UiT The Arctic University of Norway

The Department of Clinical Dentistry (IKO)

Digital learning application for clinical dentistry – a pilot study

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Abstract

Background: Microlearning is a growing trend in education which can have a positive effect on learning motivation and outcome. In health education, it has been shown to increase student knowledge and confidence in clinical procedures. Little research has been done on implementing digital learning solutions specifically aimed for clinical dental studies. Unifractal is an existing digital learning platform on which students and supervisors can easily create and share learning content.
Objective: In the present pilot study, we cooperated with Unifractal to develop and test the value of implementing such a tool in dental education.
Methods: Content, based mainly on clinical instruments, for the application was made by two fourth year dental students. It was tested by third year dental students at the simulation clinic at The Arctic University of Norway – UiT. Also, a questionnaire survey was developed to evaluate user experience. Here, students and supervisors participated.
Results: The survey analysis showed that students appreciated the content provided and experienced the application as a potentially useful learning tool. However, the use of the application seemed to be limited by the relatively sparse amount of content available.
Conclusion: This study shows that a digital learning platform, such as Unifractal, holds the potential to be an important and useful digital learning tool for dental students. However, more content needs to be developed in cooperation with students and supervisors to reach a satisfactory level of usefulness.

Keywords: digital learning, microlearning, dental studies, health care education

1. Introduction

1.1 Background

The study "A Study of the Effects of Digital Learning on Learning Motivation and Learning Outcome" found that the effects regarding motivation to learn when using digital learning was better compared to traditional methods (Lin & Chen, 2017). In addition, the use of digital learning tools showed better positive effects on learning than traditional teaching (Lin & Chen, 2017). A positive relationship between learning motivation and learning outcome was found. Hence, implementing digital learning in dental education should not only boost the students' motivation to learn, but also provide better results in exams overall.

The term "digitalization" can be defined as the implementation of computers and information technologies to improve processes (Bloomberg, 2018). Digitalization in learning is a multifaceted process, which can be developed in relation to smart phones. Ownership of smart phones among students is growing, as is the use of smartphones for learning (Chen, Seilhamer, Bennett, & Bauer, 2015). A systematic review indicated that the use of mobile devices for learning led to increased student learning (Crompton & Burke, 2018).

Digitalization in higher education is usually understood as implementing digital learning platforms, digital lectures or microlearning. Microlearning is a concept that has been described as overlapping well with mobile learning (Hug, 2010). Here, learning can be achieved through short bursts of information (e.g., in the form of concise videos). It is a growing trend globally. A study on the trend of microlearning found that "microlearning is a relevantly new and emerging global topic involving authors, affiliations and funding sponsors from different countries" (Leong, Sung, Au, & Blanchard, 2020). They also noted that "higher education was the most frequently mentioned education level in the identified publications" (Leong et al., 2020). Students report microlearning being a highly satisfying form of learning, increasing both confidence and motivation to learn (Shatte & Teague, 2020). Educational outcomes improved and students were more engaged in learning with microlearning (Shatte & Teague, 2020). In health education microlearning has been shown to increase knowledge and confidence among students regarding educational results, retaining knowledge and clinical procedures and may lead to a safer clinical environment (Dahiya & Bernard, 2021; De Gagne et al., 2019; Fagerstrøm, Gulliksen, & Grønli, 2017).

Today, virtually every student has access to a smart phone device. A microlearning tool in odontology studies could capitalize on this and lead to better learning and retaining of knowledge. However, research studies that report digital solutions aimed specifically at dental studies are scarce. Two studies found that the use of digital supplements in the form of podcasts during the first-year dental students provided a clear benefit in the form of improved student performance (S. Kalludi, Punja, Rao, & Dhar, 2015; S. N. Kalludi, Punja, Pai, & Dhar, 2013).

At the Department of Clinical Dentistry, UiT – The Arctic University of Norway, the 5-year program starts off with two years of preclinical studies, consisting of basic biomedical subjects such as introduction to 1. medical and dental studies, 2. digestion, metabolism, and nutrition, 3. respiration, circulation, and kidney function, 4. genes, cell proliferation and cancer and finally introduction to clinical odontology (UiT, 2022). The second year gives an introduction as to how oral health and general health affect each other.

The last three years focus on clinical dentistry. During the 5th semester, clinical education takes place using models at the simulation clinic. This is also where the students get basic knowledge of dental biomaterials and practical skills training. Introduction to patient treatment starts in the 6th semester. Prophylaxis and basic dental care with therapeutic treatment are the main emphasis this semester. During the 7th semester all students have external practice for 4 months at public dental clinics all over Norway. During this semester, the focus is training in preventive evidence-based approach with holistic, patient-centered care. When they reach the 8th semester the students continue practice-oriented theoretical education combined with clinical education at the University dental clinic. The 9th semester focuses on dental treatment of all age groups with more complex cases. During the 10th and last semester, the students have a new, 2-month period of external practice. Additionally, they are required to write their master's thesis before taking their finishing exams (Fig.1) (UiT, 2020).

Year	Semester	Subject			
1	1	Examen philosophicum (10)	Odontology 1st year (50)		
	2				
2	3	Biomedicine 1 and the scientific method (30)			
	4	Biomedicine 2 (15)		Oral anatomy (15)	
3	5	Propaedeutics 1. 2. and 3. (15)		Dental biomaterials (10)	Oral ecology (10)
	6	Clinical odontology 1 (20)			Social odontology
4	7	External practice 1 (30)			
	8	Clinical odontology 2a + 2b (30)	Orthodontics/pedodontics (15)	Radiology (10)	
5	9			Master's thesis (20)	
	10		External practice 2 (15)		

Figure 1: Self-made translated schematic overview of course progression based on UiT's Norwegian version

The third-year dental students at UiT are new to the clinical aspects of dentistry. Most of the students' basic practical knowledge is attained at the simulation clinic during the third year. Each class has 30-40 students and 5-6 responsible course supervisors. Students are usually divided into groups of 7-8 students per supervisor. The students, especially in the initial stages of the course, require a significant amount of supervisor guidance regarding different instruments and procedures. From our own and our common students' experience, this could lead to significant waits to get instructions on, in hindsight, simple questions. With the possibility to link reading materials and informational videos to each instrument and procedure, students could get as much or as little guidance as they feel the need for without long waits.

Supervisors are only available for a set amount of time each day, which limits their supervision to this period. It is common that the supervisors answer the same questions repeatedly to different students and every year. If commonly asked questions and routine demonstrations were answered and showed in the Unifractal application, it could free up time for the supervisors to better follow up students who have a tough time understanding. It is reasonable to think that a tool like this has the possibility to help the weakest students or students with some form of absence from the physical lectures by giving them the possibility to study more at home to catch up some lost time in the classes.

There are some obvious advantages with implementing mobile technology such as microlearning in the simulation clinic. At present, the dental students of UiT do not have any specific digital tool to learn clinical skills apart from when they are attending the simulation classes. Mobile technologies play a key role in students' lives. Microlearning on their mobile phones could help with learning substantial amounts of theory at home or any other place (Evans, 2008; Morar, Muntean, & Tomai, 2010) such that the time spent at the university could be used more efficiently learning practical skills. Additionally, the learning experience

from mobile-based microlearning is perceived as satisfying among students (Nikou & Economides, 2018).

To address these issues, Unifractal, an existing digital platform, was developed and trialed as a dental learning tool.

1.2 Unifractal – a digital platform for learning

According to Unifractal themselves, "Unifractal is a tool for learning that lets you scan equipment and present relevant videos and instructions created by your peers and people you trust" (Unifractal, n.d.-c). This can be achieved by using a smartphone or tablet camera. In the application it is possible to access relevant tutorials or simple how-to guides made by professionals, supervisors or even students.

Unifractal's pilot project in cooperation with UiT - The Arctic University of Tromsø and the University of Agder, was regarding music technology studies at both universities. With the help of the Unifractal application the teachers claimed that students no longer had to depend on help as often as before. Examples for this were observed when setting up various kinds of studio equipment for recording or when encountering unknown errors (Unifractal, n.d.-b).

Unifractal has also been utilized in training staff at the University Hospital of Northern Norway (UNN) at the intensive care unit (OPIN). In the hospital, staff members may be relocated urgently to other facilities if necessary. This requires the staff to familiarize themselves quickly with new kinds of equipment, how to adjust the settings and how to take care of it. The Unifractal mobile phone application was used to train fresh staff and as a tool for quick review of medical equipment and positive outcomes have been reported (Unifractal, n.d.-a).

Dental students encounter many different instruments during the clinical part of their studies. These instruments can both look similar and have similar use cases, which can lead to confusion and insecurities in the clinical aspect of the studies. A precise and easily accessible compendium of the different instruments could be both time saving and help make the students' clinical courses easier.

1.3 Hypothesis/research question

Unifractal reports positive feedback from the OPIN-clinic (Unifractal, n.d.-a). Here they deal with various kinds of advanced medical equipment. Throughout dental studies students also deal with various kinds of advanced medical equipment. However, there are differences in both the size and use cases of the equipment.

Can Unifractal be a suitable platform for developing a digital learning tool for dental studies?

1.4 Aims:

The overall aim of the study is to establish a digital platform for learning for dentals students in Norway to help make their work easier and keep the dental studies up to date in this time of rapid technological advancements.

The specific aims of this study are:

- Make content for 3rd year dental students in a digital learning application using the Unifractal platform
- Introduce the pilot application/platform to the 3rd year simulation clinic course
- Perform a questionnaire survey of students and supervisors at the simulation clinic course regarding the pilot application

2. Material and Methods

2.1 Developing the digital content

In collaboration with Unifractal, two fourth year dental students were assigned the task of making introduction and instructional videos for several types of dental equipment for a proof-of-concept type of project. The videos were designed to be used as a digital tool to help introduce different procedures and instruments, especially aimed for the third-year dental students.

The two fourth year dental students were given access to the Unifractal application and made a total of 32 items in it. Each item was given a thumbnail, a brief explanation in text and at least one short video which introduced an instrument or a piece of equipment. Some of the items were given up to four videos which, for example, explained how to use a Gracey curette

in relation to the treatment of periodontal disease or how to assemble a matrix used in approximal filling therapy. The dental fields which were briefly covered by these videos were simple procedures in cariology and periodontology and some practical procedures like how to mount the dental handpiece and turbine to the dental unit or how to take care of the equipment after use.

All the videos were made with the help of an iPhone XS Max with a 12-megapixel camera and a connected BOYA BY-M2 Lavalier microphone. One student filmed while the other introduced the item or procedure. The students switched roles regularly. Both students focused on the fields they were the most knowledgeable in. This was done to achieve the best possible quality of the videos and the most accurate description of each instrument. The students cooperated to spot any errors that could have occurred and were cautious not to say anything that was in violation of the guidelines provided at the simulation clinic.

The items added to the odontology location in the Unifractal application were selected based on feedback from the previous third-year students, wishes from the professor responsible for the simulation clinic, and the content creators' own experiences from the third year. In addition to this, several different odontological disciplines were included to diversify and explore how the various subjects would fit in this new learning format. The subject which receives the most positive feedback from supervisors is periodontics.

After the items were made, the Unifractal team went to the simulation clinic and introduced the application to the dental students. Each student was given an account and free access to all the application's content which was accessible from their smart phone.

2.2 Questionnaire survey

To evaluate the application's reception a questionnaire was made with the help of Google forms (Google, 2022). To begin with, all participants were asked to enter an email address. This was to make sure there were no double entries or single people trying to manipulate the results of the survey. All the questions had fixed premade alternatives apart from one which had the option to reply with free text. The questionnaire was written in Norwegian and split into two separate parts. The Norwegian questionnaire is provided in the appendix. In short, the flow of questions was designed as described below:

All students got the same description of the Unifractal application: “Unifractal is a digital learning tool where both fellow students and professors/supervisors can make content to aid learning at the simulation clinic/at the clinic. This could, for example, be short videos about how to use the various kinds of burs or instruments used in the treatment of periodontal disease.”

The first question was “Are you aware of the Unifractal application?” Based on whether the participants answered “Yes” or “No” they were sent to different parts of the questionnaire. If they answered “No” they would get the following questions: “Do you think you would have used the application if you were aware of its existence?” with the options “Yes” or “No” and “What would you prefer: content made by fellow students or content made by the professors/supervisors?” with the choice between “Fellow students,” “Professors/supervisors” or “No preference.”

If the answer to the first question was “Yes” the next question was “How often did you use the Unifractal application as a tool at the simulation clinic?” with five choices: “Multiple times a day,” “Every day,” “Every week,” “Every month” or “Did not use it.”

This question was followed by the statement: “Unifractal was a useful tool” and the following choices: “Completely agree,” “Somewhat agree,” “Neither agree nor disagree,” “Somewhat disagree” or “Completely disagree.”

The next question was “I would have used the application more often if there was more/different content in the application” with the choices “Completely agree,” “Somewhat agree,” “Neither agree nor disagree,” “Somewhat disagree” or “Completely disagree.”

This was followed by the question “What type of content would you like to see in the application/would you find helpful in the application?” When answering this question, it was possible to check multiple boxes and/or they could write their own alternative as a free text reply. The choices were “Cariology,” “Periodontology,” “Endodontics,” “Prosthodontics,” “Dental surgery,” “I don’t think the application has any kind of utility value” and “Other” where it was possible to enter their own thoughts. The proposed choices covered the odontological disciplines the students meet during the simulation clinic course.

Finally, they were asked “What do you prefer: content made by fellow students or content made by professors/supervisors?” with the choices “Fellow students,” “Professors/supervisors” or “No preference.”

At first, a request was published in the third-year students’ online class group. However, too few students replied to reach satisfactory conclusions about the group opinions. To get more replies, each third-year student was contacted by direct messages, both by social media and by email. This led to an acceptable response percentage. A few duplicate answers (i.e., more than one answer from the same email) were discovered. The duplicates were deleted before analyzing the data.

Supervisors were invited to reply to a different questionnaire. All respondents got a description of the Unifractal application (identical to the one in the students’ questionnaire). Like the students' survey the supervisors got different sets of questions based on their answer to “Are you aware of the Unifractal application?” There were two choices: “Yes” or “No.”

If they answered “No” they would get the following questions: “Do you believe you would have used the Unifractal application in student counselling/as a supplement to the education based on the description?” with the choices “Yes,” “No” or “I don’t know” and “What kind of content do you believe could be useful for the students?” The last question had six different proposed answers and a possibility to reply with their own ideas. It was possible to choose multiple answers. The proposed choices were as follows: “Cariology,” “Periodontology,” “Endodontics,” “Prosthodontics,” “Dental surgery,” “I don’t think the application has any kind of utility value” and “Other” as a free text option. These proposed choices covered the odontological disciplines the students meet during the simulation clinic course.

If the supervisors answered “Yes” on the first question they were asked “Are you aware that the students had access to the Unifractal application during their time at the simulation clinic?” with the choices “Yes” or “No.”

This question was followed by “How often did you use the Unifractal application for student counselling/as a supplement to the standard teaching of the third-year dental students at the simulation clinic?” with the choices “Multiple times a day,” “Daily,” “Weekly,” “Monthly” or “Did not use it.”

They were then asked, “How do you respond to the following statement: A tool like the Unifractal application is useful at the simulation clinic?” with the choices “Completely agree,” “Somewhat agree,” “Neither agree nor disagree,” “Somewhat disagree,” “Completely disagree” or “I don’t know.”

The last question was “What kind of content do you believe could be useful for the students?” This question had six different proposed answers and a possibility to reply with their own ideas. The proposed alternatives were the same as for the supervisors who were not aware of the Unifractal application.

3. Results

3.1 Digital content

The following figures are an overview of the main menus in the Unifractal application:

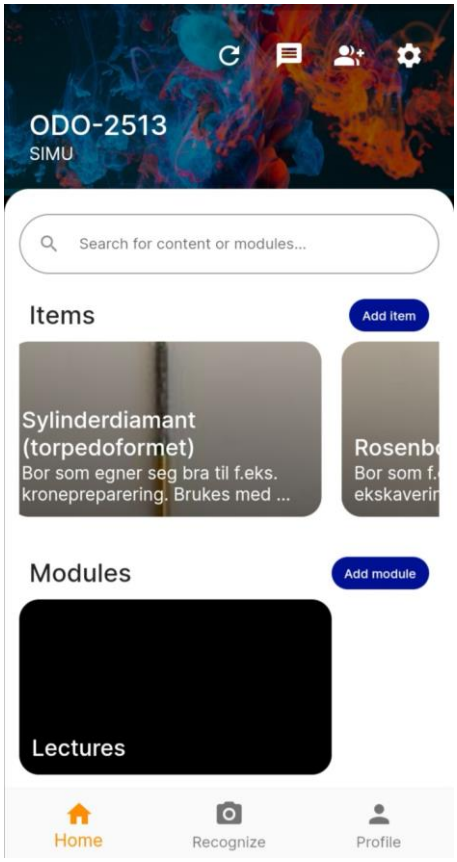

Figure 2: Unifractal application - starting menu

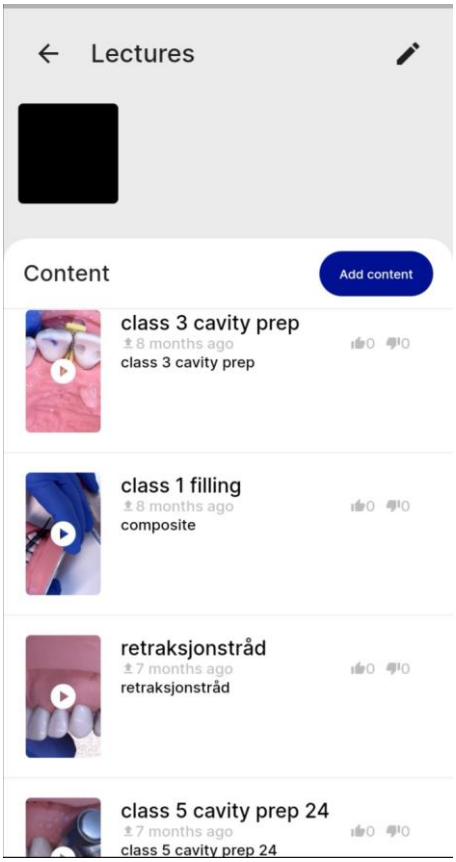

Figure 3: Unifractal application - supervisor made lectures

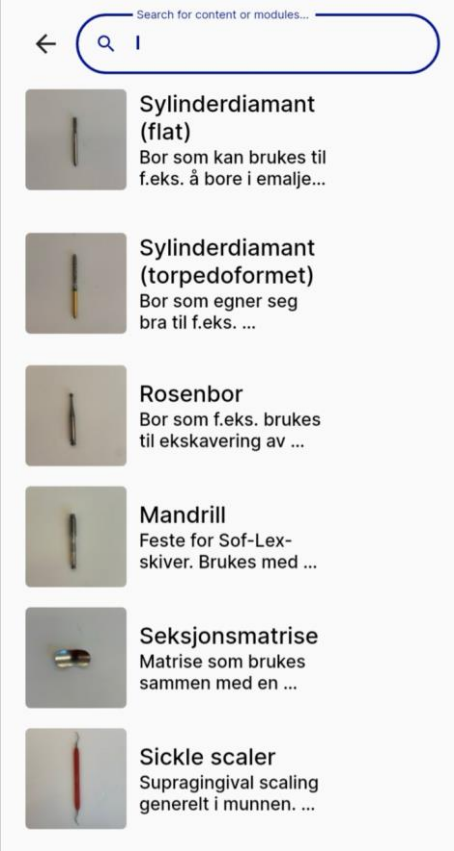

Figure 4: Unifractal application - database all items

The items included in the first test period of the application were as follows (the item information was shortened):

Item	**Thumbnails**	**Item information**	**Video demos**
Articulating paper		Used to check occlusion, for example, on composite fillings	- Demonstration of use
Ball burnisher		Instrument for shaping composite	- Demonstration of use

Ball shaped fine diamond bur		Can be used for crude polish of dental fillings	- Demonstration of use
Ball shaped diamond bur		Bur suited for removing enamel, for example, in fissures.	- Demonstration of use
Burnisher		Instrument for shaping composite	- Demonstration of use
Carver		Can be used for shaping composite	- Demonstration of use
Composite gun		Used to apply composite to a prepared cavity	- Mounting a composite capsule in the composite gun
Composite polisher cup yellow		Can be used for finishing polish of dental fillings	- Demonstration of use
Composite polisher flame yellow		Can be used for finishing polish of dental fillings	- Demonstration of use
Cylindrical diamond bur		Bur suited for removing enamel	- Demonstration of use

FenderWedge		Prevents damage to adjacent teeth.	- Demonstration of use
Football shaped fine diamond bur		Can be used for crude polish of dental fillings	- Demonstration of use
Gingival margin trimmers, mesial and distal	 	Can be used to remove lips of undermined enamel	- Demonstration of use, mesially and distally
Gracey Curette 1-2		Used for subgingival scaling in anterior teeth	- "Anatomy" of the curette - Demonstration of use - Sharpening of the curette
Gracey Curette 7-8		Used for subgingival scaling on buccal and palatal surfaces in posterior teeth	- "Anatomy" of the curette - Demonstration of use - Sharpening of the curette
Gracey Curette 11-12		Used for subgingival scaling on mesial surface in posterior teeth	- "Anatomy" of the curette - Demonstration of use - Sharpening of the curette

Gracey Curette 13-14		Used for subgingival scaling on distal surface in posterior teeth	- "Anatomy" of the curette - Demonstration of use - Sharpening of the curette
High-speed electric hand piece		Hand piece for medium to high-speed drilling	- Mounting of the hand piece
Low-speed electric hand piece		Hand piece for low-speed drilling.	- Mounting of the low-speed hand piece
Mandrel		Used to secure, for example, Sof-Lex discs	- Demonstration of use
Matrix holder		Several types, used for securing and fastening dental matrices. Most common at the university clinic is Nystrøm matrix holder	- Demonstration of use Nystrøm matrix holder nr. 1 - Demonstration of use Nystrom matrix holder nr. 2
Non-curved dental matrices		Can be used if there is insufficient space for a pre-curved matrix	- Mounting in matrix holder - Mounting on tooth
Pre-curved dental matrices		Suitable for achieving tight contacts and natural	- "Anatomy" of the pre-curved matrix - Mounting in matrix holder

		anatomy in approximal fillings	- Mounting on tooth
Rose head bur		Can be used to excavate caries	- Demonstration of use
Sectional matrices	 	Suitable for achieving tight contacts and natural anatomy in approximal fillings	- "Anatomy" of the sectional matrix - Mounting of sectional matrix
Sickle scaler		Can be used for supragingival scaling	- Demonstration of use - "Anatomy" of the sickle scaler - Sharpening of the sickle scaler
Sof-Lex discs		Can be used for polishing fillings. Mounted on mandrels	- Mounting Sof-Lex discs - Demonstration of use
Syntette		Used for subgingival scaling on all tooth surfaces	- "Anatomy" of the syntette - Demonstration of use - Sharpening of the syntette
Torpedo shaped diamond bur		Bur suited for crown preparations	- Demonstration of use

Turbine		Hand piece for high-speed drilling	- Mounting of turbine
Wedge		Can be used with a dental matrix	- Demonstration of use

3.2 Survey analysis

30 of 31 students enrolled in the simulation clinic course replied to the questionnaire. Of them, 29 (96,7%) had heard about the Unifractal application. Among the 29 students who knew about the application 14 (48,3%) did not use Unifractal as a tool at all throughout the course, 13 (44,8%) used it monthly and 2 (6,9%) used it weekly. The 1 student who did not know about the Unifractal application believed he/she would have used it had he/she known about it.

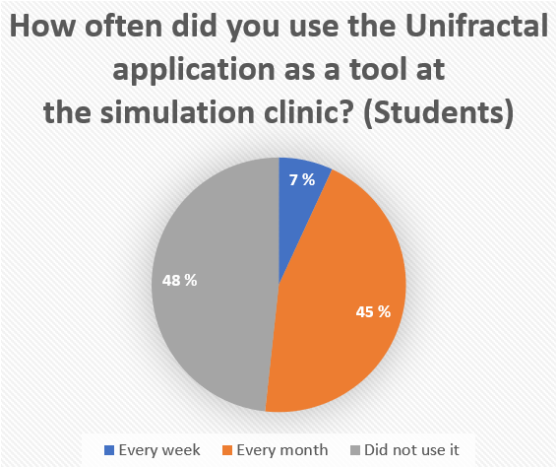

Figure 5: How frequently students used Unifractal

18 (62%) students completely or somewhat agreed with the statement “I would use the Unifractal application more if it had more content”, divided equally (9 and 9) between “Completely agree” and “Somewhat agree”. 11 (38%) had neither agreed nor disagreed with the statement.

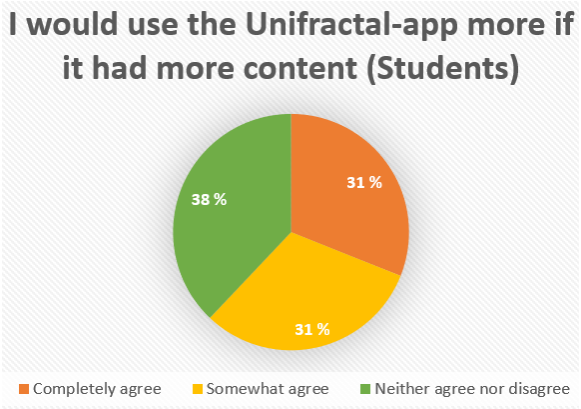

Figure 6: Students' opinions on using Unifractal with more content

The students requested more content on all the proposed odontological topics. Endodontics and cariology were the two most requested topics with respectively 27 (93,1%) and 25 (86,2%) students requesting more content on these topics. Periodontics, prosthodontics, and oral surgery were slightly less requested topics with respectively 22 (75,9%), 19 (65,5%) and 17 (58,6%) students requesting more content on these topics. 1 (3,4%) student requested more content on orthodontics (free text). Additionally, 1 student had replied to the question in free text with (translated) “Have not used the application before, and it is the first time I’ve heard about it”.

17 (58,6%) either completely or somewhat agreed with the statement “Unifractal was a useful tool”, divided between 3 (10,3%) “Completely agree” and 14 (48,3%) “Somewhat agree”. The remaining 12 (41,4%) replied “Neither agree nor disagree”.

Regarding the students’ preference on who should make content for the Unifractal application 16 (55,2%) had no preference. 9 (31%) (10 including the student who had not heard of the application before) students preferred content made by supervisors/professors and 4 (13,8%) preferred content made by other students.

Only 4 of 9 supervisors replied to the questionnaire made for them. All 4 of them were aware of the Unifractal application, and 3 of them knew that the students had access to it during the simulation clinic course. Of the 4 supervisors who replied to the questionnaire, 2 did not use the Unifractal application at all, and 2 used it weekly. 2 supervisors completely agreed, 1 somewhat agreed and 1 neither agreed nor disagreed with the statement “A tool like the Unifractal application is useful in the simulation clinic”.

The supervisors believed more content on all odontological topics listed in the survey would be useful to the students. All 4 supervisors requested more content on cariology, periodontics and prosthodontics. 3 supervisors also requested more content on endodontics and oral surgery.

4. Discussion

Technological difficulties in using digital devices or platforms are not an uncommon negative aspect of digital learning, (Sormunen et al., 2020). Students who are more technologically proficient therefore stand to get more out of a digital learning tool than other students, leading to technological inequality and an unfair advantage for those students. (De Gagne et al., 2019). Also, an important reason students may be hesitant to use mobile learning solutions is the lack of technical support (Chen et al., 2015).

Finding out about the application's content and learning how to use a digital learning tool like Unifractal independently, requires additional time. This may be an important reason for why 48% of the students reported that they did not use the application at all, despite 97% of students knowing about its existence.

The day-to-day studies at the simulation clinic may be perceived as hectic, especially regarding the initial stages of the course, when most of the equipment and procedures are completely new to the students. The content developed for the pilot project with the Unifractal application may therefore be of most use during these early parts of the course.

From our own and our fellow students' personal experience, the learning curve at the simulation clinic was perceived as very steep. By the time students have settled into the course and may feel they have time to learn to use a digital tool, it may be past the period they would have had the largest learning outcome from the application with the content currently available.

However, it is interesting that 62% of the students reported that they would have used the application more if it had more content. The students may require more content on all the odontological topics that they encounter at the simulation clinic. In this specific study, we only made content for a limited number of instruments. Furthermore, the videos and descriptions of the different instruments and procedures were solely introductory and aimed at the students' early encounters with these instruments and procedures. Both the quantity and

the quality, in this pilot study, could have led to some students not finding the tool relevant beyond the first few weeks of the simulation clinic course.

The demand for more content on other odontological topics was clear. Creating more content that addresses the procedures and instruments, ranging from a novice to an advanced level of knowledge, should make such a digital learning tool relevant throughout the simulation clinic course and increase students' use of it. As indicated by students' opinions, this content should be developed by both students and supervisors.

The supervisors also seem to support this notion that digital learning tools could improve significantly for the simulation clinic if more content, on the above-mentioned odontological topics, is included. However, too few supervisors responded to the questionnaire to reach a satisfactory conclusion about their opinions.

Also, the students have an Objective Structured Clinical Examination (OSCE) during their 3rd year which focuses mostly on specific procedures or part of procedures. OSCE is a tool that allows for uniform testing and evaluation of students' clinical skills through objective testing and direct observation (Zayyan, 2011). Using the Unifractal application to attain this type of knowledge is part of its intended use case and has had a positive reception at the OPIN-clinic (Unifractal, n.d.-a).

There was a significant delay between the trial period of the Unifractal application and the distribution of the questionnaire. Therefore, students may misremember and over- or under-report how often they used the application, or even misremember their impression of the application altogether, leading to poorer data. However, the data gathered can be considered a reliable representation of the students' view at the time the questionnaire was given, as all but one student replied to the questionnaire.

Optimally, the survey respondents should be unfamiliar with the interviewers, due to the potential influence any familiarity between interviewer and respondent may have on data quality. We were familiar with many of the students before the trial period of the application and subsequent distribution of the questionnaire. One might suspect that this could lead to them misreporting their opinions in a more positive or negative direction. However, a study concluded that self-administered questions where the interviewer is not present, such as the questionnaire we distributed, were effective at eliminating interviewer-respondent familiarity bias (Rodriguez, Sana, & Sisk, 2015).

The Unifractal platform makes use of image detection using mobile cameras to help users identify equipment. This image detection algorithm has only been implemented to identify larger equipment. At the OPIN-clinic such image detection was implemented. Using the mobile camera as a scanning device, one would get sent directly to short videos explaining the scanned equipment and answering commonly asked questions (Unifractal, n.d.-b) There was an attempt to apply this mobile camera-based image detection to dental equipment as well, but so far, the results have been inconclusive (not included). In the future it might be possible to identify smaller objects or differentiate very similar-looking equipment using the mobile camera as well, hence making the process of accessing data even more effortless.

Making content for a database like this can easily be done by students themselves. The immediate focus should involve making the database larger in cooperation with both students and supervisors to meet their needs, thus increasing the platform's applicability.

This dental Unifractal database source may also have implementation value outside of a dental teaching institution. Dental assistants and oral health workers at nursing homes and other elderly care institutions may access the database from their phones, to identify and demonstrate specific dental articles, either directly (as a dental encyclopedia) or by using a mobile phone camera to identify various kinds of equipment with image recognition.

Also, when arriving at a new dental clinic it is more than likely that a dentist, dental hygienist, or dental assistant would come across equipment or materials they have never seen nor used. The dental Unifractal application would allow the clinic owners to build and advance its content to the specific clinic easily and rapidly. This would alleviate both time and resources and facilitate streamlined clinical procedures.

4.1 Conclusion

The goal with this study was to make a database with learning materials tied to multiple instruments, simple routines, and short procedures to show the potential of this kind of application in combination with the traditional learning styles in the dental education. The overall positive result of the survey suggests that the pilot application developed here does hold the potential to become an important and useful digital learning tool for dental students.

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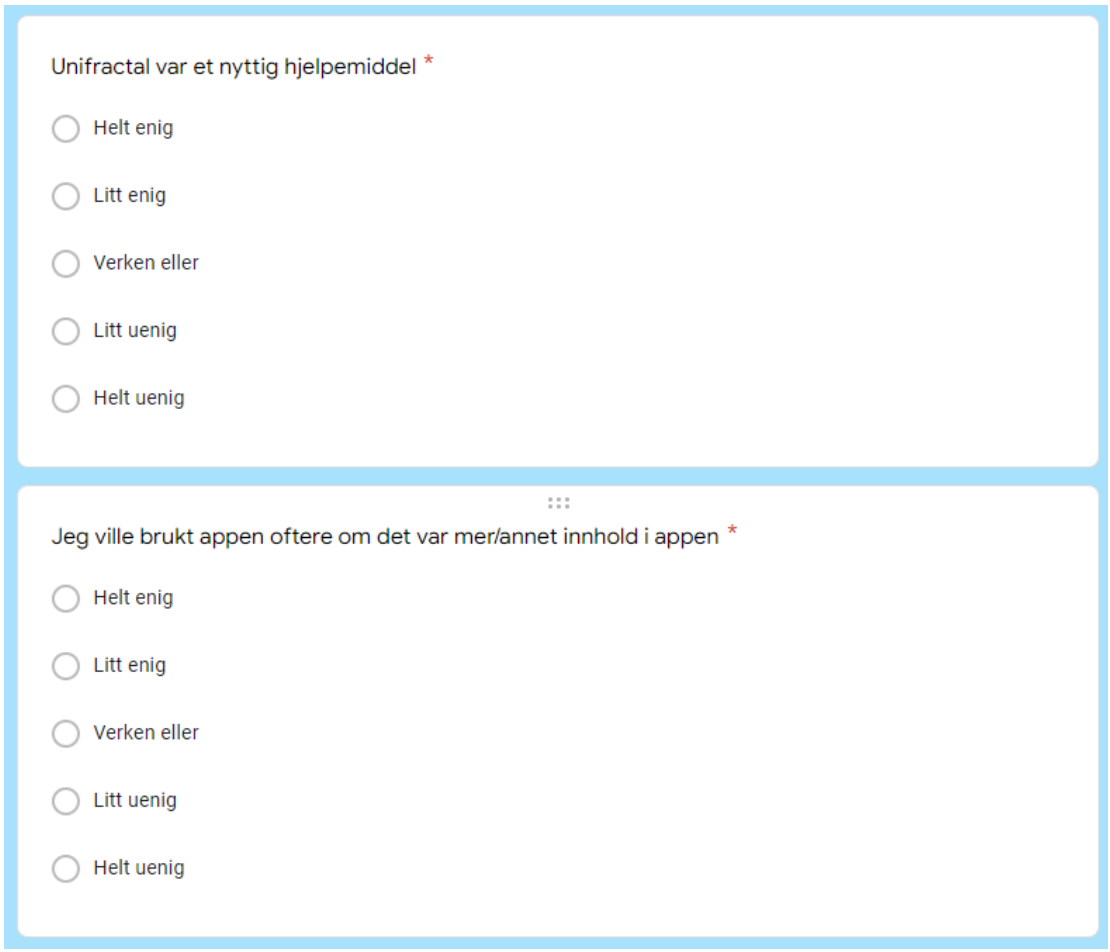
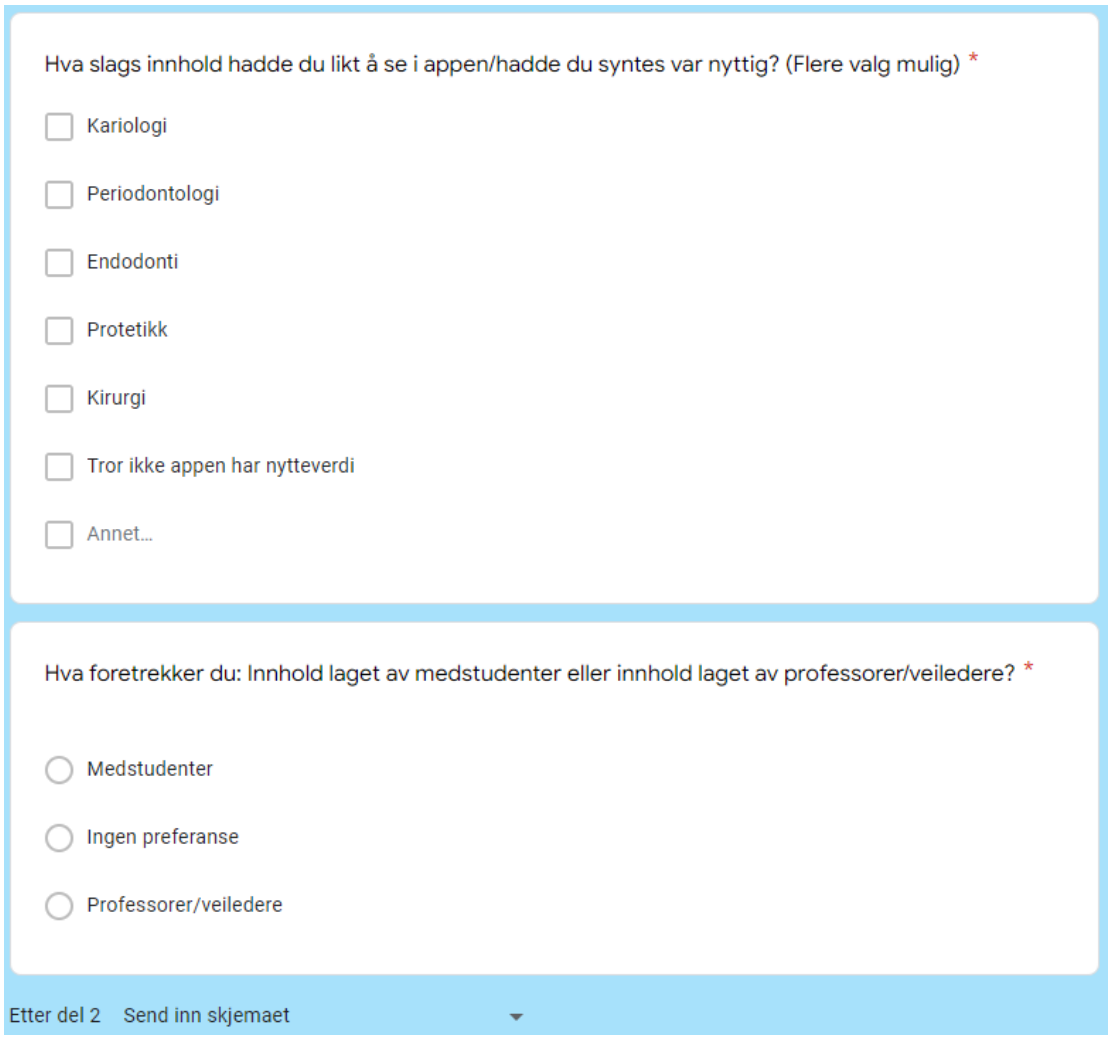
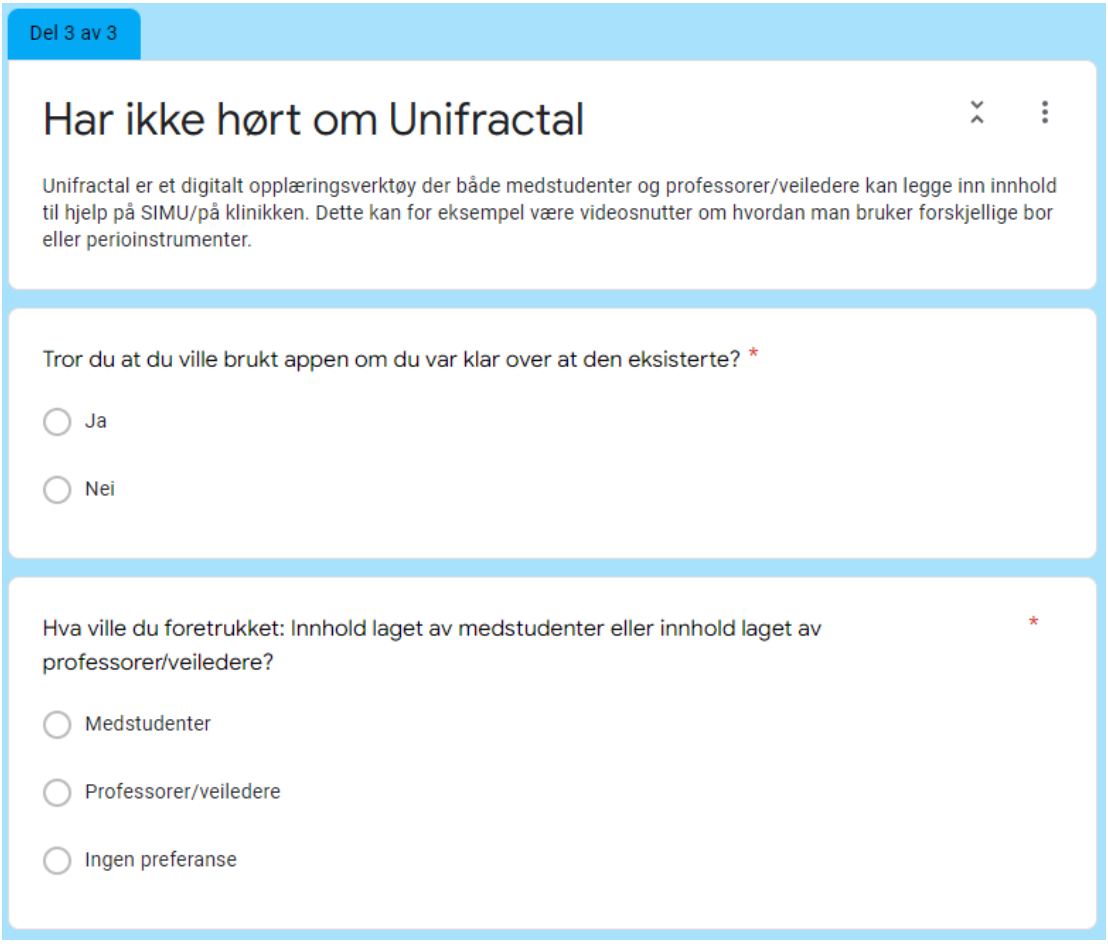
6. Appendix I

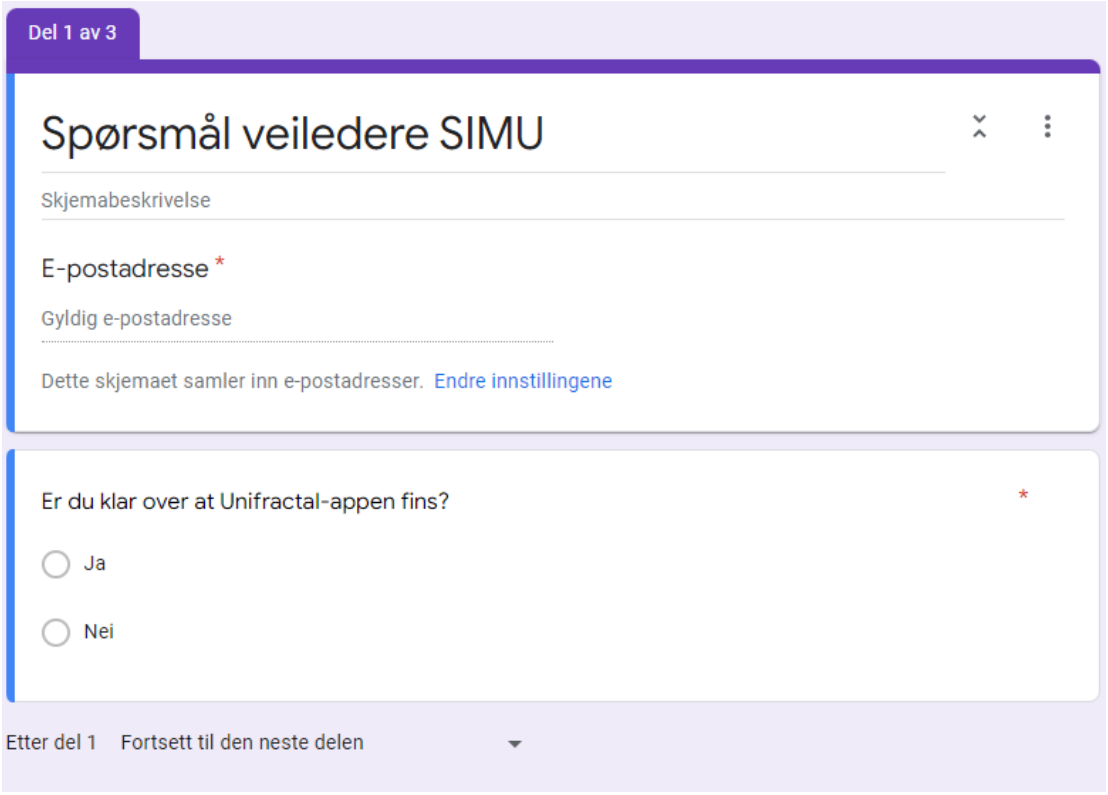

Del 1 av 3
Spørsmål 3. klasse ODO
Skjemabeskrivelse
E-postadresse *
Gyldig e-postadresse
Dette skjemaet samler inn e-postadresser. Endre innstillingene
Er du klar over at Unifractal-appen fins? *
Ja
Nei
Etter del 1 Fortsett til den neste delen


Del 2 av 3
Har hørt om Unifractal
Unifractal er et digitalt opplæringsverktøy der både medstudenter og professorer/veiledere kan legge inn innhold til hjelp på SIMU/på klinikken. Dette kan for eksempel være videosnutter om hvordan man bruker forskjellige bor eller perioinstrumenter.
Hvor ofte brukte du Unifractal-appen som hjelpemiddel på SIMU? *
Flere ganger om dagen
Daglig
Ukentlig
Månedlig
Brukte den ikke


Unifractal var et nyttig hjelpemiddel *
Helt enig
Litt enig
Verken eller
Litt uenig
Helt uenig
Jeg ville brukt appen oftere om det var mer/annet innhold i appen *
Helt enig
Litt enig
Verken eller
Litt uenig
Helt uenig


Hva slags innhold hadde du likt å se i appen/hadde du syntes var nyttig? (Flere valg mulig) *
Kariologi
Periodontologi
Endodonti
Protetikk
Kirurgi
Tror ikke appen har nytteverdi
Annet...
Hva foretrekker du: Innhold laget av medstudenter eller innhold laget av professorer/veiledere? *
Medstudenter
Ingen preferanse
Professorer/veiledere
Etter del 2
Send inn skjemaet


Del 3 av 3
Har ikke hørt om Unifractal
Unifractal er et digitalt opplæringsverktøy der både medstudenter og professorer/veiledere kan legge inn innhold til hjelp på SIMU/på klinikken. Dette kan for eksempel være videosnutter om hvordan man bruker forskjellige bor eller perioinstrumenter.
Tror du at du ville brukt appen om du var klar over at den eksisterte? *
Ja
Nei
Hva ville du foretrukket: Innhold laget av medstudenter eller innhold laget av professorer/veiledere? *
Medstudenter
Professorer/veiledere
Ingen preferanse


Del 1 av 3
Spørsmål veiledere SIMU
Skjemabeskrivelse
E-postadresse *
Gyldig e-postadresse
Dette skjemaet samler inn e-postadresser. Endre innstillingene
Er du klar over at Unifractal-appen fins? *
Ja
Nei
Etter del 1 Fortsett til den neste delen

Del 2 av 3

Har hørt om Unifractal

Unifractal er et digitalt opplæringsverktøy der både medstudenter og professorer/veiledere kan legge inn innhold til hjelp på SIMU/på klinikken. Dette kan for eksempel være videosnutter om hvordan man bruker forskjellige bor eller perioinstrumenter.

Er du klar over at studentene hadde tilgang til Unifractal-appen? *

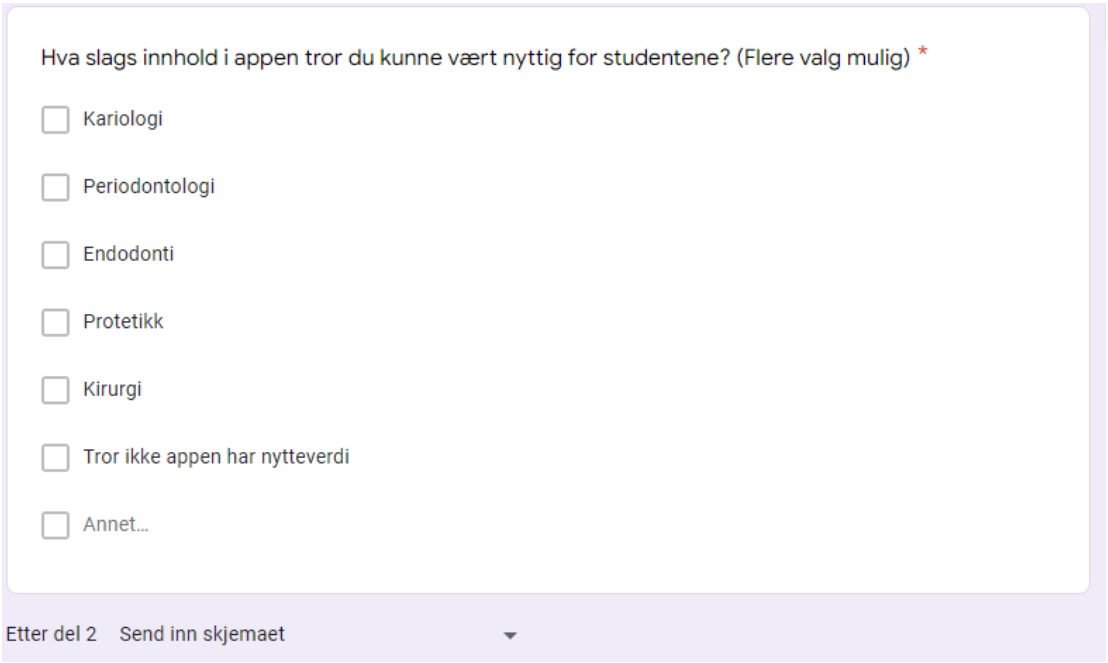
- ◯ Ja
- ◯ Nei

Hvor ofte tok du Unifractal-appen i bruk til studentveiledning/supplement til undervisningen av 3. året ODO på SIMU? *

- ◯ Flere ganger daglig
- ◯ Daglig
- ◯ Ukentlig
- ◯ Månedlig
- ◯ Brukte den ikke

Hvordan stiller du deg til følgende påstand: Et verktøy som Unifractal-appen er nyttig på SIMU *

- ◯ Helt enig
- ◯ Litt enig
- ◯ Verken ellller
- ◯ Litt uenig
- ◯ Helt uenig
- ◯ Vet ikke


Hva slags innhold i appen tror du kunne vært nyttig for studentene? (Flere valg mulig) *
Kariologi
Periodontologi
Endodonti
Protetikk
Kirurgi
Tror ikke appen har nytteverdi
Annet...
Etter del 2
Send inn skjemaet

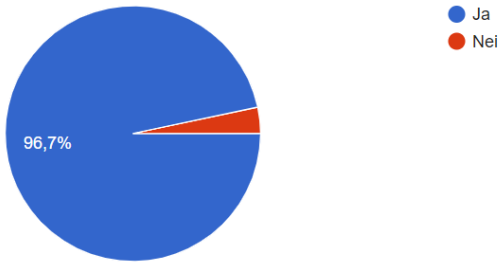

Del 3 av 3
Har ikke hørt om Unifractal
Unifractal er et digitalt opplæringsverktøy der både medstudenter og professorer/veiledere kan legge inn innhold til hjelp på SIMU/på klinikken. Dette kan for eksempel være videosnutter om hvordan man bruker forskjellige bor eller perioinstrumenter.
Tror du at du ville tatt Unifractal-appen i bruk til studentveiledning/supplement til undervisningen basert på beskrivelsen? *
Ja
Nei
Vet ikke

Hva slags innhold i appen tror du kunne vært nyttig for studentene? (Flere valg mulig) *

- [ ] Kariologi
- [ ] Periodontologi
- [ ] Endodonti
- [ ] Protetikk
- [ ] Kirurgi
- [ ] Tror ikke appen har nytteverdi
- [ ] Annet...

Er du klar over at Unifractal-appen fins? Kopiér

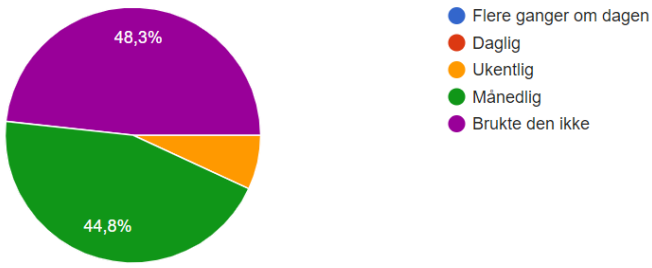
30 svar



Har hørt om Unifractal

Hvor ofte brukte du Unifractal-appen som hjelpemiddel på SIMU? Kopiér

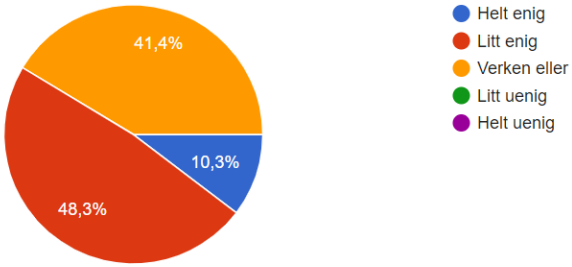
29 svar



Unifractal var et nyttig hjelpemiddel

Kopiér

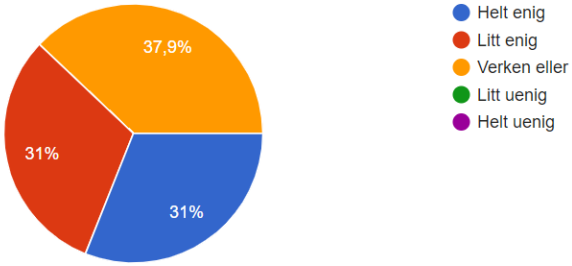
29 svar



Jeg ville brukt appen oftere om det var mer/annet innhold i appen

Kopiér

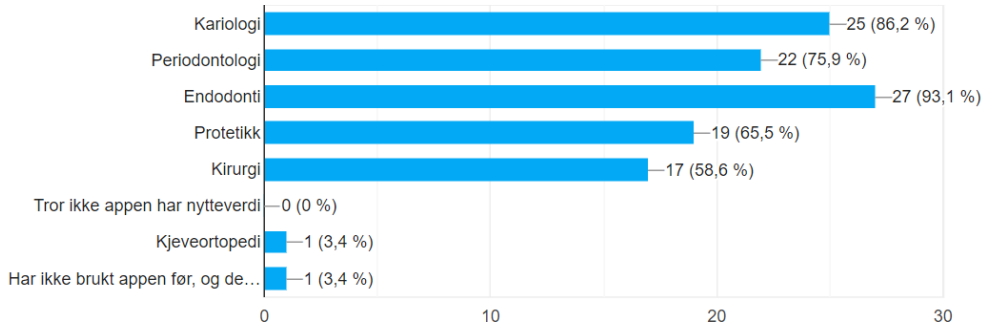
29 svar



Hva slags innhold hadde du likt å se i appen/hadde du syntes var nyttig? (Flere valg mulig)

Kopiér

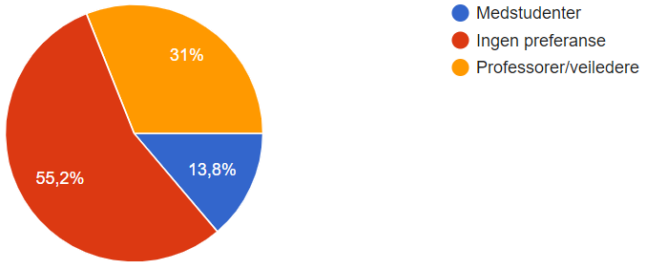
29 svar



Hva foretrekker du: Innhold laget av medstudenter eller innhold laget av professorer/veiledere?

Kopiér

29 svar

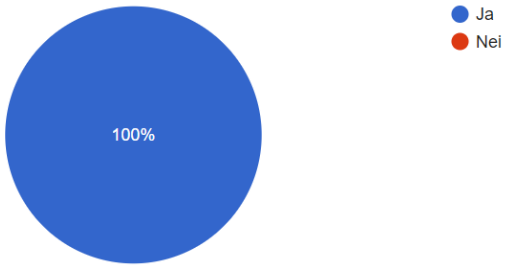


Har ikke hørt om Unifractal

Tror du at du ville brukt appen om du var klar over at den eksisterte?

Kopiér

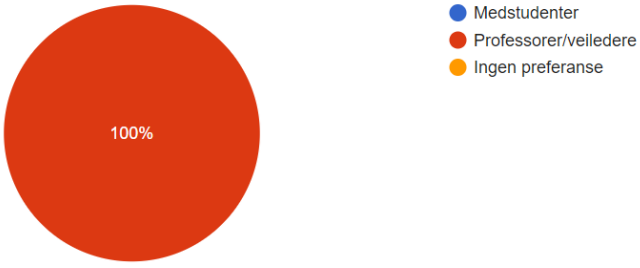
1 svar



Hva ville du foretrukket: Innhold laget av medstudenter eller innhold laget av professorer/veiledere?

Kopiér

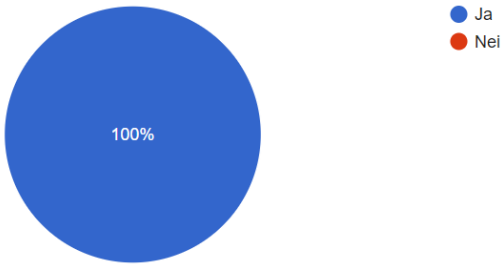
1 svar



Er du klar over at Unifractal-appen fins?

Kopiér

4 svar

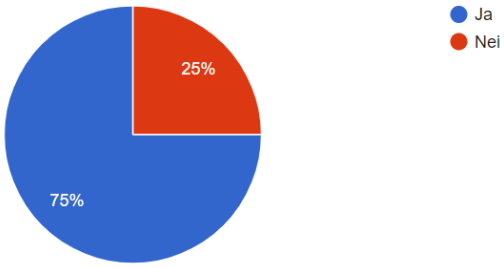


Har hørt om Unifractal

Er du klar over at studentene hadde tilgang til Unifractal-appen?

Kopiér

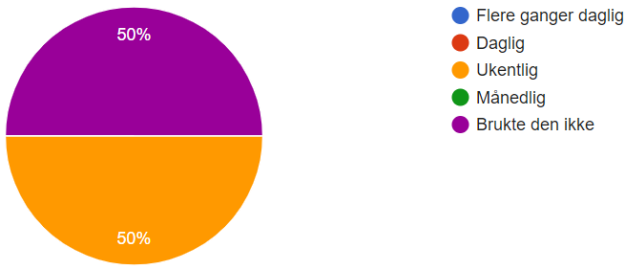
4 svar



Hvor ofte tok du Unifractal-appen i bruk til studentveiledning/supplement til undervisningen av 3. året ODO på SIMU?

Kopiér

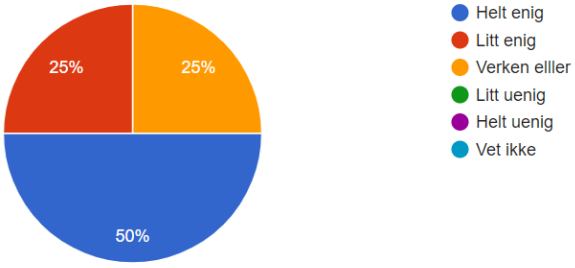
4 svar



Hvordan stiller du deg til følgende påstand: Et verktøy som Unifractal-appen er nyttig på SIMU

Kopiér

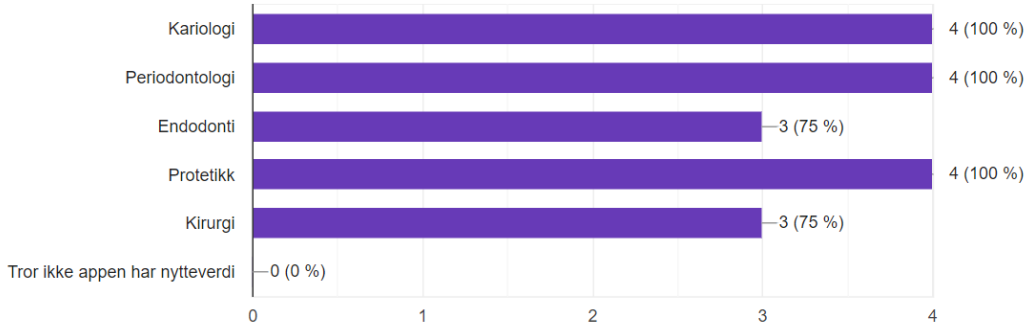
4 svar



Hva slags innhold i appen tror du kunne vært nyttig for studentene? (Flere valg mulig)

Kopiér

4 svar



Har ikke hørt om Unifractal

Tror du at du ville tatt Unifractal-appen i bruk til studentveiledning/supplement til undervisningen basert på beskrivelsen?

0 svar

Det finnes foreløpig ingen svar på dette spørsmålet.

Hva slags innhold i appen tror du kunne vært nyttig for studentene? (Flere valg mulig)

0 svar

Det finnes foreløpig ingen svar på dette spørsmålet.