually generic: “I liked nothing”. A few negative comments from the control group were more specific and focused on the amount of content within the app: “I liked that it had videos but when researching rocks I found it very hard to get any of the research that I needed”, or “I liked how there was a few articles, but the problem was there wasn't anything in them.”

The positive comments were mostly about the appropriateness of the content for the age group (“no difficult words”, “easy to understand”), many students commented positively on the layout, the navigation, and the look and feel of the app, and 5 users answered that they liked specific features: 4 students liked the customization controls, and one student liked the ability to save an article to their favourites.

The comments reinforce the aforementioned conclusion from the quantitative part of the survey, that is that the content re-composition with rich media and the magazine-like experience enhances the learner experience, while the adaptation seemed to affect the user experience less that the content composition.

Interviews

In the interviews the learners identified similar advantages and shortcomings of Almanac as in the survey comments. Overall, they commended the visual design and layout of Almanac and its curriculum relevance. Moreover, the mix of publisher content, images, and video was deemed positive.

One key finding from the interviews is that some students found the app initially difficult to understand without any instruction. Indeed, one of the assumptions while designing and

developing the app had always been that the teachers would explain the purpose and function of the app before the trial, since the experimental nature of it would make it impossible for users to know what they should anticipate. Thus, this aspect of the learner experience was only revealed when the interviewees mentioned that the trial scenario was breached and the learners were not instructed in the trial scenario as planned.

The only usability issue that was design-related rather than trial-related and was identified through the interviews, was that the star icon to favourite an article was an unfamiliar metaphor to some students. This metaphor was common when the design phase of Almanac first started, but until the trial took place the star icon had been dropped in favour of a heart icon in most apps that the age group would use.

Other comments that occurred at the interviews were suggestions that were beyond the scope of this trial. For instance, linking keywords to external websites would distract the users from the actual trial and were thus not considered for inclusion at the moment, while future versions of Almanac may consider such devices.

Overall, the interviews did not reveal any user experience obstacles in the use of Almanac, and the usability was perceived as high. While some usability issues were reported, these are more related to the research and trial lifecycle, rather than Almanac itself.

As with the survey, so with the interviews the teachers agreed with the general student perception about the high usability of Almanac and how rich media enhance the user experience.

Correlating Usage and Usability

We investigated the possibility of observing correlations between questionnaire responses (subjective) and log/performance data (objective) that correspond to user's behaviour. For this we only considered users for whom we have both kinds of data. The students' RAT test scores were included in this analysis.

There were some statistically significant correlations found between questionnaire items, both positive and negative, between items that one would expect. Items with positive statements were positively correlated with other such items and negatively correlated with items with negative statements. More such correlations were however observed in the control group's data.

There were no statistically significant correlations observed between survey items and performance data in either group. That means that there was no relationship between these variables. Student satisfaction from using Almanac was not related to the way they used it.

Full details of the calculated correlation coefficients can be found in Appendix L.

Discussion of Primary Trial Conclusions

This report has discussed the trial and evaluation of Almanac, a dynamic recomposition service that was designed to support the generation of tablet based learning experiences that can be adapted to the learner's immediate learning needs. The Almanac trial was carried out in two parts, the first was a large trial with 1st and 2nd year Irish secondary school students in which Almanac was used in an authentic classroom setting over a 5 week period. The part of trial occurred in a school in the United States with a much smaller number of students who did not use Almanac for specific classroom tasks. The specific details of the respective trail methodologies, the instruments used to elicit feedback from trial participants have all been described leading on to a detailed analysis of the results obtained from the trial. The outputs of the trial fell into three broad categories, usage data describing how and when students used Almanac, student surveys which provided insight into how students perceived Almanac and interviews with both students and teachers. In describing the results from the trial, this report has provided

Three challenges:

- mobile learning where the growth in the mobile market and the increasing pervasiveness of these devices across all sectors from corporate to K12 represents new platforms and new opportunities for mobile learning.

Kathy - In terms of pedagogy, the mobile design of ALAMANC was successful in regards to being used both in the classroom and at home and by individual participants for personal learning needs

- non-formal learning by applying just in time approaches when addressing learning needs. The need for smaller or shorter learning experiences was also expressed as a challenge by our industry partners, which aligns with both the needs of mobile and non-formal learners.

Kathy - From the pedagogical standpoint, trialling for non-formal learning within a school context will always be problematic, especially at the ages (junior cycle) where learning is transitioning from acquisition of knowledge to application of knowledge. In regards to being a just-in-time learning resource which addresses learner needs, the use of Almanac both in the classroom and at home in conjunction with the ability to personalise aspects of the content did provide for this experience.

- content reuse in order to reuse and remonetise existing knowledge assets. Other aspects of content reuse challenge were the extraction of metadata from legacy content as well as the curation of relevant and appropriate content from existing libraries.

Pedagogical Findings

The main pedagogical finding from the trial of Almanac in this context is that in response to the objective of *researching the viability of Almanac in an authentic classroom setting* is that:

- **Conceptually, Almanac supports differentiated learning.**

This finding is based on the questionnaire and interview responses from the two teachers involved with the trial as well as the interview responses from the TEST group of learners.

From the questionnaire, when asked to respond to the statement 'Almanac was easy to incorporate into lessons' both teachers choose STRONGLY AGREE.

When asked to respond to the statement 'Almanac supported differentiation' Teacher 1 chose STRONGLY AGREE and Teacher 2 chose AGREE. In the interview follow-up, Teacher 2 cited the lack of content currently in Almanac as her reason for not choosing STRONGLY AGREE.

Specifically, in support of this pedagogical finding, when speaking on the use of Almanac in the authentic classroom setting, Teacher 1 said:

The value of Almanac is the how easy it was for exploring [the topic] and easy to use in class, no need to change anything….I used it mostly in class or for homework…It benefits the weaker and stronger students as they can spend more time with it at home; they are all getting knowledge. The stronger student would control it differently than the weaker student so it would be very good…[Almanac] creates different level of information; it creates the differentiation for the teacher.

Teacher 2 was clear in stating that she 'loved' Almanac as a trusted source and as a 'classroom resource' and continued that the premise of Almanac, with the ability to personalise information to receive individually levelled content, would be a great help in differentiating instruction.

While learners were not specifically questioned on ease of use in the classroom or differentiation (interview questions were much more general: *what did you like? What was difficult/challenging? What didn't you like about it? How would you improve it?)*, certain responses supported the teacher statements. Specifically, in the TEST group interview:

LEARNER 1: *It was easier to gather information, you could put it to your own standard and you know every word, not fancy words.*

LEARNER 2: *It was good because it wasn't as confusing as some things and pictures helped…I liked to use it as myself for homework instead of teacher telling you to use it.*

In regards to supporting the finding around personalisation supporting differentiation, both of these students are describing the way in which they felt that the information contained in Almanac was at their level. Additionally, Learner 2 describes using Almanac as a tool for differentiation.

It should be noted that this finding is specific to this trial context, as well as the pedagogical structure used within this trial context, and not necessarily transferable.

Usability findings

Overall the content composition with rich media from the open web seemed to be a factor that contributes positively to the usability of Almanac. Students with dyslexia may especially benefit from this. The adaptation did not seem to improve nor inhibit the app's usability.

One common observation across all user groups though, was the lack of content in Almanac. This should serve as a trigger warning to publishers, as publisher-specific content may not be enough to create next-generation smart and usable EdTech applications, and a shared content "marketplace" may be required

US School School Trial

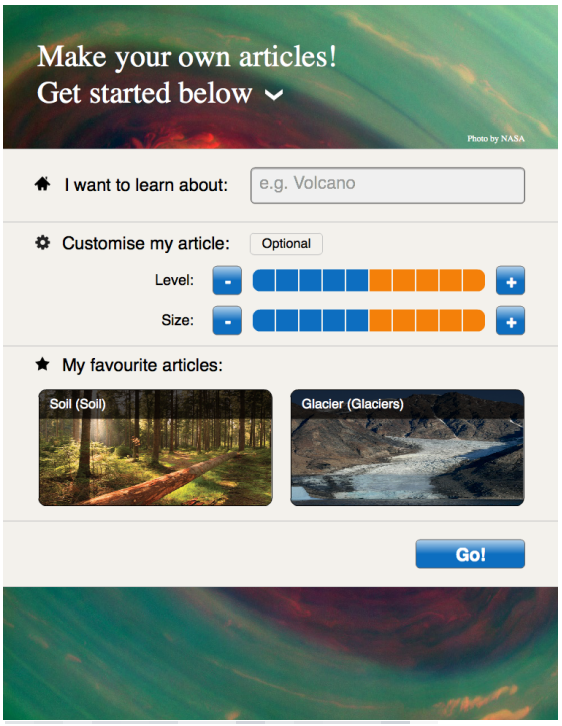
Context

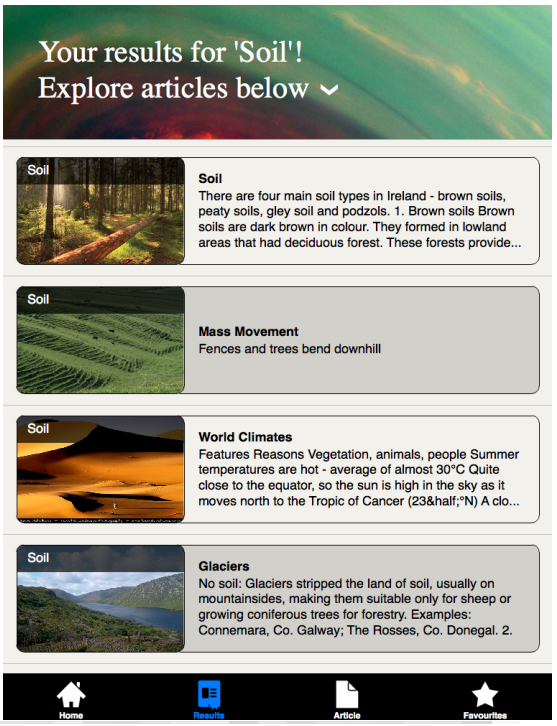
In addition to this main trial, a secondary Almanac trial geared towards data around general usability, took place within a fee paying secondary school for students with dyslexia located in the Eastern United States. Ten students (ages 11- 14) took part in the trial, conducted on 10th April 2015.

As there is not a dedicated geography class for this age group within the USA, student and teacher participants use was not integrated within an authentic classroom setting and specific time was set aside for the specific purpose of trialling the system for usability. Specifically, participants only used Almanac once within a single class period (45 minutes) and the focus given was not on preparing for class discussion but on testing the system.

It should be noted that while this trial was not run within an authentic classroom setting, this controlled trial environment removed the contextual challenges faced in the main trial and allowed for a narrow focus on the usability of the system.

Within this controlled trial, then, students only used the TEST version of Almanac and accessed the app through an iOS operating system. Figure 21 and Figure 20 provide screenshots of the iOS Almanac app used by the students in the US School.





Methodology

To help focus the trial, the Almanac team selected the three 'richest' content topic areas (in both content and open media sources) for users to choose from. The teacher then assigned a topic to each of the three grade levels participating in the study.

With an assigned topic for exploration, this trial of Almanac proceeded as follows:

TEACHER ACTION:

1. **Students activate Almanac.** The code to activate Almanac is: almanac1

2. **Students decide which topic they would like to explore.** For this trial, we ask that students select from: GLACIERS, RIVERS or THE SEA. It may be easiest at the onset to assign one topic to a grade.

3. **Give pre-RAT identifier code to students.** Before using Almanac to search their topic, students must take a RAT survey. The student will accesses the appropriate RAT by typing the identifier in Almanac's main page search bar:

   For **GLACIERS**, students should enter: **valley13**
   For **RIVERS**, students should enter: **pool19**
   For **THE SEA**, students should enter: **drift21**

   These should take the student 1-3 minutes to complete.

4. **Allow students to explore their topic in Almanac into instruction.** Depending on class time, this should take approximately 10-15 minutes.

5. **Give post-RAT identifier code to students.** After the student finishes searching their topic, the will need to retake the RAT survey using a secondary identifier.

   For **GLACIERS**, students should enter: **valley8**
   For **RIVERS**, students should enter: **pool22**
   For **THE SEA**, students should enter: **drift24**
   These should take the student 1-3 minutes to complete.

6. **Allow students to explore other topics.** If class time allows, students may explore the other topics (or try to guess what else might be included in the system).

7. **Direct students to fill out questionnaire.** To access the questionnaire, students will need to enter zone1 into the Almanac search bar. The questionnaire should take approximately 5-10mins.

STUDENT ACTION:

1. **Access Almanac**
2. **Take pre-RAT** (1-3 minutes)
3. **Use Almanac** (10-15 minutes)
4. **Take post- RAT** (1-3 minutes)
5. **Explore Almanac** (if time allows)

6. **Fill out questionnaire** (5-10 minutes)

In regards to the data generated and collected in this secondary trial, the main purpose was to investigate whether or not it would support the findings around usability with the primary trial.

Within the pedagogical finding of personalisation within Almanac supporting differentiated learning**,** the teacher's report on Almanac greatly supported this:

Great potential to be used as a research tool with more refinement on results returned. Clear application for the flipped classroom model. Great tool for differentiation in the classroom (as well as a great time saver for teachers in the same regard). For me, this seems to be its greatest strength. If a student were able to customize both the length and complexity of the information that is returned from an independent internet search based on their own prior knowledge, it would be a "game-changing" tool.

This becomes an even greater support for this finding when the placed within the specific user context of this trial, that of student participants with an identified educational need, dyslexia, as the argument may be made that the demand for differentiation and personalisation are of greater importance than in a traditional classroom setting.

Usage Results

User ID	Searches	Compositions	Page Views
161bd8af-7744-4883-b83b-745c06a31cc3	4	10	31
298204e1-9a50-4ab9-b414-51617422e0db	8	23	75
29906d62-583c-445b-a37c-07b08910e5f3	5	13	41
40167457-b680-4689-a462-78f98567650a	4	5	34
84320a6a-7075-4468-a645-181c9624bedb	8	19	69
9b548890-4cef-43e6-906c-c50630460117	9	17	57
0a38cb1b-d787-4016-ba79-bda4043e0002	1	13	31
67e4659b-9061-44bb-8789-7172fc3e7f78	1	4	15
cba8f57a-d272-4e10-a508-c2c033d36c2b	1	9	25
6920cd45-c0b4-4f63-8e42-965320f7ab71	0	0	1
7d01ff67-9629-4658-affd-cb56658ff16f	0	0	1
8b688221-f71c-4b4f-a1fb-403ff400b35f	0	0	1

c4ed0c3e-c880-4df9-bee0-5aa7a321b178	0	0	1
cfcde6f9-2d55-4fb8-b56c-260e7ce5c875	0	0	2
ed10cd2d-e7c6-4a27-9504-88acbcc1d246	0	0	1

- 9 users
- Avg 4.5 searches per user
- Avg 12.5 compositions per user
- Avg 54.5 page views per user (3.35 pages per composition)
- Search Terms:

User ID	Search Terms		
161bd8af-7744-4883-b83b-745c06a31cc3	the sea (2)	seas (1)	angkor wat (1)
298204e1-9a50-4ab9-b414-51617422e0db	glaciers (8)		
29906d62-583c-445b-a37c-07b08910e5f3	the sea (5)		
40167457-b680-4689-a462-78f98567650a	volcanoes (2)	rivers (1)	the sea (1)
84320a6a-7075-4468-a645-181c9624bedb	rivers (6)	the sea (1)	zone 1 (1)
9b548890-4cef-43e6-906c-c50630460117	rivers (3)	the sea (6)	
0a38cb1b-d787-4016-ba79-bda4043e0002	the sea (1)		
67e4659b-9061-44bb-8789-7172fc3e7f78	rivers (1)		
cba8f57a-d272-4e10-a508-c2c033d36c2b	rivers (1)		
6920cd45-c0b4-4f63-8e42-965320f7ab71			
7d01ff67-9629-4658-affd-cb56658ff16f			
8b688221-f71c-4b4f-a1fb-403ff400b35f			
c4ed0c3e-c880-4df9-bee0-5aa7a321b178			
cfcde6f9-2d55-4fb8-b56c-260e7ce5c875			
ed10cd2d-e7c6-4a27-9504-88acbcc1d246			

Survey Results

There were an additional 10 responses from a smaller trial of ALMANAC in a second school in the United States. These results are presented in this section and interpreted separately from the main trial results.

Within this secondary trial, participant response to the free text response question 'Which features of Almanac did you like?' (to be found in Appendix K) were classified using the categories that had emerged from the qualitative grouping of the primary trial data to this question; the seven general categories were: Ease of Use, Media, Learning, Design, Search, Personalisation and Other, and responses were categorised within these (with multiple categorisations if necessary).

The categories of response for this group, in order of frequency, were: 1. Media and Design (tied), 3. Personalisation and Other (tied), and 5. Ease of Use, Learning and Search (tied).

In comparing these categories of responses to that of both the test and control groups, the first noticeable difference in responses speaks to how the trial context can influence response, where Learning was the most frequent category of classification for the primary trial participants and the least frequent classification in this secondary trial. As this secondary trial was around usage and not conducted in an authentic classroom environment where 'real' learning was being facilitated, this difference was expected and supports the choice to trial in an authentic setting.

Secondly, the responses also could be seen to highlight the way in which the trial context becomes significant in that, as this was a trial conducted with dyslexic participants, the media (videos and images) and design aspects were of great importance and received the most feedback by this specific group of participants.

A third observation around trial context can also be made as in this secondary trial, the teacher made use of the supplemental user guide and spent time discussing how to use the 'Level' and 'Size' features which may have lent to student responses in this area.

Lastly, these free text responses can be used to support and supplement the responses of the primary trial as they address the same features of Almanac.

Usability Findings

Concerning the trial with the US School, the following can be said with regard to the usability of Almanac.

The survey responses correlated highly with the responses from the other test group. This means that the US students found the app generally usable, and it also provides evidence about the validity of the survey results. This finding is important because dyslexic students can be seen as having more reasons to prefer a rich media presentation of their curriculum material than the other test group. The students also identified the low content availability.

With regard to the adaptation, the US School students presented better understanding of the controls, either because of better instruction, or the use of the supplemental user guide, or the difference may appear because of the small sample size. Another potential reason could be the familiarity of this specific set of students with technology, as in an initial pre-trial interview they answered that they are familiar as much with games (Sushi Monster,

Minecraft, Clash of Clans, etc) as with generic tools that use data management intensively (Dropbox, Google Drive, OneNote, Pages etc).

to provide enough content so that adaptive rich media apps can be reasonably usable.

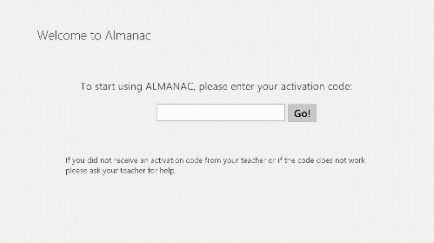
Appendix

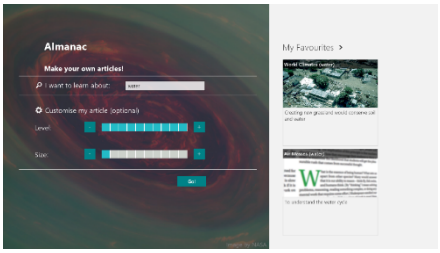
Appendix A – Almanac Trial Test Group Instructions for Use

ALMANAC TRIAL
Instruction for Use (SURFACE - TG)

HOME PAGE

The home page is what you will use to search in ALMANAC. The information entered on this page will be used to create the articles (text, images, video) you will be shown.





1. **TO GET TO THE HOME PAGE, YOU WILL NEED TO ENTER AN ACTIVATION CODE ON THE WELCOME SCREEN: almanac1**

2. **SEARCH:** To begin a search, type your topic in the search box which appears after *I want to learn about:*

3. **CUSTOMISE MY ARTICLE (optional):** If you choose to customise (personalise) the article Almanac creates, you will get different information based on *what you know* and *what you want*. You may customise in two ways: LEVEL and SIZE. Combine these two options for your desired results.

    - **Level:** Select the **'**level' you think you are at in regards to how much you know about the topic. To do this, use the '+' and '-' tabs.
        - *If the level bar is **all blue,** or 10/10, it means you know a lot about the topic and want more sophisticated information.*
        - *If the level bar is **half blue/half grey**, or 5/10, it means you know the basics about the topic and want to learn more.*
        - *If the level bar is **mostly grey**, or 1/10, it means you are unfamiliar with the topic and want the basics.*

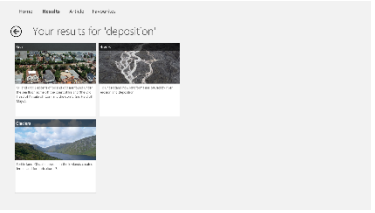
    - **Size:** Select the 'size' you want your article to be. To do this, use the '+' and '-' tabs.
        - *If the size bar is **all blue**, or 10/10, it means you want a longer article with more detailed information.*
        - *If the size bar is **half blue/half grey**, or 5/10, it means you want a general size article with general information.*
        - *If the size bar is **mostly grey,** or 1/10, it means you want a short article with basic information.*

4. **GO:** When you are ready to learn, hit **GO!**

5. **MY FAVOURITES:** Once you begin using Almanac, you can favourite articles. Your favourite articles will be saved and appear in this section; you can scroll through them by swiping left/right.

YOUR RESULTS PAGE

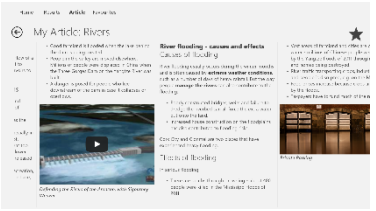
Based on the information you entered (topic, size, level), Almanac creates different articles for you. The results page gives you a preview of the different articles (swipe left/right). The preview contains: *the heading under which information on your search topic can be found, an image and a text preview.* PLEASE NOTE: Almanac will find information on your topic across units of study.



1. To open the article that interests you, tap on it. Swipe left/right to read.
2. The other articles will remain available and are listed at the end of your current article. You can access them under the 'READ MORE' heading.

MY ARTICLE PAGE

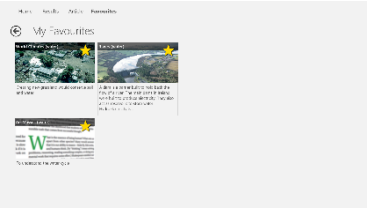
The article Almanac creates contains text, image and video information based on the topic you searched. The text in each article is based on your level/size customisation.



1. To read the article, swipe left/right.
2. Images can be enlarged by tapping on them and compressed by tapping the arrow in the left hand corner.
3. Videos can be played by tapping on them and enlarged/compressed using the Youtube controls.
4. To favourite an article, click on the STAR icon in the upper right hand corner. Favourite articles will appear on the home screen and on the Favourite Articles page (accessed on the tab bar).

MY FAVOURITES PAGE

Once you begin using Almanac, you can favourite articles to save them. To favourite an article, click on the **STAR** icon in the upper right hand corner. Your favourite articles will appear in this section.



1. To read an article from your favourites list, tap on it.
2. To remove an article from your favourites list, tap on the star and select remove.

TAB BAR

When you are not on the home page, a tab bar will appear on the top of your screen. There are four tabs: **Home, Results, Articles, Favourites.**

1. **Home:** takes you to the home page to do another search.
2. **Results:** takes you to the results page for your current search.
3. **Articles:** takes you back to the page you were last on in the most current article you were reading.

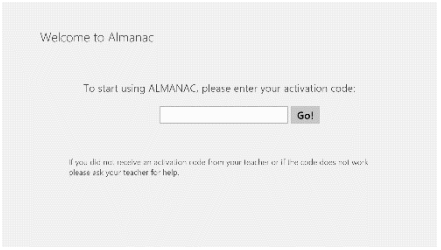
4. **Favourites:** takes you to your favourite articles page.

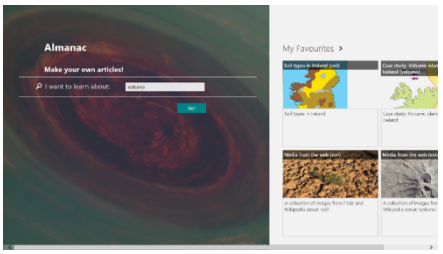
Appendix B – Almanac Trial Control Group Instructions for Use

ALMANAC TRIAL
Instruction for Use (SURFACE - CG)

HOME PAGE

The home page is what you will use to search in Almanac. The information entered on this page will be used to create the articles (text, images, video) you will be shown.





6. **TO GET TO THE HOME PAGE, YOU WILL FIRST NEED TO ENTER AN ACTIVATION CODE ON THE WELCOME SCREEN: almanac2**

7. **SEARCH:**
   To begin a search, type your topic in the search box which appears after *I want to learn about:*

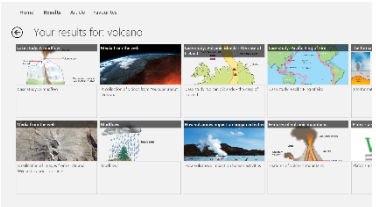
8. **GO:**
   When you are ready to learn, hit **GO!**

9. **MY FAVOURITES:**
   Once you begin using Almanac, you can favourite articles. Your favourite articles will be saved and appear in this section. You can scroll through them by swiping left/right.

YOUR RESULTS PAGE

Based on the information you entered, Almanac creates different articles for you. The results page gives you a preview of the different articles (swipe left/right). The preview contains: *the heading under which information on your search topic can be found, an image and a description of the article's contents.* PLEASE NOTE: Some articles contain just media (images or video) from the web; this is noted in the description.

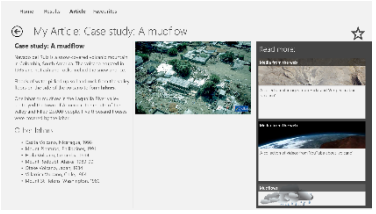
3. To open the article that interests you, tap on it. Swipe left/right to read.
4. The other articles will remain available and are listed at the end of your current article. You can access them under the 'READ MORE' heading.



MY ARTICLE PAGE

The article Almanac creates contains text, image and video information based on the topic you searched. The text in each article is based on your level/size customisation.

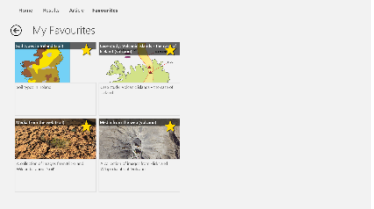
5. To read the article, swipe left/right.
6. Images can be enlarged by tapping on them and compressed by tapping the arrow in the left hand corner.
7. Videos can be played by tapping on them and enlarged/compressed using the Youtube controls.
8. To favourite an article, click on the STAR icon in the upper right hand corner. Favourite articles will appear on the home screen and on the Favourite Articles page (accessed on the tab bar).



MY FAVOURITES PAGE

Once you begin using Almanac, you can favourite articles to save them. To favourite an article, click on the **STAR** icon in the upper right hand corner. Your favourite articles will appear in this section.

3. To read an article from your favourites list, tap on it.
4. To remove an article from your favourites list, tap on the star and select remove.



TAB BAR

When you are not on the home page, a tab bar will appear on the top of your screen. There are four tabs: **Home, Results, Articles, Favourites.**

5. **Home:** takes you to the home page to do another search.
6. **Results:** takes you to the results page for your current search.
7. **Articles:** takes you back to the page you were last on in the most current article you were reading.
8. **Favourites:** takes you to your favourite articles page.

Appendix C – Methods of Use Form

ALMANAC TRIAL
Methods of Use

As a part of answering Almanac's research question within this trial, we are interested in knowing how you used Almanac to support differentiation. To help us with this, we ask that you keep track of each classroom use of Almanac on the chart below (or on a soft copy that can be forwarded on).

Specifically, within your instructional sequence, we are interested to know which methods you paired with ALMANAC (e.g. jigaw, group presentation of information, flipped classroom, individual use, as homework, etc.) and how this was integrated into the rest of the class (e.g. first you revised the topic with the class as a whole, then you used Almanac in a think-pair-share, then you had a student-led class discussion). If you do not have a 'name' for the method, just describe what you and your class were doing.

Date:
Class:
Topic Covered:
Instructional Sequence:

Date:
Class:
Topic Covered:
Instructional Sequence:

Date:
Class:
Topic Covered:
Instructional Sequence:

Appendix D – Teacher Questionnaire

ALMANAC TRIAL
Almanac Teacher Questionnaire

Each of the below questions are optional. Feel free to omit a response to any question; however, the research team would be grateful if all questions are responded to.

	STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE
1. Almanac was easy to incorporate into lessons.					
2. Almanac supported differentiation.					
3. Almanac was difficult for students to use.					
4. Almanac prepared students for class.					
5. The articles contained the information students were looking for.					
6. The articles contained expected information and examples for the content.					
7. The information in the articles was scaled appropriately.					
8. The images and videos supported student learning on the topic.					

9. How did you most frequently use Almanac in the classroom (research tool, homework, etc.)

10. How valuable was Almanac as a tool to support differentiated learning?

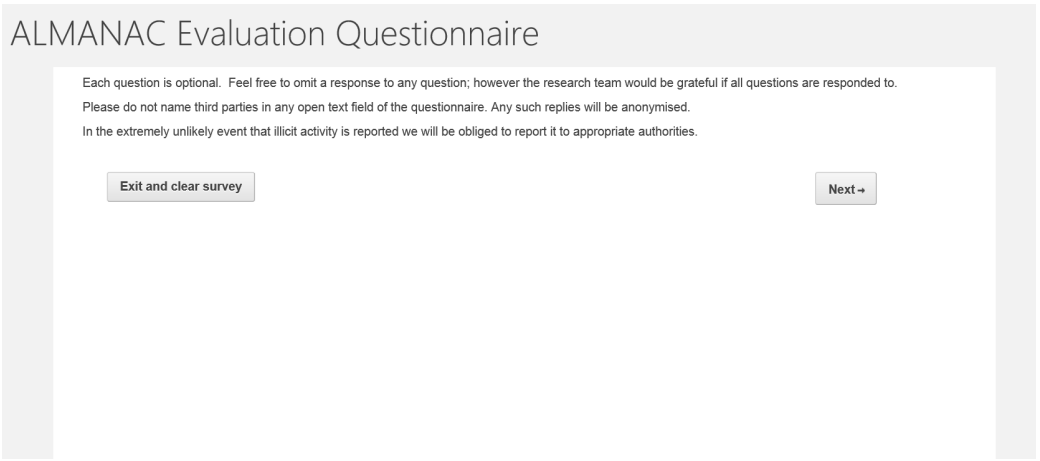
Each of the below questions are optional. Feel free to omit a response to any question; however, the research team would be grateful if all questions are responded to.

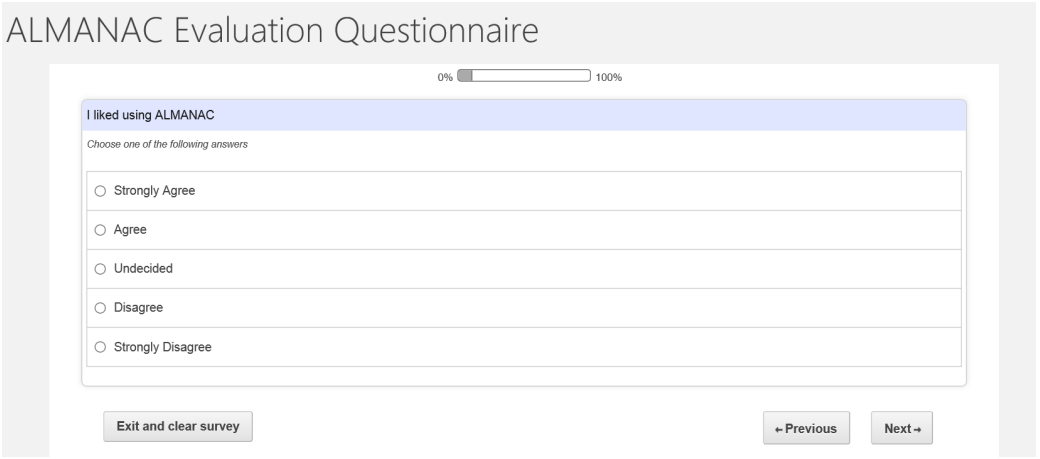
11. What features would you add to Almanac to improve the teacher experience?

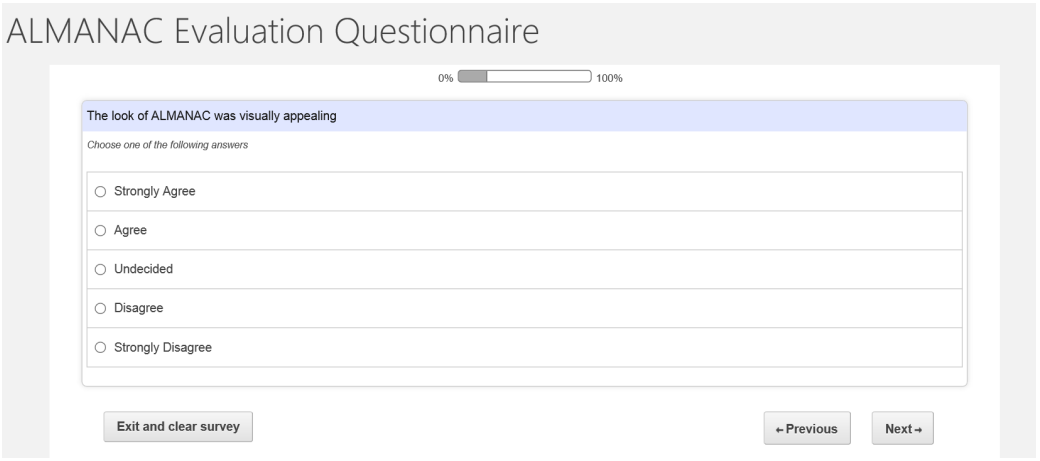
12. What features would you add to Almanac to improve the student experience?

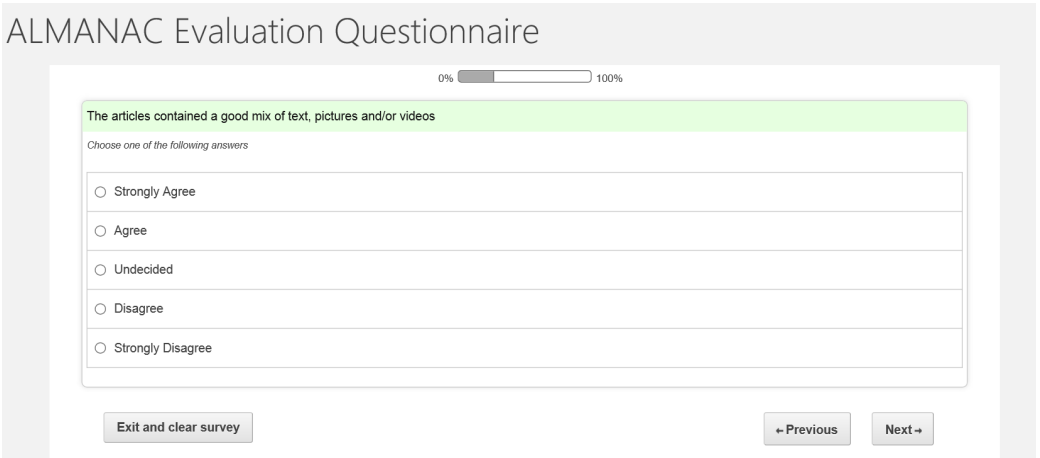
13. What features would you add to Almanac to improve the classroom experience?

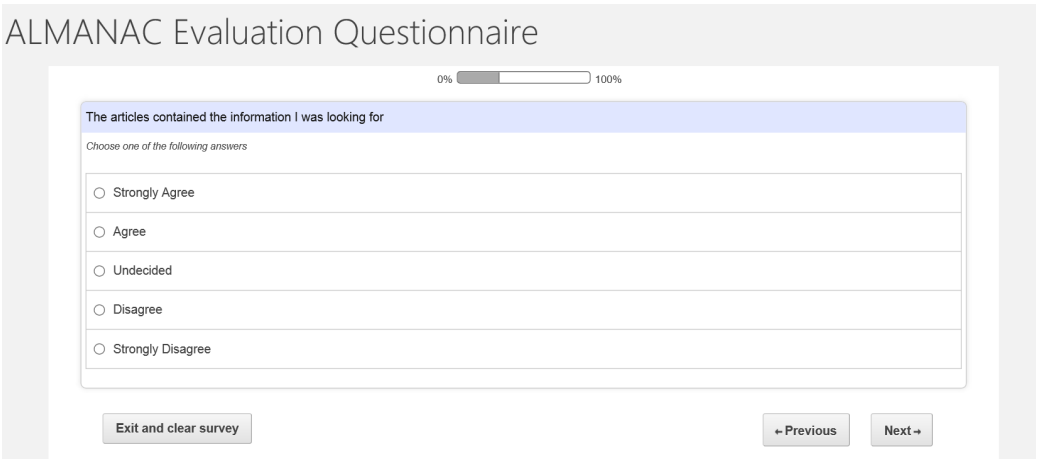
Appendix E – Student Questionnaire

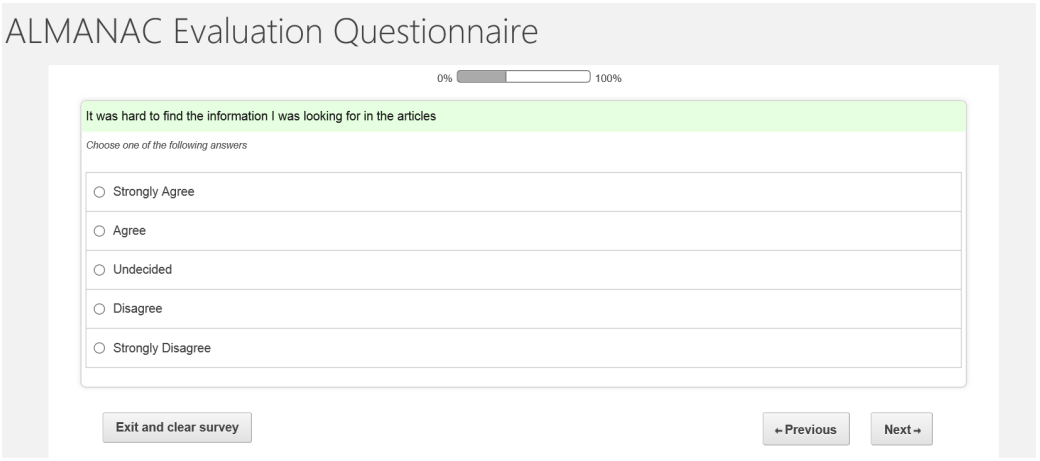


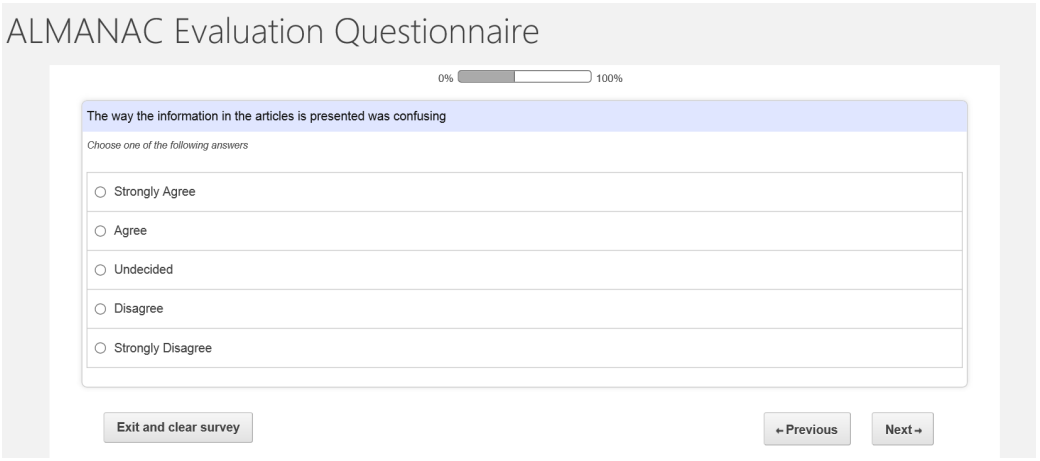


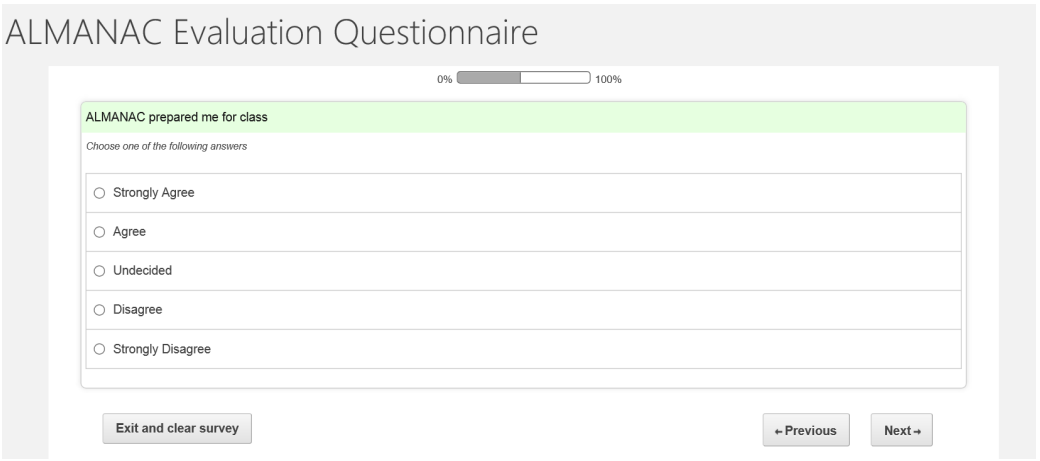

ALMANAC Evaluation Questionnaire
0%
100%
The look of ALMANAC was visually appealing
Choose one of the following answers
Strongly Agree
Agree
Undecided
Disagree
Strongly Disagree
Exit and clear survey
Previous
Next

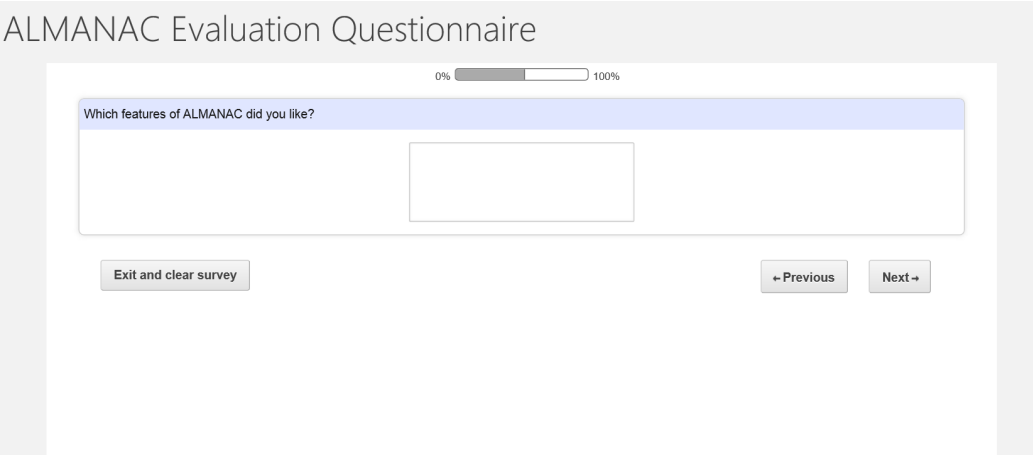

ALMANAC Evaluation Questionnaire
0%
100%
The articles contained a good mix of text, pictures and/or videos
Choose one of the following answers
Strongly Agree
Agree
Undecided
Disagree
Strongly Disagree
Exit and clear survey
Previous
Next


ALMANAC Evaluation Questionnaire
0%
100%
The articles contained the information I was looking for
Choose one of the following answers
Strongly Agree
Agree
Undecided
Disagree
Strongly Disagree
Exit and clear survey
Previous
Next

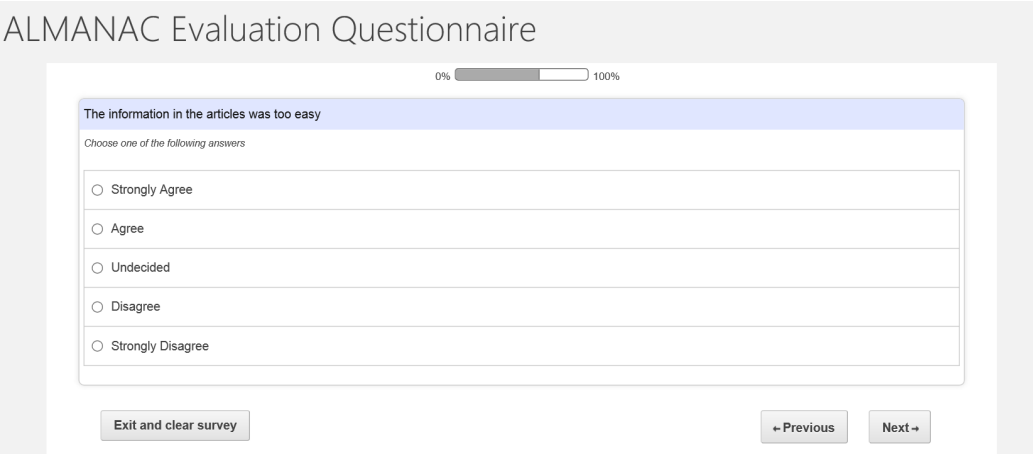

ALMANAC Evaluation Questionnaire
0%
100%
It was hard to find the information I was looking for in the articles
Choose one of the following answers
Strongly Agree
Agree
Undecided
Disagree
Strongly Disagree
Exit and clear survey
←Previous
Next→

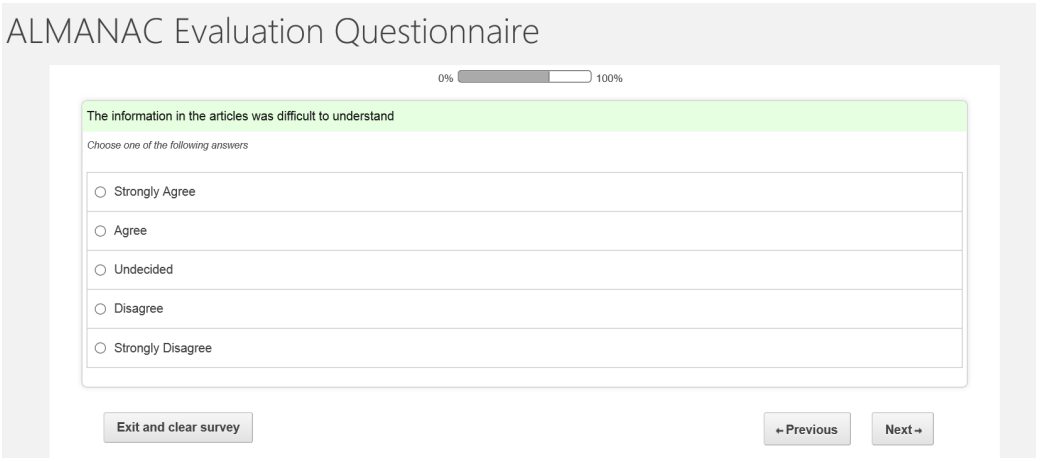

ALMANAC Evaluation Questionnaire
0%
100%
The way the information in the articles is presented was confusing
Choose one of the following answers
Strongly Agree
Agree
Undecided
Disagree
Strongly Disagree
Exit and clear survey
←Previous
Next→

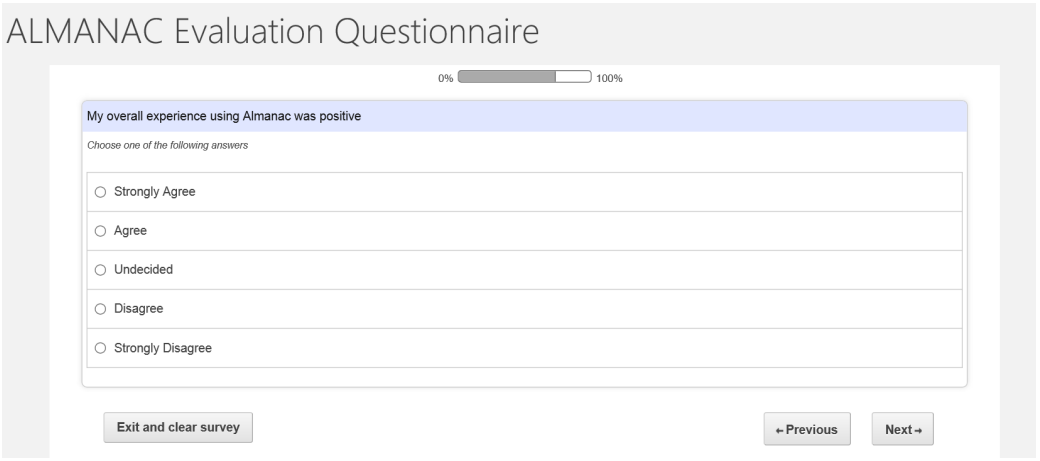

ALMANAC Evaluation Questionnaire
0%
100%
ALMANAC prepared me for class
Choose one of the following answers
Strongly Agree
Agree
Undecided
Disagree
Strongly Disagree
Exit and clear survey
←Previous
Next→

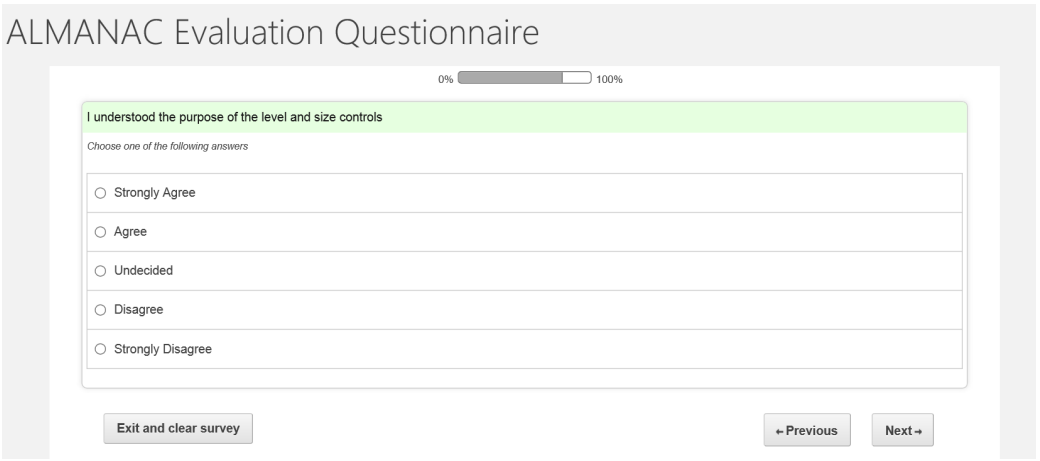

ALMANAC Evaluation Questionnaire
0%
100%
Which features of ALMANAC did you like?
Exit and clear survey
←Previous
Next→

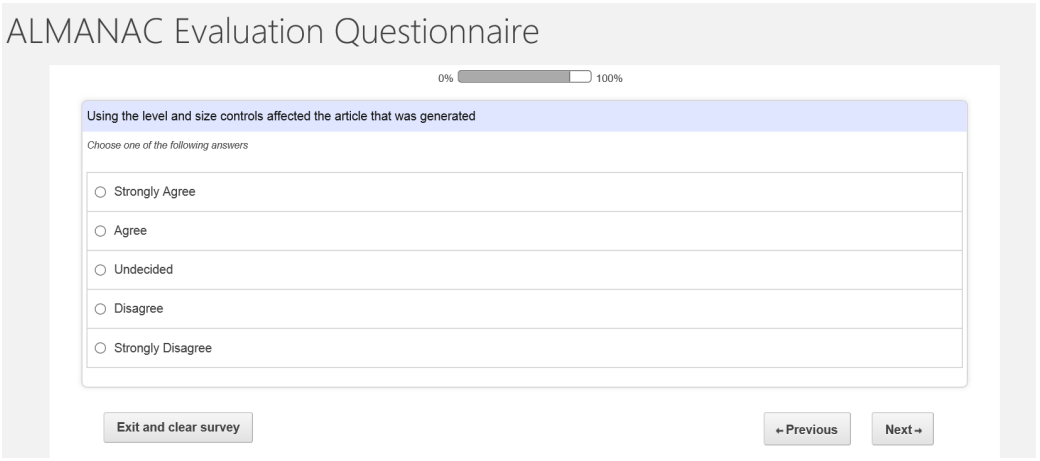

ALMANAC Evaluation Questionnaire
0%
100%
The length of the articles was good
Choose one of the following answers
Strongly Agree
Agree
Undecided
Disagree
Strongly Disagree
Exit and clear survey
←Previous
Next→

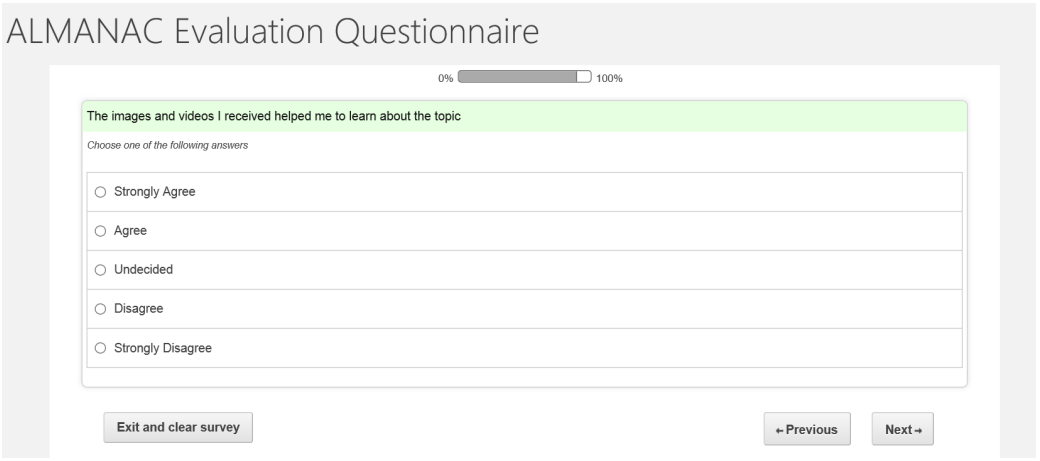

ALMANAC Evaluation Questionnaire
0%
100%
The information in the articles was too easy
Choose one of the following answers
Strongly Agree
Agree
Undecided
Disagree
Strongly Disagree
Exit and clear survey
←Previous
Next→

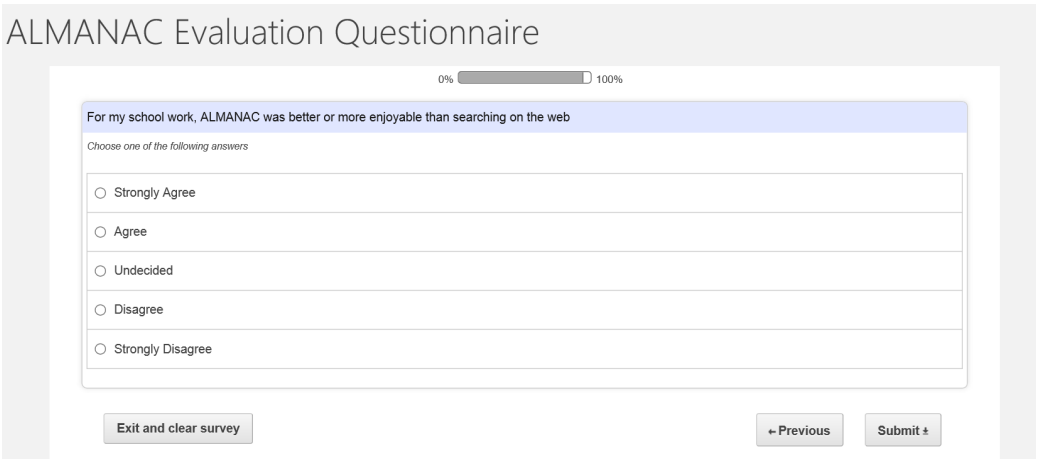

ALMANAC Evaluation Questionnaire
0%
100%
The information in the articles was difficult to understand
Choose one of the following answers
Strongly Agree
Agree
Undecided
Disagree
Strongly Disagree
Exit and clear survey
Previous
Next


ALMANAC Evaluation Questionnaire
0%
100%
My overall experience using Almanac was positive
Choose one of the following answers
Strongly Agree
Agree
Undecided
Disagree
Strongly Disagree
Exit and clear survey
Previous
Next


ALMANAC Evaluation Questionnaire
0%
100%
I understood the purpose of the level and size controls
Choose one of the following answers
Strongly Agree
Agree
Undecided
Disagree
Strongly Disagree
Exit and clear survey
Previous
Next


ALMANAC Evaluation Questionnaire
0%
100%
Using the level and size controls affected the article that was generated
Choose one of the following answers
Strongly Agree
Agree
Undecided
Disagree
Strongly Disagree
Exit and clear survey
Previous
Next


ALMANAC Evaluation Questionnaire
0%
100%
The images and videos I received helped me to learn about the topic
Choose one of the following answers
Strongly Agree
Agree
Undecided
Disagree
Strongly Disagree
Exit and clear survey
Previous
Next


ALMANAC Evaluation Questionnaire
0%
100%
For my school work, ALMANAC was better or more enjoyable than searching on the web
Choose one of the following answers
Strongly Agree
Agree
Undecided
Disagree
Strongly Disagree
Exit and clear survey
Previous
Submit

Appendix F – Trial Usage Statistics

Test group usage data by day

Date	# Users	Searches	Compositions	Page Views
Tue Feb 24	45	177	48	176
Wed Feb 25	6	20	17	143
Thu Feb 26	20	110	36	303
Fri Feb 27	7	34	6	36
Sat Feb 28	2	4	1	35
Sun Mar 01	3	10	2	33
Mon Mar 02	25	184	99	355
Tue Mar 03	90	837	444	2523
Wed Mar 04	22	121	64	615
Thu Mar 05	83	396	272	2334
Fri Mar 06	40	156	135	1482
Sat Mar 07	3	12	4	20
Sun Mar 08	1	1	0	0
Mon Mar 09	27	84	68	775
Tue Mar 10	30	192	81	337
Wed Mar 11	26	73	41	240
Thu Mar 12	42	124	94	430
Fri Mar 13	22	48	39	255
Sat Mar 14	2	8	4	49
Sun Mar 15	8	23	14	101
Mon Mar 16	17	33	25	142
Tue Mar 17	1	3	1	11
Wed Mar 18	24	75	15	67
Thu Mar 19	25	48	25	98
Fri Mar 20	40	353	321	1007
Sat Mar 21	1	4	2	25
Sun Mar 22	6	19	4	16

Mon Mar 23	28	56	33	185
Tue Mar 24	10	34	18	110
Wed Mar 25	5	9	5	36
Thu Mar 26	10	23	9	53
Fri Mar 27	4	4	1	1

Control group usage data by day

Date	# Users	Searches
Tue Feb 24 2015	4	8
Thu Feb 26 2015	2	7
Mon Mar 02 2015	20	75
Tue Mar 03 2015	24	379
Wed Mar 04 2015	29	226
Thu Mar 05 2015	16	60
Fri Mar 06 2015	23	149
Sat Mar 07 2015	1	1
Sun Mar 08 2015	2	6
Mon Mar 09 2015	1	47
Tue Mar 10 2015	11	27
Wed Mar 11 2015	10	44
Thu Mar 12 2015	8	19
Fri Mar 13 2015	19	168
Sat Mar 14 2015	2	9
Sun Mar 15 2015	4	11
Mon Mar 16 2015	1	1

Wed Mar 18 2015	3	6
Thu Mar 19 2015	1	1
Fri Mar 20 2015	1	10
Sun Mar 22 2015	3	7
Mon Mar 23 2015	6	24
Tue Mar 24 2015	12	39
Wed Mar 25 2015	2	3
Thu Mar 26 2015	3	28

Appendix G – Student Survey Responses

Test group survey responses

	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
Q1	6	16	35	60	22
Q2	5	11	18	70	34
Q3	5	26	33	56	16
Q4	3	13	29	53	40
Q5	7	23	31	57	19
Q6	11	45	28	34	16
Q7	20	51	33	26	7
Q8	15	24	31	49	17
Q9	NA	NA	NA	NA	NA
Q10	5	16	27	64	26
Q11	8	64	41	15	6
Q12	19	62	31	12	12
Q13	10	14	24	59	29
Q14	18	18	36	47	18
Q15	11	11	56	42	14
Q16	6	11	26	61	33
Q17	19	20	26	36	35

Control group survey responses

	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
Q1	4	11	12	18	2
Q2	3	11	7	20	6
Q3	3	6	14	19	5
Q4	7	7	13	15	4
Q5	6	11	15	9	6
Q6	1	11	9	16	10
Q7	1	18	9	15	4
Q8	6	14	13	12	2
Q9	NA	NA	NA	NA	NA
Q10	7	6	15	13	6
Q11	7	19	16	5	0
Q12	5	18	11	9	4
Q13	7	8	12	16	4
Q14	NA	NA	NA	NA	NA
Q15	NA	NA	NA	NA	NA
Q16	6	2	9	24	6
Q17	12	11	11	10	2

Control and test group survey mean scores and paired t-test results

	Control Group	Test Group	T-Test
Q1	3.06	3.55	0.0086
Q2	3.32	3.85	0.0069
Q3	3.36	3.38	0.9076
Q4	3.04	3.83	0.0002
Q5	2.96	3.42	0.0226
Q6	3.49	2.99	0.0128
Q7	3.06	2.63	0.0192
Q8	2.79	3.21	0.0283
Q9	NA	NA	NA
Q10	3.11	3.65	0.0083
Q11	2.40	2.60	0.1878
Q12	2.77	2.53	0.2231
Q13	3.04	3.61	0.0065
Q14	NA	3.21	NA
Q15	NA	3.28	NA
Q16	3.47	3.76	0.2320
Q17	2.54	3.35	0.0011

Appendix H – Unique search queries from Irish secondary school students

Almanac search queries submitted by trial participants from Irish secondary school that do not relate to either the Rivers or Rocks topics selected by the teachers at the school for their lessons.

- metallica
- mass movement
- sun
- horse chestnut
- farming
- hedghog
- primary economic activities
- facebook
- lol
- geography
- a potato flew around my room
- :)
- solar eclipse
- macroni
- hedghogs
- more info
- Diagram
- solar system
- choo choo
- LONG PROFILE
- cow
- magents
- potatoes
- physics
- Diagrams
- ;)
- sway
- Sink
- fox
- los santos
- doodle
- jupiter
- ass
- fifa 15
- FIFA
- formula one
- pens
- football
- hi
- "What I want to learn?"
- animal
- solar
- honda
- Onenote
- Dogs
- mitsubishi
- solar eclips
- crdcrcytry
- education
- mtho
- money
- dogs
- skeleton
- france
- noot
- ;)
- ks5
- your mom
- black holes
- parasite
- hedgehog
- youtube
- Galway
- poop
- Youtube
- Skeletal
- Soccer
- eccilpse

Appendix I - Thematic Grouping of Free Entry Text Response to Student Survey – Test Group (Main Trial)

Which features of Almanac did you like – Irish Secondary School TEST GROUP

THEME	COMMENT
Ease of Use	I liked that all you had to do was type in the topic and videos, pictures and text all came up. I also liked that there was only a few page and the text was nice and clear, and you didn't have to search page and page of non-useful information to find bits that you need.
	I liked the way it was easy to find the topic
	The pictures videos and information was clear and easy to understand
	How you can find information easily
	Easy to access
	How it was very simple to use.
	how quick and easy it was to get information and the fact that it gave m the main points of what I was looking for not just useless information
	It was easy to use. Only what you want comes up
	All the information I need is there. It is easy to understand.
	I liked being able to find the Information I wanted easily and it was presented well
	It was easy to use
	I liked that there was a good mix of texts and pictures and that it was easy to find what I was looking for.
	It came up with information we are learning about, (just like Google)
	the articles and information comes straight up
	It is easy to use and the information is helpful
	it was easy to find all the info
	Easy to get good information
	That all the information was in one place
	I liked how it is clear and straight forward using words and language I understand.
	The way I could easily find and locate information .
	information in one place
	The way it was easy to use
	I liked the way it gave me the exact information i needed and it was clear and easy to understand
	That everything is clear and easy to find information
	It was easy to search the stuff
	the way its easy to use
	The easy access of information
	The information was better to use. It was easier to find.
	Easy to search stuff
	How the information was so easy to access and it had everything i needed
	it was easy to use

	I liked the way you could just type in what you wanted to know and everything that you needed to know came up straight away
Media Content	I like the videos and it can sometimes help very much
	The videos
	I liked the pictures and videos
	The pictures. Where it showed you what you needed to know
	The videos
	The videos and pictures
	the fact you could look up something and it would come up as information and pictures, not just information.
	I like videos
	The pictures and the different parts of information
	The pictures and vidoes
	the videos
	pictures videos and design
	The videos
	the images
	The videos
	Pictures
	The videos
	the pictures
	The videos and presentation
	Pictures and information
	Pictures and videos and good information
	The videos
	I liked that there was a good mix of texts and pictures and that it was easy to find what I was looking for.
	I liked the picture and the useful information in Almanac
	I liked they way it had pictures and videos in the articles
	The way it's layed out. The pictures are sometimes helpful as they are not diagrams but real examples.
	The pictures
Learning	The amount of relative information presented to me after researching a specific topic.
	I like that when you look up something it gives you all he things you might be looking for
	The pictures and the different parts of information
	I liked how there was a variety. It showed images, videos and text on the topic searched. It was clearly presented.
	that it as pulled articles from different areas
	Some of the articles are interesting
	Helps you learn better
	Easy to get
	good
	information
	It is easy to use and the information is helpful

	The fact that it only showed facts related to the topic
	I could learn new things outside of class
	good facts
	Almanac is for me used to get geography notes its better than looking up what you want to know about e.g. waterfalls than looking it up on google
	Pictures and videos and good information
	Pictures and information
	The information was better to use. It was easier to find.
	How the information was so easy to access and it had everything i needed
	I like how it gives you useful information.
	i liked the fact that it was specifically for school curriculum
	useful information but didn't contain it all
	how they were grouped into topics
	How all the information is provided.
	The Articles had lots of information
	The information
	The pictures. Where it showed you what you needed to know
	how quick and easy it was to get information and the fact that it gave m the main points of what I was looking for not just useless information
	I liked the picture and the useful information in Almanac
	I liked the way it gave me the exact information i needed and it was clear and easy to understand
	The information
	Where you could add articles to favourites
	The extensive range of the articles.
	I liked how it gives you a whole article instead of just a sentence to answer the question. It makes it really easy to find extra information
	articles
	The way it looked and the informatian
	The way that all the information was about geography
	the simple descriptions
	I could learn new things outside of class
	I liked the fact that you could watch videos but also read information
	the words are not the hard and the pictures are good

Design	I liked being able to find the Information I wanted easily and it was presented well
	Just the way it is laid out and presented
	the search bar was a nice length
	the look of the app
	information
	I liked the slidey part when you were looking through information and I liked the layout of the images
	The set up of the information and how it was layed out
	I like the what do I want to learn
	I like the way you can search very quickly and the way its presented
	The setup
	The videos and presentation
	I liked the layout of almanac
	Where you could add articles to favourites
	I really liked the way information was presented.
	The way it's layed out. The pictures are sometimes helpful as they are not diagrams but real examples.
	appearance
	I liked how there was a variety. It showed images, videos and text on the topic searched. It was clearly presented.
	I liked that appearance and layout of ALMANAC. I liked the fact that you could watch videos but also read information
	The way it looked and the informatian
Search	the way you can search anything
	the features I liked was the search the way when you just put in what you want and search it
	I liked the slidey part when you were looking through information and I liked the layout of the images
	the search
	I like the way you can search very quickly and the way its presented
	the search
	The search bar…
	Search Options
	I enjoyed searching for the information.
Personal isation	Different levels and sizes
	I liked the slidey part when you were looking through information and I liked the layout of the images
	i liked how you could choose your size

Other	None
	none
	nothing
	Nothing
	All
	none of it
	All
	nothing First time using it.
	the one about rocks

Appendix J - Thematic Grouping of Free Entry Text Response to Student Survey – Control Group (Main Trial)

Which features of Almanac did you like – Irish Secondary School CONTROL GROUP

THEME	COMMENT
Ease of Use	How it is so easy to find the information with the help of the titles and pictures and the search engine at the beginning
	I like how easy it is to find text in each paragraph
	It was handy to just go on to
	I liked how all the information was quick and easy to access
	Information was easy to find
	I liked that there was videos so it shows you an example instead of just words. I liked that things are easy to find
Media Content	Sometimes the videos were helpful
	The videos from YouTube and the search bar
	I liked that ALMANAC had lots of pictures and videos
	the videos
	There was good images
	The articles contained the prime information I needed and the videos where a very useful resource.
	The pictures
	I liked that it had videos but when researching rocks I found it very hard to get any of the research that I needed
	I liked that there was videos so it shows you an example instead of just words. I liked that things are easy to find
Learning	I liked that you could type in what you wanted to know and that they gave lots of options to chose from
	Everything is trustworthy
	I liked how some of the information you were looking for was there
	I liked it because it helps with projects and researching things.
	The articles contained the prime information I needed and the videos where a very useful resource.
	I like that it is all summarised and that there is no excess information
	The way it only has geography
	I liked the way when I typed something in only geography related things came up
	All the facts on it
	I like that it focused on Geography alone.
	I liked how there was a few articles , but the problem was there wasn't anything in them.
	I liked the fact that most of the information was geography related

Design	The videos from YouTube and the search bar
	I like the its layout and the way it looks, it looks clear and easy but the information isn't clear
	The mix of videos text and link
	The passwords and stuff
	the layout
	I like the passwords and stuff Like that
	I like how their was a choice between videos and articles.
	The presentation and filter.
	The simple interface
Search	I liked that you could type in what you wanted to know and that they gave lots of options to chose from
Other	I don't know
	undecided
	Nothing
	Nothing
	nothing
	None
	none
	There wasn't much I liked because whenever I tried to search something all that came up was videos and not the stuff I wanted to find out so I didn't like that
	I liked that it had videos but when researching rocks I found it very hard to get any of the research that I needed
	I liked how there was a few articles , but the problem was there wasn't anything in them.
	I like the its layout and the way it looks, it looks clear and easy but the information isn't clear
	I disliked every single aspect of ALMANAC!

Appendix K - Thematic Grouping of Free Entry Text Response to Student Survey – Secondary Trial

Which features of Almanac did you like – secondary trial

THEME	COMMENT
Ease of Use	I liked it because it wa easy to fined videos.mthey had really nice videos. It's hard to fined nice video so I was happy with it and the pictures were really nice
Media Content	The videos and pictures
	I liked it because it wa easy to fined videos.mthey had really nice videos. It's hard to fined nice video so I was happy with it and the pictures were really nice
	The mix of video and pictures
	I like the picture
	The level in size feature was nice. The pictures were nice
Learning	It showed the pictures when you needed him right before the text
Design	The way you searched for things was pretty cool. Also the format of it. But you should add a glossary and more articles
	It showed the pictures when you needed him right before the text
	How it was set up
	I like how your back round I would like for u guys to speak it to us because I'm not a very good reader
	I liked that after you finish an artisan it gives the original options minus the one you read.
Search	The way you searched for things was pretty cool. Also the format of it. But you should add a glossary and more articles
Personalisation	The way you searched for things was pretty cool. Also the format of it. But you should add a glossary and more articles
	The level in size feature was nice. The pictures were nice
Other	The way you searched for things was pretty cool. Also the format of it. But you should add a glossary and more articles
	I like how your back round I would like for u guys to speak it to us because I'm not a very good reader

Appendix L - The correlations between survey and log results for each group.

Notes: The question names correspond to the names referred to in the document and the questionnaire. #NUM! means that the number was too small for Excel. Yellow cells indicate a coefficient >0.5, or <-0.5.

	Q1 and Q2	Q2 and Q3	Q3 and Q4	Q4 and Q5	Q5 and Q6	Q6 and Q7	Q7 and Q8	Q8 and Q10	Q10 and Q11	Q11 and Q12	Q12 and Q13	Q13 and Q16	Q1
Pearson Coefficient	0,7434	0,3415	0,3954	0,5419	-0,7883	0,5202	-0,4812	0,4987	0,1594	-0,0952	-0,4208	0,6382	
Significance	0,0000	0,0289	0,0105	0,0003	#NUM!	0,0005	#NUM!	0,0009	0,3195	#NUM!	#NUM!	0,0000	
	Q1 and Q3	Q2 and Q4	Q3 and Q5	Q4 and Q6	Q5 and Q7	Q6 and Q8	Q7 and Q10	Q8 and Q11	Q10 and Q12	Q11 and Q13	Q12 and Q16	Q13 and Q17	Q1
Pearson Coefficient	0,4067	0,4003	0,5179	-0,4579	-0,4851	0,6432	-0,6387	-0,0159	-0,2852	0,0585	-0,3409	0,7541	
Significance	0,0083	0,0095	0,0005	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	0,7166	#NUM!	0,0000	
	Q1 and Q4	Q2 and Q5	Q3 and Q6	Q4 and Q7	Q5 and Q8	Q6 and Q10	Q7 and Q11	Q8 and Q12	Q10 and Q13	Q11 and Q16	Q12 and Q17	Q13 and RAT	Q1
Pearson Coefficient	0,5425	0,6461	-0,4204	-0,4576	0,6814	-0,4526	-0,2763	-0,3747	0,5972	0,0775	-0,3322	0,2919	
Significance	0,0002	0,0000	#NUM!	#NUM!	0,0000	#NUM!	#NUM!	#NUM!	0,0000	0,6301	#NUM!	0,0641	
	Q1 and Q5	Q2 and Q6	Q3 and Q7	Q4 and Q8	Q5 and Q10	Q6 and Q11	Q7 and Q12	Q8 and Q13	Q10 and Q16	Q11 and Q17	Q12 and RAT	Q13 and Searches	Q1
Pearson Coefficient	0,7397	-0,5463	-0,4175	0,5359	0,4315	0,0168	0,5377	0,6951	0,4955	-0,0380	-0,1272	-0,0216	
Significance	0,0000	#NUM!	#NUM!	0,0003	0,0049	0,9171	0,0003	0,0000	0,0010	#NUM!	#NUM!	#NUM!	
	Q1 and Q6	Q2 anf Q7	Q3 and Q8	Q4 and Q10	Q5 and Q11	Q6 and Q12	Q7 and Q13	Q8 and Q16	Q10 and Q17	Q11 and RAT	Q12 and Searches	Q13 and Compositic	Q1
Pearson Coefficient	-0,6989	-0,4103	0,4135	0,5694	-0,2060	0,4369	-0,5146	0,5056	0,5393	0,3199	0,0922	0,1002	
Significance	#NUM!	#NUM!	0,0072	0,0001	#NUM!	0,0043	#NUM!	0,0007	0,0003	0,0415	0,5665	0,5330	
	Q1 and Q7	Q2 and Q8	Q3 and Q10	Q4 and Q11	Q5 and Q12	Q6 and Q13	Q7 and Q16	Q8 and Q17	Q10 and RAT	Q11 and Searches	Q12 and Composit	Q13 and Page Views	
Pearson Coefficient	-0,5568	0,4951	0,3085	0,0172	-0,3599	-0,7360	-0,5162	0,6519	0,4183	0,1309	0,0194	0,1931	
Significance	#NUM!	0,0010	0,0497	0,9150	#NUM!	#NUM!	#NUM!	0,0000	0,0065	0,4147	0,9040	0,2264	
	Q1 and Q8	Q2 and Q10	Q3 and Q11	Q4 and Q12	Q5 and Q13	Q6 and Q16	Q7 and Q17	Q8 and RAT	Q10 and Searches	Q11 and Compositi	Q12 and Page Views		
Pearson Coefficient	0,6971	0,2946	0,1412	-0,2384	0,7544	-0,4636	-0,3904	0,2286	-0,0142	-0,0248	-0,0722		
Significance	0,0000	0,0615	0,3787	#NUM!	0,0000	#NUM!	#NUM!	0,1505	#NUM!	#NUM!	#NUM!		
	Q1 and Q10	Q2 and Q11	Q3 and Q12	Q4 and Q13	Q5 and Q16	Q6 and Q17	Q7 and RAT	Q8 and Searches	Q10 and Compositi	Q11 and Page Views			
Pearson Coefficient	0,5931	-0,1178	-0,2760	0,5525	0,6121	-0,6605	-0,1763	-0,0942	0,0051	-0,0370			
Significance	0,0000	#NUM!	#NUM!	0,0002	0,0000	#NUM!	#NUM!	#NUM!	0,9746	#NUM!			
	Q1 and Q11	Q2 and Q12	Q3 and Q13	Q4 and Q16	Q5 and Q17	Q6 and RAT	Q7 and Searches	Q8 and Compositi	Q10 and Page Views				
Pearson Coefficient	-0,0977	-0,3924	0,5190	0,5908	0,6407	-0,2248	0,1437	0,1617	0,2277				
Significance	#NUM!	#NUM!	0,0005	0,0000	0,0000	#NUM!	0,3700	0,3126	0,1522				
	Q1 and Q12	Q2 and Q13	Q3 and Q16	Q4 and Q17	Q5 and RAT	Q6 and Searches	Q7 and Compositi	Q8 and Page Views					
Pearson Coefficient	-0,3717	0,6979	0,5962	0,4850	0,0974	-0,0723	0,0490	0,2068					
Significance	#NUM!	0,0000	0,0000	0,0013	0,5448	#NUM!	0,7609	0,1945					
	Q1 and Q13	Q2 and Q16	Q3 and Q17	Q4 and RAT	Q5 and Searches	Q6 and Compositior	Q7 and Page Views						
Pearson Coefficient	0,7897	0,5550	0,2089	0,2707	-0,1752	-0,1857	-0,0689						
Significance	0,0000	0,0002	0,1900	0,0870	#NUM!	#NUM!	#NUM!						
	Q1 and Q16	Q2 and Q17	Q3 and RAT	Q4 and Searches	Q5 and Compositior	Q6 and Page Views							
Pearson Coefficient	0,5563	0,6102	0,2676	-0,2228	0,1749	-0,1816							
Significance	0,0002	0,0000	0,0908	#NUM!	0,2741	#NUM!							
	Q1 and Q17	Q2 and RAT	Q3 and Searches	Q4 and Composition:	Q5 and Page Views								
Pearson Coefficient	0,7591	0,0011	-0,3512	0,0985	0,0717								
Significance	0,0000	0,9945	#NUM!	0,5402	0,6558								
	Q1 and RAT	Q2 and Searches	Q3 and Composition:	Q4 and Page Views									
Pearson Coefficient	0,0661	-0,1130	-0,1557	-0,0209									
Significance	0,6816	#NUM!	#NUM!	#NUM!									
	Q1 and Searches	Q2 and Compositic	Q3 and Page Views										
Pearson Coefficient	-0,1423	-0,0021	0,0588										
Significance	#NUM!	#NUM!	0,7151										
	Q1 and Compositio	Q2 and Page Views											
Pearson Coefficient	-0,0914	0,1657											
Significance	#NUM!	0,3005											
	Q1 and Page Views												
Pearson Coefficient	0,1874												
Significance	0,2407												

Figure 22 Control Group

	Q1 and Q2	Q2 and Q3	Q3 and Q4	Q4 and Q5	Q5 and Q6	Q6 and Q7	Q7 and Q8	Q8 and Q10	Q10 and Q11	Q11 and Q12	Q12 and Q13	Q13 and Q14	Q14 and Q15	Q15 and Q16	Q16
Pearson Correlation	0,6661	0,2896	0,3499	0,4927	-0,5242	0,5532	-0,3895	0,3944	-0,0513	0,1607	-0,3685	0,3948	0,2193	0,2897	
Significance	0,0000	0,0011	0,0001	0,0000	#NUM!	0,0000	#NUM!	0,0000	#NUM!	0,0735	#NUM!	0,0000	0,0140	0,0011	
	Q1 and Q3	Q2 and Q4	Q3 and Q5	Q4 and Q6	Q5 and Q7	Q6 and Q8	Q7 and Q10	Q8 and Q11	Q10 and Q12	Q11 and Q13	Q12 and Q14	Q13 and Q15	Q14 and Q16	Q15 and Q17	Q16
Pearson Correlation	0,3859	0,4764	0,3383	-0,4173	-0,3566	-0,3625	-0,2906	-0,1377	-0,2999	-0,0222	-0,2597	0,3965	0,3556	0,2172	
Significance	0,0000	0,0000	0,0001	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	0,0000	0,0000	0,0150	
	Q1 and Q4	Q2 and Q5	Q3 and Q6	Q4 and Q7	Q5 and Q8	Q6 and Q10	Q7 and Q11	Q8 and Q12	Q10 and Q13	Q11 and Q14	Q12 and Q15	Q13 and Q16	Q14 and Q17	Q15 and RAT	Q16
Pearson Correlation	0,4324	0,5315	-0,2019	-0,2358	0,5089	-0,3943	0,2703	-0,2411	0,5424	-0,0260	-0,1081	0,6009	0,2210	-0,0219	
Significance	0,0000	0,0000	#NUM!	#NUM!	0,0000	#NUM!	0,0023	#NUM!	0,0000	#NUM!	#NUM!	0,0000	0,0133	#NUM!	
	Q1 and Q5	Q2 and Q6	Q3 and Q7	Q4 and Q8	Q5 and Q10	Q6 and Q11	Q7 and Q12	Q8 and Q13	Q10 and Q14	Q11 and Q15	Q12 and Q16	Q13 and Q17	Q14 and RAT	Q15 and Searc	Q16
Pearson Correlation	0,5189	-0,4973	-0,2804	0,4193	0,5485	0,3302	0,5818	0,5029	0,3682	0,1121	-0,2785	0,6263	-0,1147	-0,0422	
Significance	0,0000	#NUM!	#NUM!	0,0000	0,0000	0,0002	0,0000	0,0000	0,0000	0,2132	#NUM!	0,0000	#NUM!	#NUM!	
	Q1 and Q6	Q2 anf Q7	Q3 and Q8	Q4 and Q10	Q5 and Q11	Q6 and Q12	Q7 and Q13	Q8 and Q14	Q10 and Q15	Q11 and Q16	Q12 and Q17	Q13 and RAT	Q14 and Searc	Q15 and Comp	Q16
Pearson Correlation	-0,4633	-0,4805	0,5512	0,4268	-0,0817	0,4857	-0,3748	0,3317	0,1629	0,0367	-0,2695	-0,0978	0,0541	0,0468	
Significance	#NUM!	#NUM!	0,0000	0,0000	#NUM!	0,0000	#NUM!	0,0002	0,0695	0,6844	#NUM!	#NUM!	0,5494	0,6061	
	Q1 and Q7	Q2 and Q8	Q3 and Q10	Q4 and Q11	Q5 and Q12	Q6 and Q13	Q7 and Q14	Q8 and Q15	Q10 and Q16	Q11 and Q17	Q12 and RAT	Q13 and Searc	Q14 and Comp	Q15 and Page View	
Pearson Correlation	-0,4145	0,4778	0,3276	-0,0129	-0,2911	-0,4932	-0,1996	0,2654	0,4190	-0,0463	-0,0123	-0,0784	0,0164	0,1749	
Significance	#NUM!	0,0000	0,0002	#NUM!	#NUM!	#NUM!	#NUM!	0,0028	0,0000	#NUM!	#NUM!	#NUM!	0,8556	0,0510	
	Q1 and Q8	Q2 and Q10	Q3 and Q11	Q4 and Q12	Q5 and Q13	Q6 and Q14	Q7 and Q15	Q8 and Q16	Q10 and Q17	Q11 and RAT	Q12 and Searc	Q13 and Comp	Q14 and Page Views		
Pearson Correlation	0,5535	0,4619	-0,1043	-0,3345	0,5760	-0,1597	-0,0734	0,3993	0,3509	0,0972	-0,0746	-0,0362	0,0233		
Significance	0,0000	0,0000	#NUM!	#NUM!	0,0000	#NUM!	#NUM!	0,0000	0,0001	0,2810	#NUM!	#NUM!	0,7968		
	Q1 and Q10	Q2 and Q11	Q3 and Q12	Q4 and Q13	Q5 and Q14	Q6 and Q15	Q7 and Q16	Q8 and Q17	Q10 and RAT	Q11 and Searc	Q12 and Comp	Q13 and Page Views			
Pearson Correlation	0,4549	-0,0235	-0,1053	0,4887	0,2700	0,0096	-0,2403	0,4452	-0,1004	0,0952	-0,1057	0,0456			
Significance	0,0000	#NUM!	#NUM!	0,0000	0,0023	0,9150	#NUM!	0,0000	#NUM!	0,2910	#NUM!	0,6137			
	Q1 and Q11	Q2 and Q12	Q3 and Q13	Q4 and Q14	Q5 and Q15	Q6 and Q16	Q7 and Q17	Q8 and RAT	Q10 and Searc	Q11 and Comp	Q12 and Page Views				
Pearson Correlation	-0,0211	-0,4197	0,3586	0,2914	0,1812	-0,3279	-0,2768	-0,1759	-0,2578	0,1116	-0,2032				
Significance	#NUM!	#NUM!	0,0000	0,0010	0,0431	#NUM!	#NUM!	#NUM!	#NUM!	0,2152	#NUM!				
	Q1 and Q12	Q2 and Q13	Q3 and Q14	Q4 and Q15	Q5 and Q16	Q6 and Q17	Q7 and RAT	Q8 and Search	Q10 and Comp	Q11 and Page Views					
Pearson Correlation	-0,3522	0,6111	0,2536	0,1428	0,5529	-0,3783	0,0258	-0,0767	-0,2452	0,0508					
Significance	#NUM!	0,0000	0,0043	0,1120	0,0000	#NUM!	0,7748	#NUM!	#NUM!	0,5734					
	Q1 and Q13	Q2 and Q14	Q3 and Q15	Q4 and Q16	Q5 and Q17	Q6 and RAT	Q7 and Search	Q8 and Compo	Q10 and Page Views						
Pearson Correlation	0,6129	0,2320	0,2262	0,3782	0,5141	0,2606	0,0233	-0,0432	-0,0625						
Significance	0,0000	0,0092	0,0112	0,0000	0,0000	0,0033	0,7963	#NUM!	#NUM!						
	Q1 and Q14	Q2 and Q15	Q3 and Q16	Q4 and Q17	Q5 and RAT	Q6 and Searche	Q7 and Compo	Q8 and Page Views							
Pearson Correlation	0,2440	0,2074	0,2841	0,2480	-0,0807	0,3162	0,0026	0,0905							
Significance	0,0061	0,0203	0,0013	0,0053	#NUM!	0,0003	0,9767	0,3153							
	Q1 and Q15	Q2 and Q16	Q3 and Q17	Q4 and RAT	Q5 and Search	Q6 and Compo	Q7 and Page Views								
Pearson Correlation	0,2867	0,4650	0,1778	-0,0908	-0,1361	0,2781	-0,0338								
Significance	0,0012	0,0000	0,0472	#NUM!	#NUM!	0,0017	#NUM!								
	Q1 and Q16	Q2 and Q17	Q3 and RAT	Q4 and Searc	Q5 and Compo	Q6 and Page Views									
Pearson Correlation	0,3552	0,4267	-0,1799	-0,0615	-0,2022	0,0922									
Significance	0,0000	0,0000	#NUM!	#NUM!	#NUM!	0,3062									
	Q1 and Q17	Q2 and RAT	Q3 and Search	Q4 and Comp	Q5 an Page Views										
Pearson Correlation	0,4543	-0,0452	-0,0884	-0,0308	0,0283										
Significance	0,0000	#NUM!	#NUM!	#NUM!	0,7544										
	Q1 and RAT	Q2 and Searcl	Q3 and Compo	Q4 and Page Views											
Pearson Correlation	-0,0396	0,0490	-0,0474	0,0509											
Significance	#NUM!	0,5870	#NUM!	0,5728											
	Q1 and Searcl	Q2 and Comp	Q3 and Page Views												
Pearson Correlation	-0,1137	0,0964	0,0216												
Significance	#NUM!	0,2847	0,8109												
	Q1 and Comp	Q2 and Page Views													
Pearson Correlation	-0,0842	0,1701													
Significance	#NUM!														
	Q1 and Page Views														
Pearson Correlation	0,0851														
Significance	0,3452														

Figure 23 Test Group

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