RECORDING EDITABLE SLIDECASTS IN-CLASS WITH A SMARTPHONE USING PRESENTAIN AND MEDIASITE

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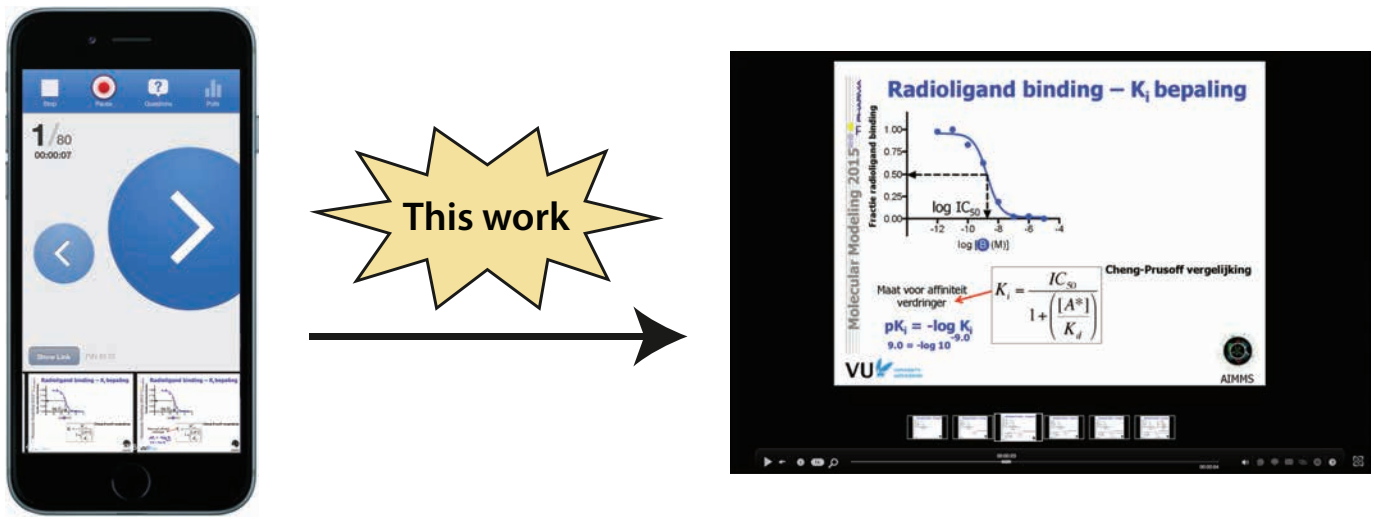
Slidecasting is emerging as a powerful tool to supplement traditional teaching methods. New technical methods to record a slidecast from a lecture are thus in demand. A versatile method is presented that (1) involves Presentain software to use a smartphone as both slide advancer and in-class portable voice recording device and (2) allows transfer of the recording data to MediaSite software for post-production editing. This powerful combination of two software packages can be used independent of class room and gives high-quality slide/audio synchronized slidecasts without the need for specialized hardware or screen capture software. The method was used by five teachers for the slidecasting of ca. 43 hours of classes at varying levels and in lecture rooms of varying sizes. A key infrastructural prerequisite of the protocol is properly working Wi-Fi. Teacher and student evaluations were positive. It is foreseen that the presented protocols can be applied to education in many fields.



PREFACE

To our fellow teachers,

We would like to share with you a tool that allows you to record a lecture with your own smartphone using the software Presentain and subsequently export it to an editable slidecast for incorporation in the (My)MediaSite video database. Given that many universities use MediaSite already (for example the majority of Dutch universities), we think other teachers may be interested in giving this a try.

The VU University initiated this research in the context of our ongoing work on innovations in blended learning. Along the way, we contacted Presentain for the inception of a crucial export link which they swiftly enabled. In all, the VU team has been directing this work independently. Still, we have found it difficult to publish this work in several journals partially because our work did not contain longitudinal studies (which is true), partially because our work involves commercial software (Presentain and Mediasite) and partially because our VU team decided to add two Presentain employees to the author list because they contributed significantly to technical aspects of our work but will, as with all SMEs, in all scenarios have competing interest (which we had clearly defined in our submitted manuscript).

We respect the rejection decisions of the involved journals but emphasise that the only key driver for our work has always been to add to the toolbox of technologies that can help in increasing innovation in education. Developing new software programs is not something we as teachers normally pursue but using existing software in a creative manner is one of the pillars of educational innovation. Thus, a smooth collaboration with an SME such as Presentain can be an appreciable asset in this context and should not by definition be a publishing burden.

Therefore, we are now happy to share our manuscript (incl. appendix) with you without journals involved and without any strings attached.

Hope you find our work useful. If you have any questions, drop us an email!

The authors

INTRODUCTION & AIM

Slidecasting

Slidecasting is a form of podcasting that involves the synchronization of presentation slides with audio (Martin 2015). Slidecasting is being probed extensively in educational contexts as a means to deliver online content (Kay 2012) . In turn, this can free up contact time for a more activated way of teaching, which itself has been indicated to be of benefit in science teaching (Freeman 2014). The general merits, grade effects and pitfalls of using slidecasts/podcasts in education are being explored (Kay 2012, Griffin 2009, Vajoczki 2010, Reyna 2009). Therefore, broadly applicable methods to record slidecasts of sufficient technical quality will help in addressing these pedagogical questions of slidecasting. Recording a slidecast can be done at home, in a booth or in a class room typically with dedicated recording software (Blevins 2009) using a computer and associated hardware. MediaSite® from SonicFoundry (see Appendix) is one such software program (Suda 2014, Vasu 2008). MediaSite is being used extensively as a means to manage educational slidecasts and weblectures and offers substantial options, such as setting security parameters and the availability of in-depth viewing statistics. The optional MyMediaSite module (see Appendix), which has parts with and without additional licensing costs, was recently rolled out at our university. It offers, amongst others, an interface (without additional license cost) to edit and fine-tune slidecasts post-recording through removing/replacing/adding slides, use of

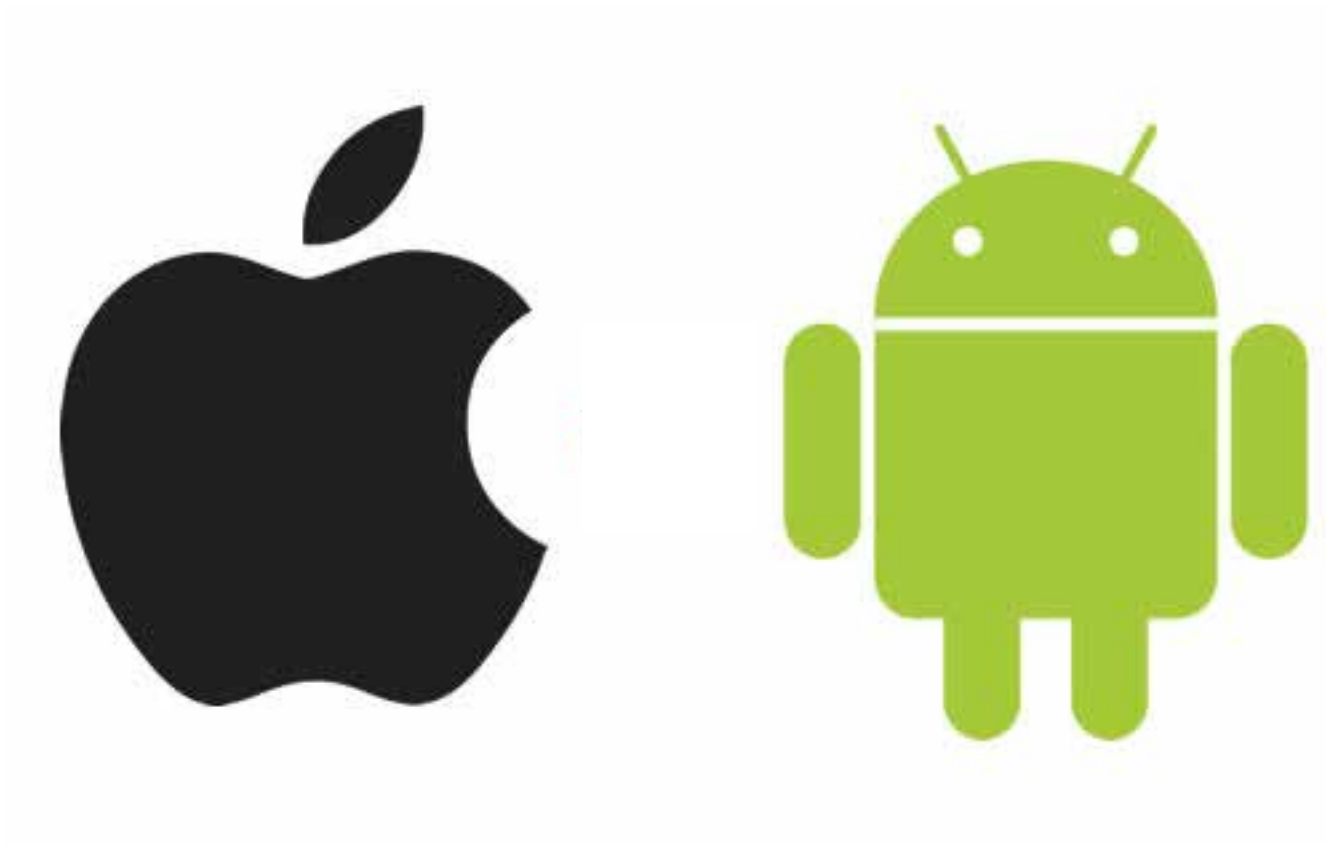
chapters, cropping, adding links, etc. The ready availability of these post-recording opportunities leaves the actual recording process as a remaining hurdle and arguably as an oft-encountered challenge for teachers.

Aim

Recording live in a class room rather than in a booth or at home can uniquely capture the dynamics and interaction experienced in the class room (including questions posed by teachers and students, as well as the resulting answers). As such, live classroom recording was the main goal in our study. The laptop/desktop-based recording in a classroom may not be optimal for all teachers, especially those that like to move around and prefer not to use a microphone. Also, several recording software packages require hardware and/or operators for recording. At our university, as part of our ongoing program in e-learning innovations (Wijtmans 2014), we set out to develop a generic recording approach that works in any class room without specialized hardware or screen capture recorder and that delivers slidecasts for MediaSite.

TECHNICAL STRATEGY

Early in our efforts, the attention of some of us (DS/EB/MW/JvM) was captured by Presentain software (see Appendix), which had just been released for business presenters. A unique feature of Presentain involves the use of the presenter's smartphone as both the slide advancer and the portable voice recording device, which allows seamless slide/audio synchronization in a basic slidecast that could be distributed afterward. The large potential of Presentain in education was evident: it allows high physical mobility for the teacher in the classroom without specialized hardware and only requires WiFi, a pre-uploaded presentation, a smartphone (iOS and Android are both supported) and a projector computer. The standard browser-based slidecast output of Presentain, while sufficient for business purposes, was not ideal for education as it lacked options for post-recording editing and in-depth viewing statistics that are both so highly useful for teachers. Therefore, to allow the use of (My)MediaSite for these slidecasts, we contacted Presentain and in a subsequent collaboration with NK/TK developed two crucial components. The two components (termed 'Matching Presentain and MediaSite formats' and 'Establishing an automated workflow') are discussed in detail in the Appendix and delivered a fully web-based automated process to import Presentain slidecasts into MediaSite with features identical to the original Presentain recording in terms of slide sequence, audio, etc. Importantly, such an imported MediaSite recording is technically indistinguishable from a MediaSite recording obtained by alternative means (for example, by a desktop recorder). With our new technical protocols at hand, the stage was set for developing two practical workflows for teachers: one for preparing the Presentain-based lecture and one for recording/processing to (My)MediaSite.

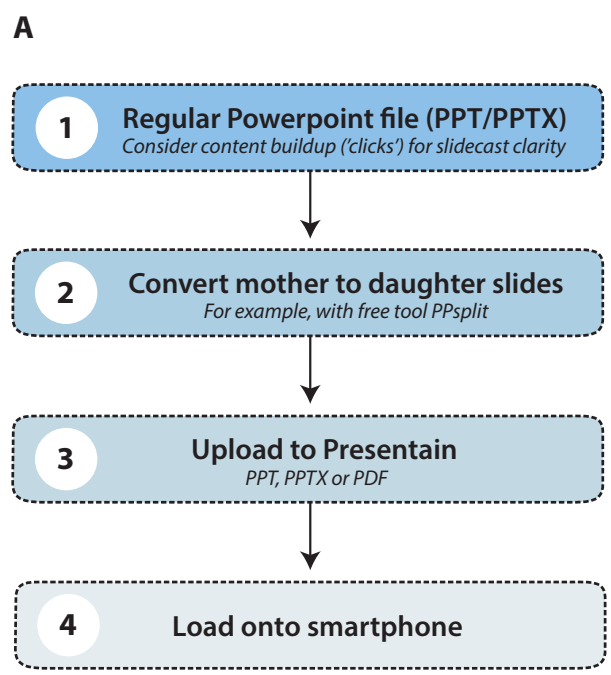


EDUCATIONAL APPLICATION

Our workflow for preparing a Presentain-based lecture for recording is shown in Figure 1A and consists of several steps:

1. Preparing the Powerpoint file. A teacher should realize that a slidecast recorded through Presentain (or through many other means) shows no laser pointer. Thus, the presentation could greatly benefit from strategic step-wise buildup of content within a single slide ('clicks'). This helps to guide students more efficiently through the resulting slidecast by increasing its 'self-explanatory' nature, which appears especially useful when many graphs, calculations and (chemical) schemes are used (see Appendix for examples).

2. Convert any click-induced content buildup in the mother slide to separate daughter slides, as Presentain is as of yet not able to process such Powerpoint buildup features (future work). The free tool PPspliT was used for this (see Appendix).



3. Uploading the file to the Presentain account. In case of PPT/PPTX sources a subsequent check on pictures in the online Presentain source is recommended and an occasional incompatibility in picture format can be fixed by adapting the picture format in the PPT(X) source. Alternatively, one can upload presentations in the Portable Document Format (PDF).

4. Loading of the presentation onto the smartphone using the Presentain app. This can be done well ahead of time.

Our workflow for the actual recording and processing to a MediaSite-compatible slidecast is shown in Figure 1B and relies heavily on the automated steps discussed in the 'Technical Strategy' section:

1. Actual recording of a lecture using Presentain and a smartphone. Just before the lecture, one requires loading of the presentation on the plenary screen through the Presentain website on the projector computer and enabling the recording process on the smartphone. The Appendix lists

Figure 1: Our workflows for applying the developed protocols. (A) Workflow for preparing a lecture for recording with Presentain. (B) Workflow for recording/processing to (My)MediaSite.

some practical tips for the actual recording process.

2. Publishing and downloading. After the lecture is finished, the recording is published to the Presentain website. This usually happens automatically, but can also be done manually. Next, a ZIP file containing the raw data can be downloaded from the Presentain website.

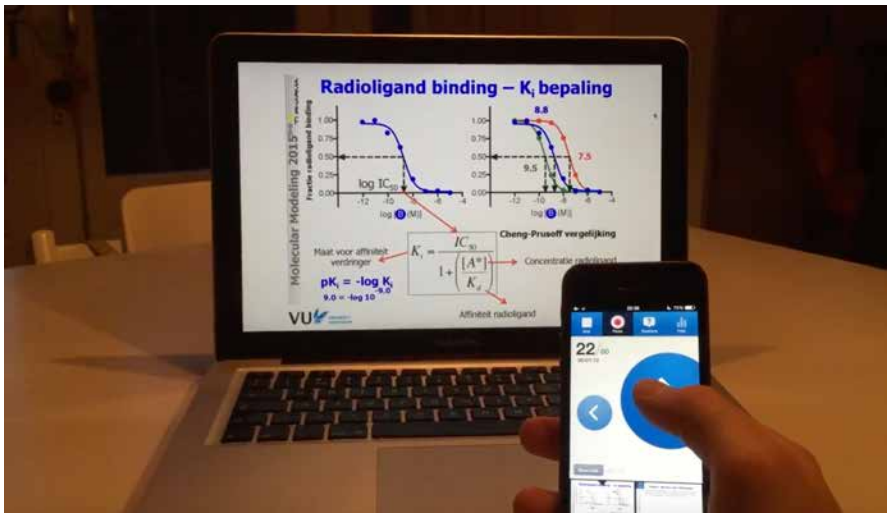
3. Importing the ZIP file using the customized secure web interface developed at our university (vide supra), resulting in the slidecast being published in MediaSite.

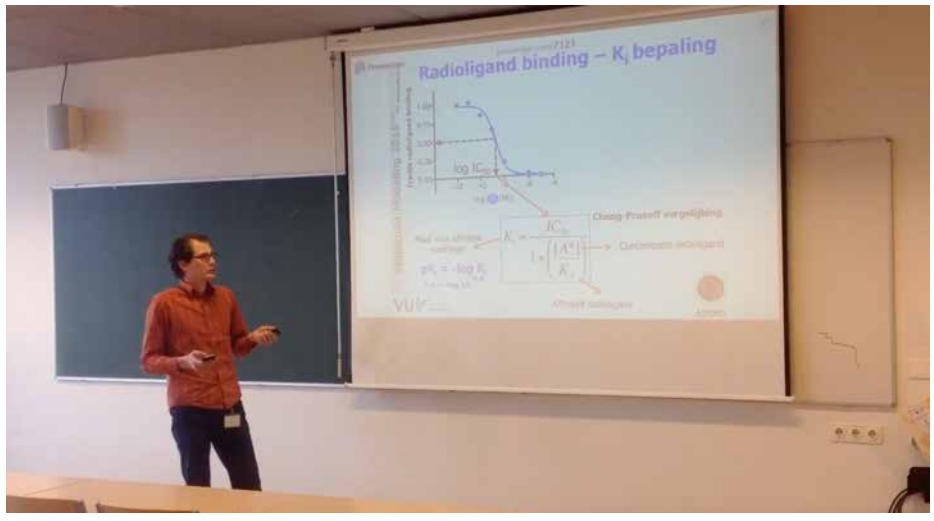
4. Post-recording editing in MyMediaSite where desired.

A short MediaSite slidecast obtained through these workflows can be found in the Appendix.

Five teachers from our department of Chemistry and Pharmaceutical Sciences applied the workflows in their teaching during the academic year 2014-2015. A total of ca. 43 hours of class time was recorded with an iPhone 5s or 6. To explore the applicability, a variety of courses with different topics were recorded partially or in full. Courses and total recording time involved were: general chemistry (bachelor, 20x45 min), pharmacology (master, 14x45 min), process chemistry (bachelor, 4x45 min), pharmacology (bachelor, 9x45 min), drug synthesis (master, 8x45 min) and a course on 'tutoring students' (master, 2x45 min). Importantly, lecture rooms varied from specialized large-scale halls (200 people) to smaller general rooms (<25 people). All the slidecasts were transferred by the described protocols to MediaSite, after which they could be protected by the login system of the university and edited in MyMediaSite to, for example, cut superfluous parts (start and end of a lecture, break time,…) or to add a slide with some additional explanation. The ensuing slidecasts left intact the questions that were posed by students or teachers and the answers given. In the subsequent academic year 2015-2016, ca. 50 additional hours of lectures have been recorded.

A short video of one of us (DS) using the pointer/phone combination during an actual class recording can be found in the Appendix.





Impression of a presentation using an iPhone 5s with Presentain as a slide clicker and audio recording device.

EVALUATION & CONCLUSIONS

Evaluation

Overall, evaluations by teachers and students of our protocols and slidecasts were positive, while the main critical parameter was, not unexpectedly, properly working IT. We refer to the Appendix for details on the evaluations, strong points and limitations of our approach.

Conclusion

A recording protocol for slidecasts is described that emerged after combining the strengths of two existing software packages: Presentain and MediaSite. The methods developed by us do not require additional license costs on top of subscriptions for Presentain and MediaSite and enable the population of a MediaSite database with lectures that are conveniently recorded in-class without specialized hardware/personnel but simply using a smartphone as both the slide advancer and the portable voice recording device. Through the use of the MyMediaSite module the slidecasts can be edited by the teacher afterward. A total of ca. 95 hours of highly valuable classes of varying topics and levels have been recorded by us in two years. A dependence on properly working IT infrastructure is evident. Both teachers and students are positive about the technical aspects of the approach. Details on the developed methods are disclosed in the Appendix to inspire fellow teachers to explore.

Acknowledgments

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Affiliations & Declaration

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APPENDICES

1. Features of Presentain, (My)MediaSite and PPspliT
2. Details of technical strategy
3. Examples of the use of content buildup
4. Practical tips for the recording process in a lecture hall
5. Exemplary MediaSite slidecast
6. Short video of a teacher using the pointer/smartphone combination
7. Evaluations/strong points/limitations
8. Exemplary XML file
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1. Features of Presentain, (My)MediaSite and PPspliT

The listed features and URLs were assembled in May 2016.

Presentain

Web link:
http://www.presentain.com/

Devices:
- Browser-based
- Smartphone app needed for recording process (available for iOS and Android)
- Projector computer linked to projector and internet needed

Features:
- Use of smartphone as slide advancer
- Recording of lectures
- Real-time questions
- Real-time polling
- Option for participants to watch lecture in real time on their devices
- Basic viewing statistics
- Use of YouTube videos

Note that advanced Powerpoint animations and embedded offline movies are not (yet) compatible with the use of Presentain. Build-up animations ('clicks') can be dealt with using tools like PPspliT.

Price:
Varies, see: http://presentain.com/pricing#individual

Tutorial:
https://vimeo.com/presentain/

(My)MediaSite

Web link:
http://www.sonicfoundry.com/mediasite/

Devices:
Interface is browser-based

Features:

- Extensive managing platform for videos and slidecasts (creating, publishing, searching,…) including the ability to set security parameters and many more features. The extensive options for selecting viewing interface and for inspection of the viewing statistics are noteworthy.
- MyMediaSite is an optional component that includes paid components such as the MediaSite Desktop Recorder but also features without additional license costs such as powerful post-production editing options, which include:
    - Adding/replacing/removing slides
    - Cutting time (cropping) e.g. for making clips
    - Adding web links
    - Adding captions
    - Use of chapters

Price:
Need inquiry: http://www.sonicfoundry.com/contact/

Tutorials:
MediaSite: http://www.sonicfoundry.com/resources/
MyMediaSite: https://support.sonicfoundry.com/Knowledge/Article/000003769

PPspliT

Web link:
http://www.dia.uniroma3.it/~rimondin/downloads.php

Devices:
PowerPoint for Windows, versions XP (2002), 2003, 2007, 2010, 2013, 2016 (32 and 64 bit).
The tool is open source so can conceivably also be adapted for use on Mac computers.

Features:
PPspliT splits Powerpoint animation effects into separate daughter slides, whilst renumbering or retaining slide numbers.

Price:
Free

Tutorials:
http://www.dia.uniroma3.it/~rimondin/downloads/PPspliT/PPspliT-howto.pdf

2. Details of technical strategy

Matching Presentain and MediaSite formats

Initially, the overall structure of the slidecasts used by Presentain and MediaSite were compared. Both systems consist of a collection of separate slide files in Portable Network Graphics (PNG) or Joint Photographic Experts Group (JPEG) format linked together by a file containing slide timing and sequence information. Both systems store audio as M4a (MPEG-4 Audio) files in the Advanced Audio Coding (AAC) format (Brandenburg 1999, Koenen 2000). As such, it was anticipated that Presentain slidecasts could be readily converted to MediaSite format. However, the Presentain file containing slide timings was written in Javascript Object Notation (JSON, http://www.ecma-international.org/publications/standards/Ecma-404.htm), which is technically different from the Extensible Markup Language (XML, http://www.w3.org/XML/) format used by MediaSite (Munzert 2015). Therefore, a conversion step was needed to convert JSON to XML format. This was achieved using Perl JSON (http://search.cpan.org/~makamaka/JSON-2.90/lib/JSON.pm) and XML::Simple libraries (http://search.cpan.org/~grantm/XML-Simple-2.20/lib/XML/Simple.pm) and intermediate scripting. Absolute slide timings used by Presentain were converted to relative slide timings in the XML file intended for MediaSite (which uses timings relative to the start of the presentation), producing a presentation manifest XML file that could be read by MediaSite software. Initial manual proof-of-concepts attempts to import the M4a/PNG/XML components of a test Presentain presentation into the MediaSite Desktop Editor proceeded smoothly and delivered a satisfactory MediaSite slidecast. Because the root Presentain slidecasts are only accessible within a browser, a functionality to automatically export such slidecasts in M4a/PNG/XML format was required. Toward this end, Presentain developed a conversion tool for its website, allowing slidecasts to be exported in a downloadable ZIP file. This ZIP file contains the files in the M4a/PNG/XML formats required by MediaSite software. The export link is now automatically available for each slidecast on the Presentain website (Figure S1).

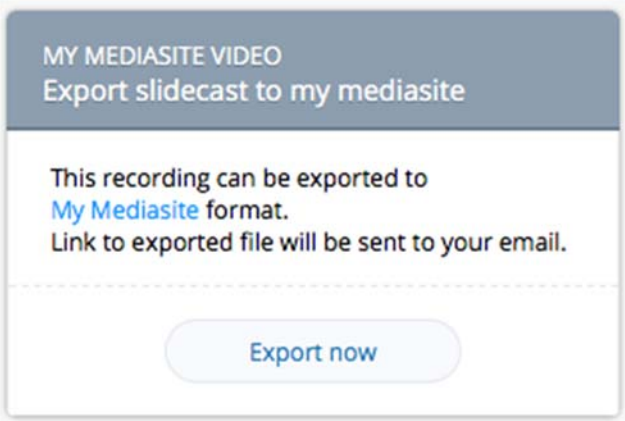


Figure S1. Export link present for each Presentain session on the Presentain website.

Establishing an automated workflow

At our university, a workflow was developed for automation of the import process such that Presentain ZIP files could be directly uploaded, processed and imported into the MediaSite interface by the user (teacher) without the need for external IT support. Figure S2 shows a schematic overview of this process. The backend of the MediaSite Enterprise Video Platform (EVP) consists mainly of three parts:

- The Extended Data Access Service (EDAS) involved in user authentication and slidecast access
- The Database Access Service (DBAS) responsible for, amongst others, slidecast publishing and slide timing
- The File Services which direct all associated files to their appropriate storage locations

In the workflow, the MediaSite EVP was targeted in a secure web interface for uploading and processing of the Presentain ZIP file. This web interface feeds directly into Presentain Processor- and Slidecast Ingestor-tools using batch processors which check for new ZIP files every 2 minutes. These two tools were used to add necessary metadata (such as userID, course title, etc.) to the Presentain slidecast ZIP resulting in a 'MediaSite ZIP', and to further process the slidecast files for correct export to the MediaSite EVP, respectively. In turn, the DBAS/EDAS/File services of the MediaSite EVP provide the logistic procedures to deliver all the files and metadata to the correct storage- and database locations within the EVP, such that the slidecast can be viewed from the frontend MediaSite player (Figure S2). The metadata is used to link the slidecast to the account of the user and enables the sending of notifications of the process. Upon completion of all steps, the user is notified of the progress and receives a link (URL) to access the slidecast. To put the new workflows to the test, a few actual lectures recorded with Presentain were exported using the new ZIP download link and subsequently uploaded to the MediaSite EVP using the new web secure interface. Here, some issues with asynchrony in slides and audio were encountered. First, there were fundamental differences between Presentain and MediaSite in handling recurrent slides that result from the teacher flipping back-and-forth between slides to revisit an earlier slide. More specifically, where Presentain assigns a recurrent slide the same number as the original slide, MediaSite requires a unique PNG file and number for each instance of a slide. Secondly, the interpretation and conversion of slide timing (*vide supra*) was still not optimal. These issues were fully resolved in an updated version of the Presentain export scripts.

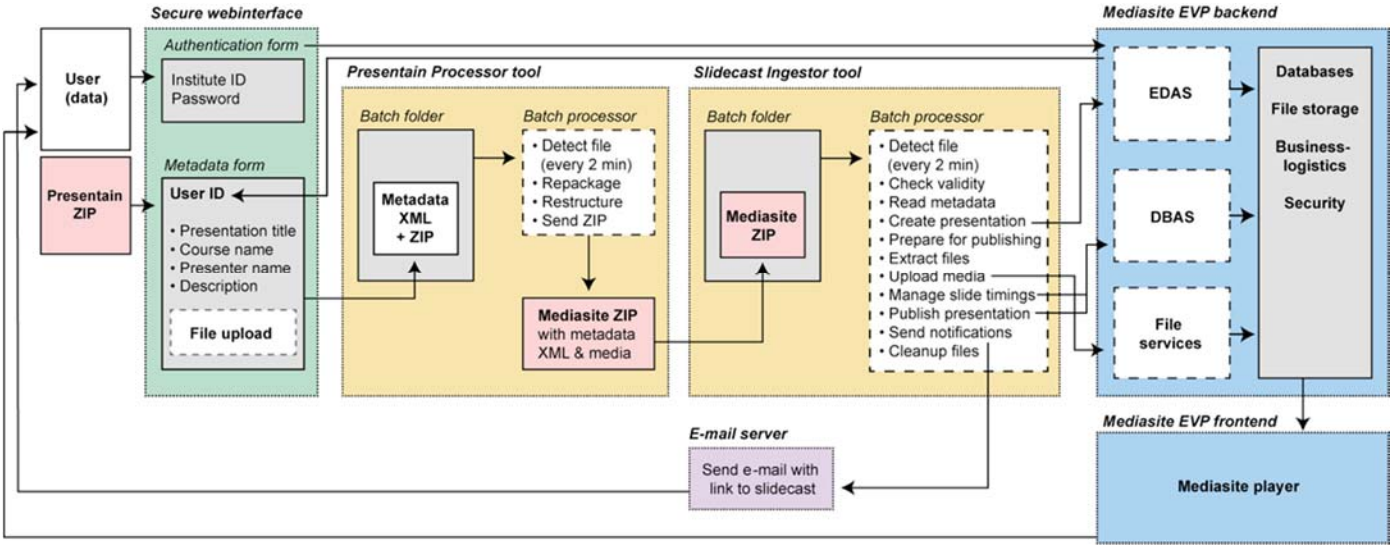
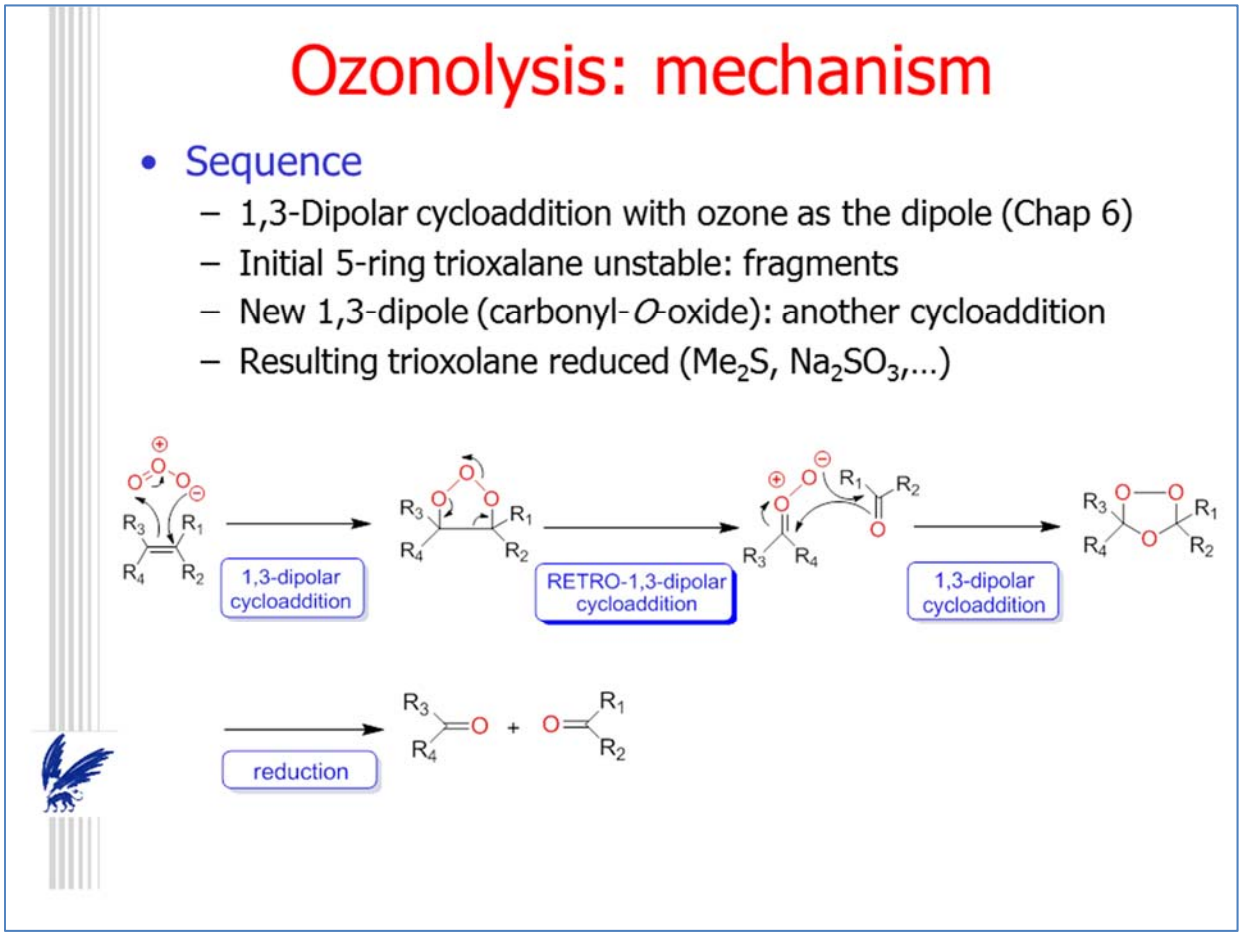


Figure S2: A schematic overview of the process of importing Presentain output into the MediaSite Enterprise Video Platform.

3. Examples of the use of content buildup

Figures S3A/B, S4A/B and S5A/B show examples of step-wise content buildup in the mother slide (Figure A) using 'clicks' in Powerpoint and subsequent treatment with PPspliT to give daughter slides (Figure B). A 'click' in the mother slide was achieved by selecting the subcontent and using the Powerpoint option Add Animation > Appear (not visible in the Figure A). Each daughter slide corresponds to a 'click' in the mother slide but contains no 'click' itself. The daughter slides can readily be used for Presentain.

(A)



(B)

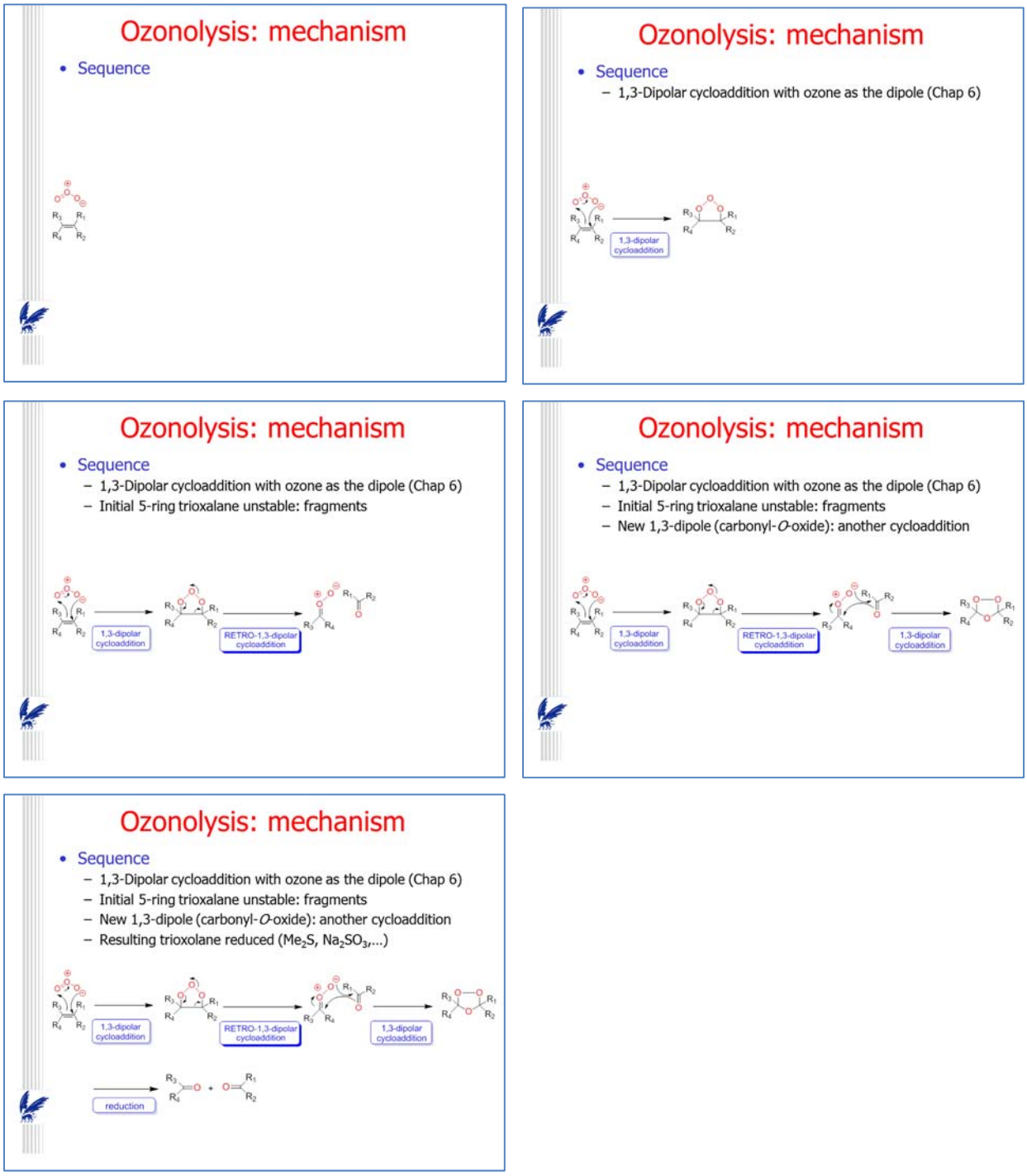
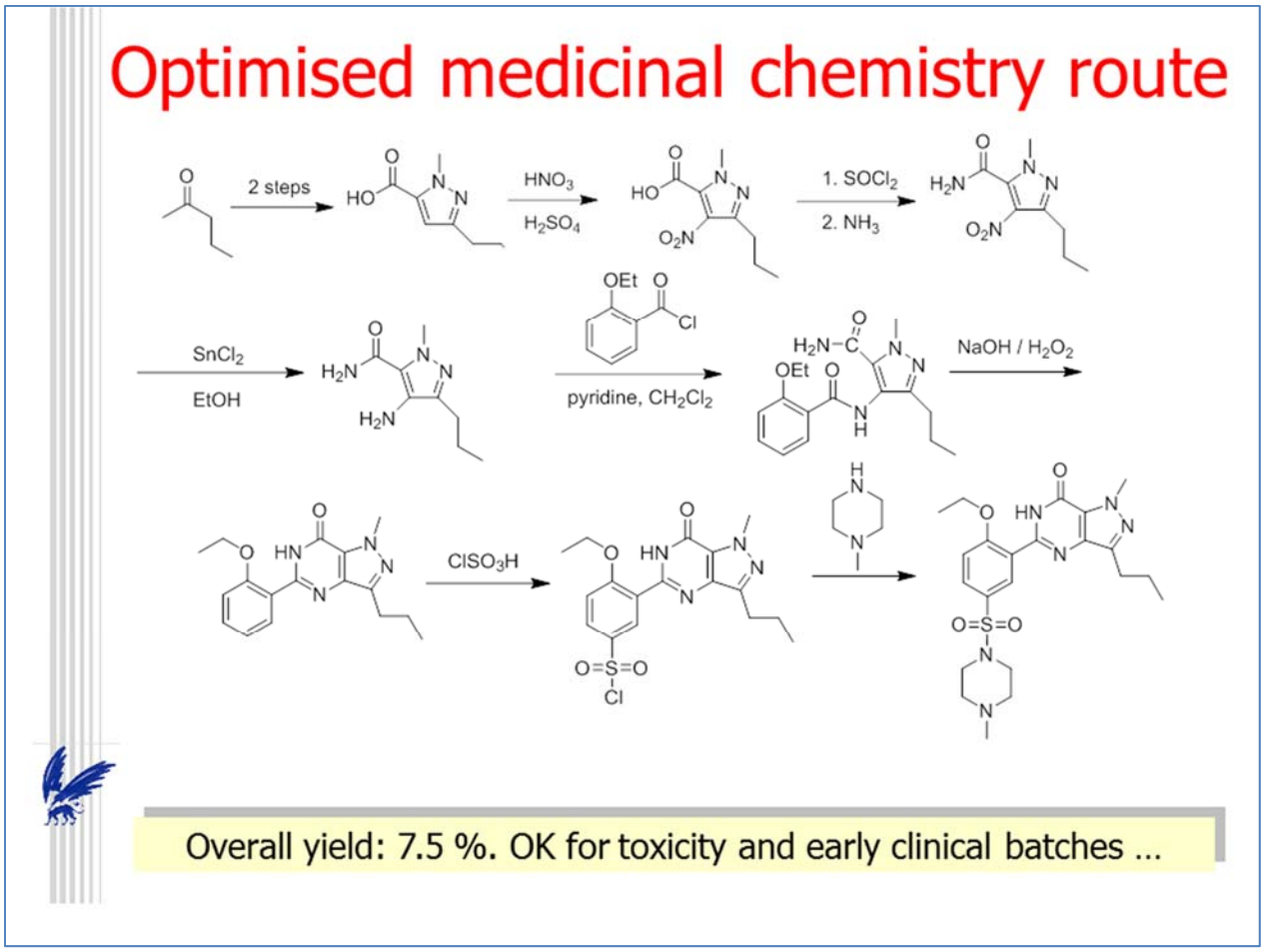
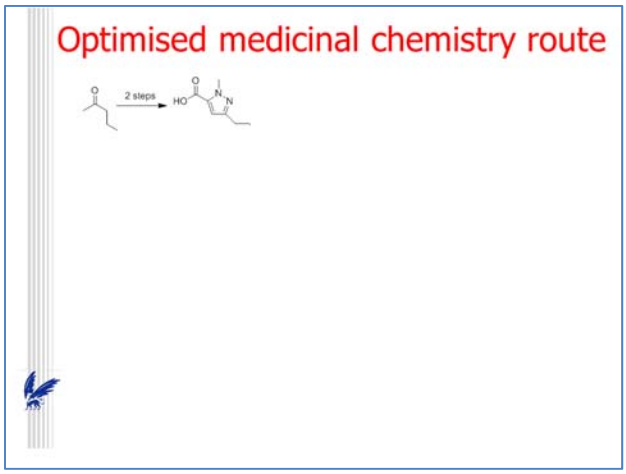


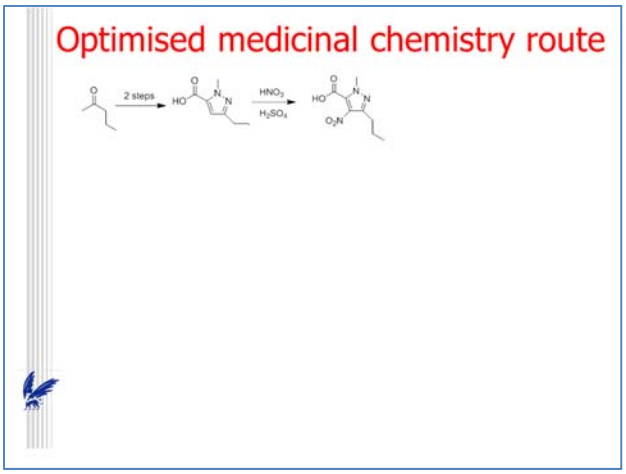
Figure S3: (A) Mother slide showing a chemical reaction mechanism. The contents of the slide were built up using several 'clicks' (not visible in figure). **(B)** Daughter slides after treatment of the mother slide with PPtspliT.

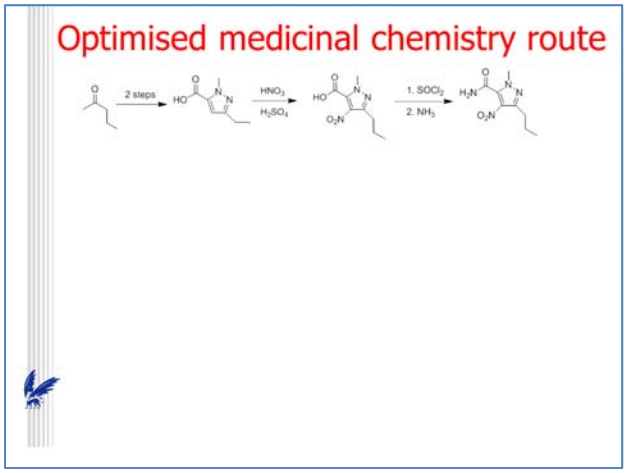
(A)

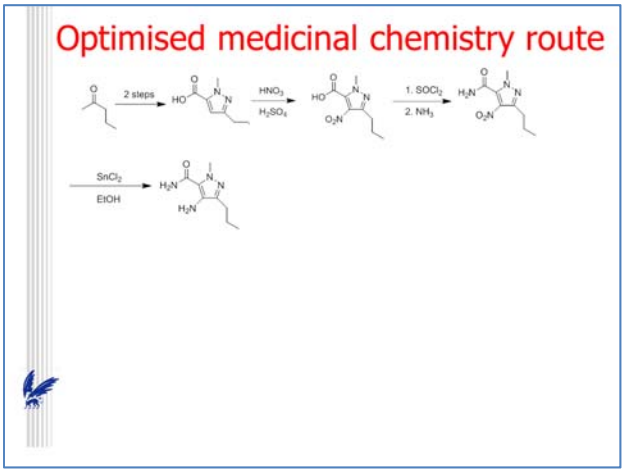

Optimised medicinal chemistry route
2 steps
HNO3
H2SO4
1. SOCl2
2. NH3
SnCl2
EtOH
pyridine, CH2Cl2
NaOH / H2O2
ClSO3H
Overall yield: 7.5 %. OK for toxicity and early clinical batches …

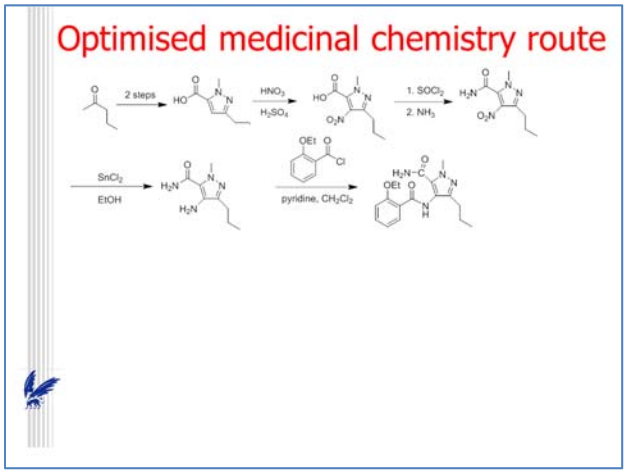
(B)

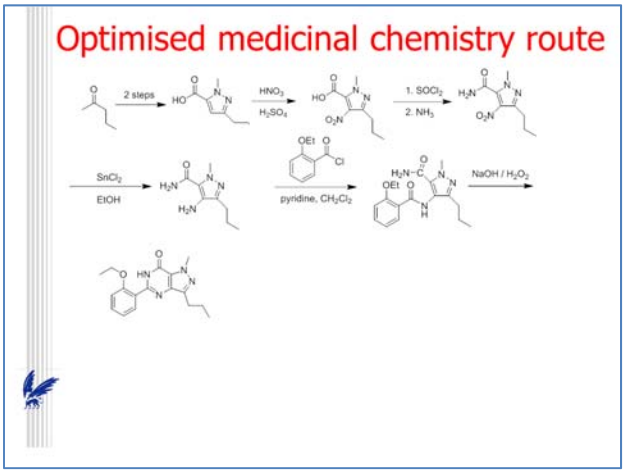

Optimised medicinal chemistry route
2 steps


Optimised medicinal chemistry route
2 steps
HNO3
H2SO4


Optimised medicinal chemistry route
2 steps
HNO3
H2SO4
1. SOCl2
2. NH3


Optimised medicinal chemistry route
2 steps
HNO3
H2SO4
1. SOCl2
2. NH3
SnCl2
EtOH


Optimised medicinal chemistry route
2 steps
HNO3
H2SO4
1. SOCl2
2. NH3
SnCl2
EtOH
pyridine, CH2Cl2


Optimised medicinal chemistry route
2 steps
HNO3
H2SO4
1. SOCl2
2. NH3
SnCl2
EtOH
pyridine, CH2Cl2
NaOH / H2O2

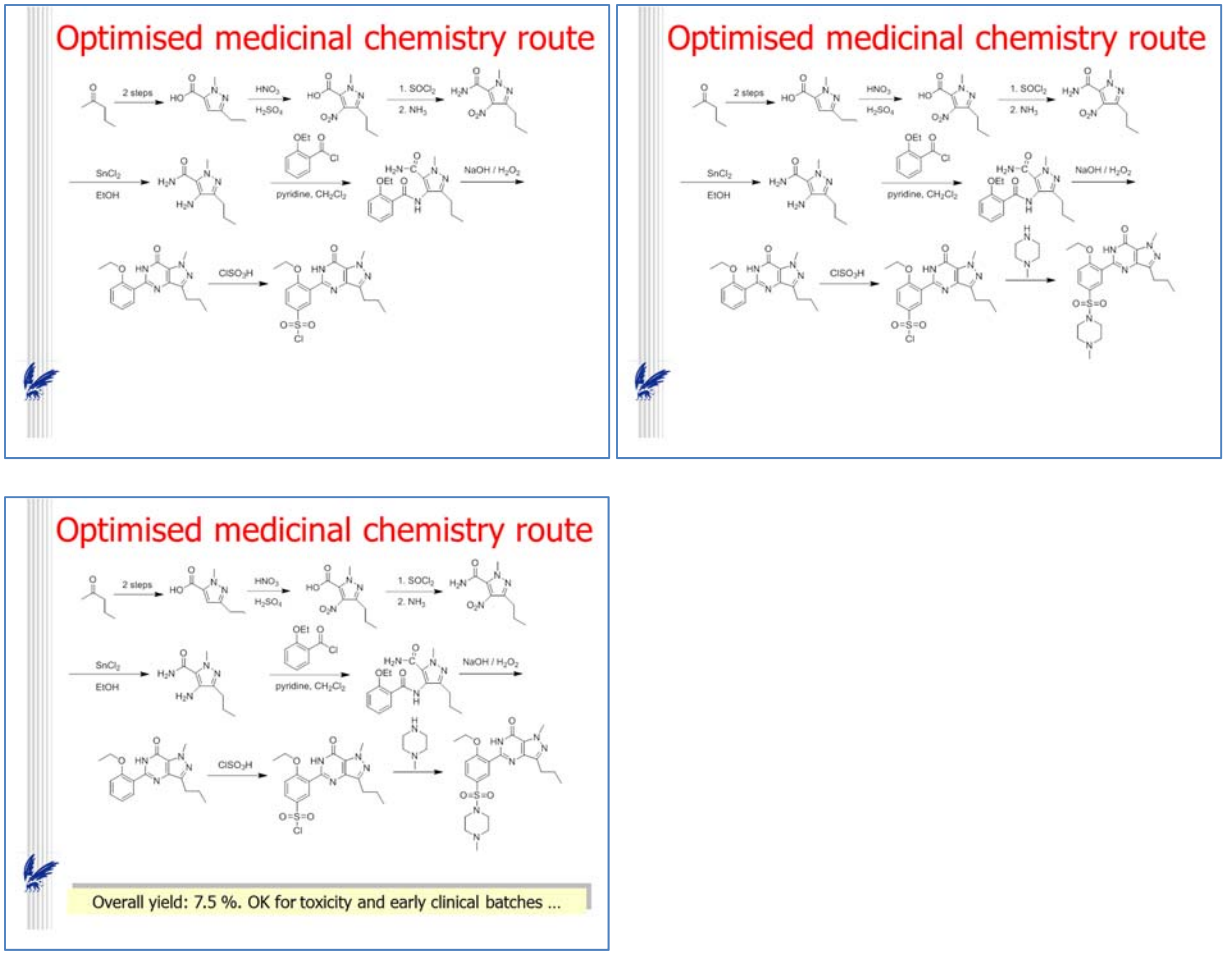


Figure S4: (A) Mother slide showing a chemical synthesis sequence. The contents of the slide were built up using several 'clicks' (not visible in figure). **(B)** Daughter slides after treatment of the mother slide with PPtspliT.

(A)

100.0 mL 0.0500 M $Pb(NO_3)_2$ + 200.0 mL 0.100 M NaI

$PbI_2(s) \rightleftharpoons Pb^{2+}(aq) + 2I^-(aq)$

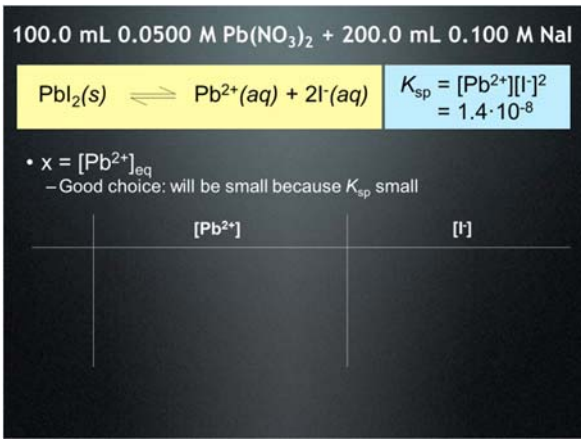
$K_{sp} = [Pb^{2+}][I^-]^2 = 1.4 \cdot 10^{-8}$

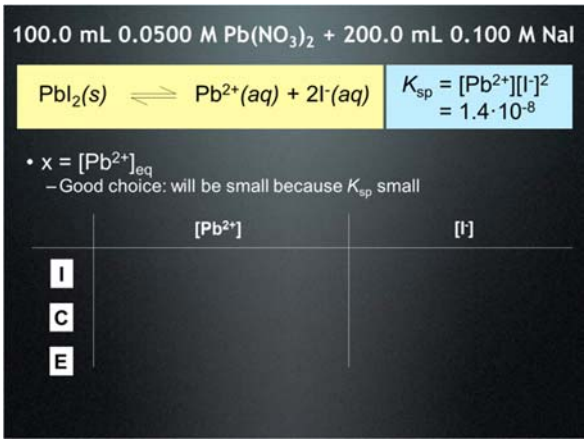
- $x = [Pb^{2+}]_{eq}$
  - Good choice: will be small because K_{sp} small

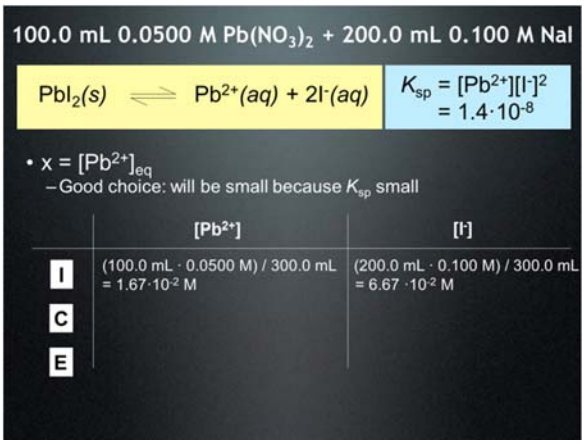
	$[Pb^{2+}]$	$[I^-]$
I	(100.0 mL · 0.0500 M) / 300.0 mL = $1.67 \cdot 10^{-2}$ M	(200.0 mL · 0.100 M) / 300.0 mL = $6.67 \cdot 10^{-2}$ M
C	$= -(1.67 \cdot 10^{-2} - x)$ M	$= -2(1.67 \cdot 10^{-2} - x)$ M
E	= x M	$= 6.67 \cdot 10^{-2} - 2(1.67 \cdot 10^{-2} - x)$ M

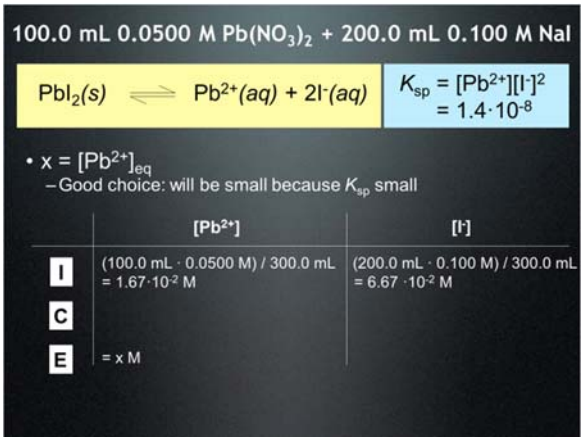
$[Pb^{2+}]_{eq} = x$ M $\quad [I^-]_{eq} = 6.67 \cdot 10^{-2} - 2(1.67 \cdot 10^{-2} - x)$ M

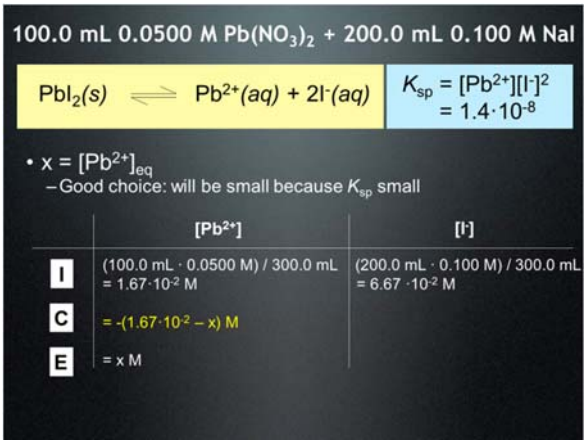
(B)

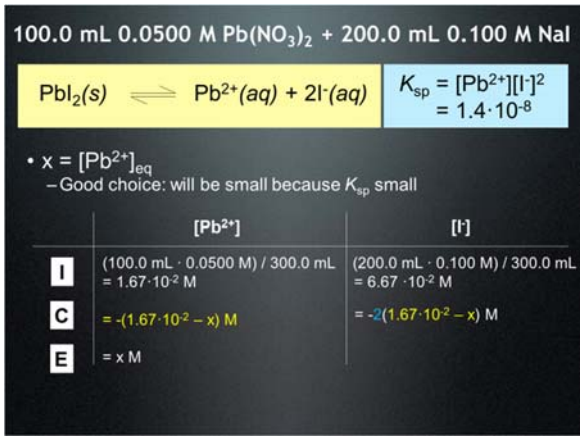

100.0 mL 0.0500 M $Pb(NO_3)_2$ + 200.0 mL 0.100 M NaI
$PbI_2(s) \rightleftharpoons Pb^{2+}(aq) + 2I^-(aq)$
$K_{sp} = [Pb^{2+}][I^-]^2 = 1.4 \cdot 10^{-8}$
• $x = [Pb^{2+}]_{eq}$
– Good choice: will be small because K_{sp} small
$[Pb^{2+}]$
$[I^-]$
I
C
E


100.0 mL 0.0500 M $Pb(NO_3)_2$ + 200.0 mL 0.100 M NaI
$PbI_2(s) \rightleftharpoons Pb^{2+}(aq) + 2I^-(aq)$
$K_{sp} = [Pb^{2+}][I^-]^2 = 1.4 \cdot 10^{-8}$
• $x = [Pb^{2+}]_{eq}$
– Good choice: will be small because K_{sp} small
$[Pb^{2+}]$
$[I^-]$
I
C
E


100.0 mL 0.0500 M $Pb(NO_3)_2$ + 200.0 mL 0.100 M NaI
$PbI_2(s) \rightleftharpoons Pb^{2+}(aq) + 2I^-(aq)$
$K_{sp} = [Pb^{2+}][I^-]^2 = 1.4 \cdot 10^{-8}$
• $x = [Pb^{2+}]_{eq}$
– Good choice: will be small because K_{sp} small
$[Pb^{2+}]$
$[I^-]$
I
(100.0 mL · 0.0500 M) / 300.0 mL = $1.67 \cdot 10^{-2}$ M
(200.0 mL · 0.100 M) / 300.0 mL = $6.67 \cdot 10^{-2}$ M
C
E


100.0 mL 0.0500 M $Pb(NO_3)_2$ + 200.0 mL 0.100 M NaI
$PbI_2(s) \rightleftharpoons Pb^{2+}(aq) + 2I^-(aq)$
$K_{sp} = [Pb^{2+}][I^-]^2 = 1.4 \cdot 10^{-8}$
• $x = [Pb^{2+}]_{eq}$
– Good choice: will be small because K_{sp} small
$[Pb^{2+}]$
$[I^-]$
I
(100.0 mL · 0.0500 M) / 300.0 mL = $1.67 \cdot 10^{-2}$ M
(200.0 mL · 0.100 M) / 300.0 mL = $6.67 \cdot 10^{-2}$ M
C
E
= x M


100.0 mL 0.0500 M $Pb(NO_3)_2$ + 200.0 mL 0.100 M NaI
$PbI_2(s) \rightleftharpoons Pb^{2+}(aq) + 2I^-(aq)$
$K_{sp} = [Pb^{2+}][I^-]^2 = 1.4 \cdot 10^{-8}$
• $x = [Pb^{2+}]_{eq}$
– Good choice: will be small because K_{sp} small
$[Pb^{2+}]$
$[I^-]$
I
(100.0 mL · 0.0500 M) / 300.0 mL = $1.67 \cdot 10^{-2}$ M
(200.0 mL · 0.100 M) / 300.0 mL = $6.67 \cdot 10^{-2}$ M
C
= -(1.67·10-2 – x) M
E
= x M


100.0 mL 0.0500 M $Pb(NO_3)_2$ + 200.0 mL 0.100 M NaI
$PbI_2(s) \rightleftharpoons Pb^{2+}(aq) + 2I^-(aq)$
$K_{sp} = [Pb^{2+}][I^-]^2 = 1.4 \cdot 10^{-8}$
• $x = [Pb^{2+}]_{eq}$
– Good choice: will be small because K_{sp} small
$[Pb^{2+}]$
$[I^-]$
I
(100.0 mL · 0.0500 M) / 300.0 mL = $1.67 \cdot 10^{-2}$ M
(200.0 mL · 0.100 M) / 300.0 mL = $6.67 \cdot 10^{-2}$ M
C
= -(1.67·10-2 – x) M
= -2(1.67·10-2 – x) M
E
= x M

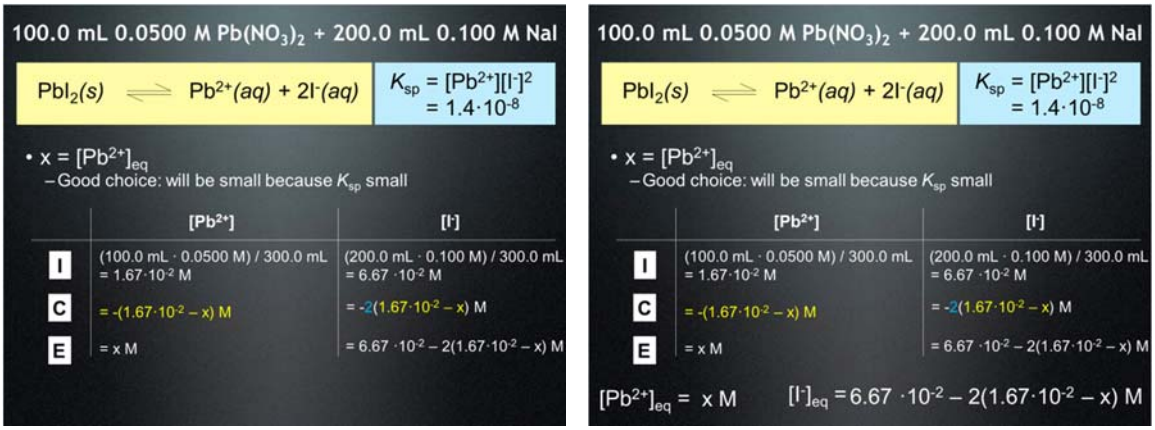


Figure S5: (A) Mother slide showing part of a chemistry calculation. The contents of the slide were built up using several 'clicks' (not visible in figure). Slides were translated from Dutch to English for the current paper. **(B)** Daughter slides after treatment of the mother slide with PPtspliT.

4. Practical tips for the recording process in a lecture hall

For fellow teachers several tips for the recording process are offered:

- Start the loading of the presentation on the plenary screen in the class room ahead of time, as this may take a while depending on the speed of the internet connection and on the size of the presentation

- Turn off all buzzer alerts (incoming calls, e-mails, etc.) on the smartphone as these alert sounds and phone vibrations will be recorded as well. For an iPhone and most Android-based smartphones this involves turning on Airplane Mode and then turning WiFi back on

- Extend auto-lock time on the smartphone or turn it off

- Extend the sleeping time of the projector computer to more than the time of the presentation. This serves to prevent the projector computer from going to sleep as a result of lack of mouse/keyboard activity, which would not harm the lecture per se but would require the teacher to briefly move the mouse to wake the projector computer

- Remove the top and bottom bars in the Presentain website viewing mode (the Presentain web interface shows the tool symbols for this)

- Do not worry about walking around: the audio quality will be consistent because the microphone is in the teacher's hand

5. Exemplary MediaSite slidecast

Below, we provide a link to a partial MediaSite slidecast obtained through application of the workflows from our paper. That is, it was recorded by one of us (MW) with a smartphone and Presentain, then converted to MediaSite and finally edited in (My)MediaSite (e.g. cropping). The slidecast was not a teaching lecture but involved a lecture about the work described in the current paper. The overall slidecast contained more slides/audio but for the current occasion it was cut to smaller parts.

Topic: Lecture about the progress made in our work

Location: Another university in The Netherlands

Date: Feb 2015

Speaker: Maikel Wijtmans

Duration: 7.13 min

Link: http://av-media.vu.nl/VUMedia/Play/0ad84257b80e4e7ebd3670e46e6ebda31d

6. Short video of a teacher using the pointer/smartphone combination

Below, we provide a link to a video of one of us (DS) teaching a class with Presentain and students present. While this particular video and sound themselves were recorded with a normal camera a few meters away from the speaker, the video primarily serves to illustrate the dynamic nature of the Presentain-based recording process with the teacher carrying the smartphone in the right hand (for Presentain) and the laser pointer in the left hand. A short segment of the whole class is shown.

Topic: Relationship between pharmacology and molecular modeling

Date*:* June 2015

Location: VU University Amsterdam

Duration: 2.47 min

Speaker: Danny Scholten

Slides: Dutch

Audio: Dutch

Link: https://video.vu.nl/media/Example+use+of+Presentain/1_3qaxj6se

Notes:

- Clearly visible on the projector screen is the buildup of the slide content for better clarity in the resulting slidecast.
- The microphone worn around the neck of the teacher is for a present student with impaired hearing and is not related to the Presentain recording setup.

7. Evaluations/strong points/limitations

Teacher evaluation

A consensus opinion was gathered from five teachers involved in our activities in the academic year 2014-2015. The time needed to prepare the lectures in advance according to the workflows shown in Figure 1 of the Main Text was not deemed a major drawback, although teachers used to last-minute work had to adapt accordingly. Some teachers had to overcome initial hesitations to record themselves, but the ability to record any class at any time and in any room with unlimited physical mobility of the teacher within the room was confirmed to be a highly attractive asset of the method. The use of two hands (one for the smartphone and one for the laser pointer) was something to get used to, but most teachers quickly adapted to this as we have wished to illustrate by inclusion in this Appendix of a short video of one of us (DS) using the pointer/phone combination during an actual class recording (*vide supra*). Unfortunately, during the exploratory work of the five teachers the IT infrastructure in some rooms was an occasional yet significant culprit. The most notable pitfalls in the lecture rooms included the presence of projector computers that were less stable in performance and/or problems in WiFi internet connections, affecting one pilot course in particular (*vide infra*). While this was frustrating at times, it is important to note that this is not a downside of just the current approach, but of any e-learning approach that relies on WiFi, and that with ever increasing IT capacity this problem should decrease. In all, the recordings, when properly exercised, gave technically high-quality slidecasts and very good audio of consistent nature. The protocols developed by us enabled the successful transferring of all Presentain slidecasts to (My)MediaSite for further editing, distribution, etc.

Student evaluation

A total of 82 responses from students was collected from three voluntary evaluations using the Likert scale (1 - lowest to 5 – highest, Table S1). Evaluated courses involved two freshmen courses (A and C) and an advanced master-level course (B), all of different topics and at different times in the academic year. The evaluations refer to the final MediaSite slidecasts that were distributed to students (often edited in MyMediaSite by the teacher prior to distribution). It is evident that the audio quality and synchronization of slides/audio in the produced slidecasts were judged positively. Due to a variety of circumstances, course B was plagued by several IT issues not related to Presentain itself. For example, in one lecture of course B significant IT issues forced us to keep the smartphone at a greater distance from the lecturer than usual, resulting in suboptimal audio. It is speculated that this is the reason for the somewhat lower but still acceptable score for audio quality (3.7) in course B compared to courses A and C which did not suffer much from IT issues (both 4.1). Nonetheless, also for course B the synchronization quality scored well (4.3 versus 4.1 for both

courses A and C). In written feedback (not shown), the overall tone was also very positive but a few students remarked that the laser pointer is not visible (as explained in the main text this is a consequence of many recording techniques, not just ours) and that not all questions could be heard properly (repeating of the question or answer by the teacher should fix this). In all, the evaluation results encouragingly proved that the slidecasts recorded anywhere with properly working IT were technically satisfactory from the student perspective. In fact, except for the 3.7, the two questions for the three courses scored similar to a course (not shown) in which the MediaSite slidecasts were recorded using the more elaborate combination of a MediaSite screen capture recorder combined with a separate microphone (only available at the large lecture halls at our university).

Table S1: **Key technical evaluations of the MediaSite slidecasts in three courses.**

Course [a]	Evaluation statement [b]	Average [c]	% Agree [d]	% Disagree [e]	n [f]
A	1. The audio quality of the slidecasts was sufficient	4.1	82 %	0 %	33
	2. The slidecast could be followed well in terms of synchronization of audio and image (slide)	4.1	85 %	0 %	33
B	1. The audio quality of the slidecasts was sufficient	3.7	70 %	15 %	27
	2. The slidecasts were easy to follow (for example, slide/audio synchronization)	4.3	96 %	0 %	27
C	1. The audio quality of the slidecasts was sufficient	4.1	91 %	0 %	22
	2. The slidecasts could be followed well (for example, in terms of audio/slide synchronization)	4.1	91 %	0 %	22

[a]**A**: First-year bachelor general chemistry course (Sept-Oct 2015). **B**: First-year master molecular pharmacology course (Nov-Dec 2014). **C**: Process chemistry module of a first-year bachelor medicinal chemistry course (March 2015). For courses A and C, evaluation statements were translated from Dutch (as offered to students) to English for the current paper.

[b]Evaluations were performed electronically with GoSoapBox software (Wijtmans 2014) by posing a statement to the students with which they could (dis)agree through scoring (Likert scale).

[c]The evaluation scoring contained the following options: 5=Fully agree, 4=Agree, 3=Neutral, 2=Disagree, 1=Fully disagree.

[d]The '% agree' is defined by: (amount of '5' and '4' answers/total amount of answers) * 100%.

[e]The '% disagree' is defined by: (amount of '2' and '1' answers/total amount of answers) * 100%.

[f]Number of respondents. The evaluations were held on a voluntary basis and not all students were present during evaluations. Only students that had actually watched slidecasts in preparation of their exams were asked to answer.

8. Exemplary XML file

Below, the contents of an exemplary XML file for a 45-min class is given. Occasional flipping back and forth between slides can be seen (for example: slide number 22/23 and 31/32/33/34).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