

TECHNOLOGY ENHANCED LEARNING tel.ac.uk

hapTEL in touch with a dental revolution

TEL stories

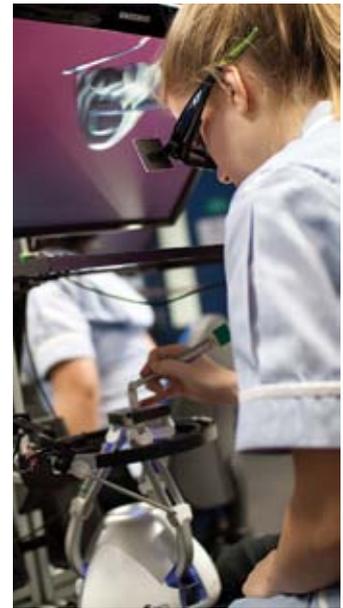
EVIDENCE from
the TEL research
programme





hapTEL represents the future for dental teaching. Based on haptic or sense-of-touch technology, the virtual-reality jaws are revolutionary, educationally effective and potentially very profitable.

Professor Margaret Cox, principal investigator, hapTEL project.



hapTEL... the challenge

With real teeth in short supply, dental students have long been honing their skills on dental-chair simulators with dummy heads whose mouths are filled with plastic teeth. But these heads don't give students any measurable feedback. They can't twitch or wince like a real patient nor can they warn students if they are holding the drill at the wrong angle or exerting too much pressure.

Also, a dental-chair simulator costs about £40,000, and that's excluding the teeth. First-year dental students have to make mistakes to learn, but their errors often mean a £16 plastic tooth disappearing in five minutes of too vigorous drilling. It's easy to see how dental institutes' training bills can soon mount up to hundreds of thousands of pounds.

Another problem with the simulator is that dental students are not allowed to use it unsupervised in case of injury. This seriously limits their practice time.

hapTEL... award winning

- Runner up, Excellence in Innovation award, London Deanery (2010)
- Winner, Best Educational Innovation in the Dental and Oral Health innovations awards, Medical Futures (2011)
- Overall winner of Best Educational Innovation Awards in Medical Futures awards (2011)
- Winner, BETT Innovation in ICT award (2012)

FIRST-YEAR DENTAL STUDENTS



have to make mistakes to learn, but their errors often mean a £16 plastic tooth disappearing in five minutes of too vigorous drilling

hapTEL...

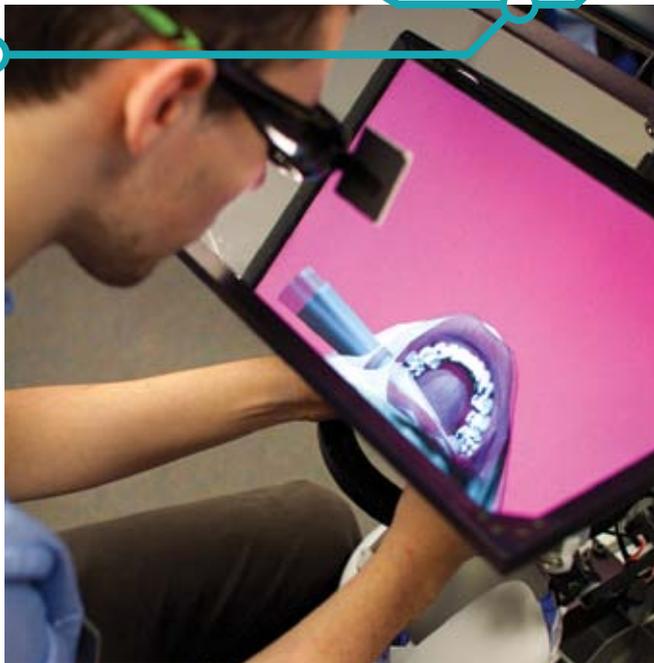
Haptic technology could, when combined with a virtual-reality jaw, help dental students acquire essential clinical skills.

hapTEL... the technology

Given the limitations and expense of traditional dental-chair simulators, researchers wanted to find out if haptic (sense-of-touch) technology could provide an answer. Haptic technology is widely used in computer gaming to give players instant tactile feedback. If they, for example, drive a racing car across rough ground, their controller shakes and vibrates as would a real steering wheel.

The hapTEL team believed that this technology could, when combined with a virtual-reality jaw, help dental students acquire essential clinical skills. They aimed to raise the quality of their learning, improve the dental curriculum and find out which teaching strategies would benefit most from such technology-enhanced learning.

In 2007 the team started work. The four-year project involved staff from the Dental Institute of King's College London (KCL), Reading and Birmingham City universities. It was funded jointly by the ESRC and the EPSRC.



hapTEL... the future

Five years on, hapTEL is making an impressive impact on dental policy and practice, on educational research and on business. The King's College lab has been visited by more than 400 dentists, researchers and students in the last two years, as well as by MPs on the dentistry committee.

Six companies are interested in turning the prototype into a commercial product and marketing it around the world. hapTEL would thus become global proof of the value of technology-enhanced learning.

The team expects to see haptic technology spread through other sectors and disciplines, aided by the robust research methods and theories they have developed. With regard to hapTEL, their ultimate aim is an online 'plug-and-play' device allowing dental students and professionals to acquire or refresh their clinical skills wherever and whenever they like.

hapTEL...

hapTEL has been evaluated over two years in tests involving about 350 King's College London dental students.

hapTEL... in action

Being able to try, try and try again is of vital importance to Sadvhik Vijay. Like most student dentists who train on hapTEL, Sadvhik has appreciated the difference that lots of practice has made to his manual dexterity, practice facilitated by the system's never-ending supply of new, and free virtual teeth.

Sitting at the hapTEL work station, one of 14 at KCL's Dental Institute, Sadvhik drills into a tooth in the virtual jaw displayed on the screen in front of him. He wears 3D glasses that track his head movements allowing him to see the jaw from different angles – just as in real life. He can also feel the difference between drilling into hard, healthy enamel and the soft areas of decay – again just as in real life.

hapTEL gives Sadvhik instant, accurate and systematic feedback, so he no longer has to wait for a tutor to assess how he is doing. Once he's finished, he can play back a video to find out if he's

removed the right amount of decayed tooth without affecting too much healthy tissue. This facility has enabled Sadvhik and his fellow students to assess their own work, something that first-year students are usually reluctant to do. And, in contrast to real life, Sadvhik can see deep into the teeth, and view a magnified image of the drilling area.



STUDENTS WORKING WITH THE HAPTEL SYSTEM

hapTEL has been evaluated over two years in tests involving about 350 KCL dental students. Pre and post-tests of clinical skills and attitudes, and psychomotor skills and perceptions were carried out, as were video observations.

The evaluation revealed that hapTEL students performed as well when tested on plastic teeth as those trained on the traditional dummy heads over the same three month period.

The large-scale trials, in conjunction with more in-depth studies, confirmed that devices like hapTEL have a place in the undergraduate dentistry curriculum and have a positive impact on students' learning. hapTEL also has a potential role in postgraduate training and professional development and assessment.

hapTEL... find out more

More information about hapTEL is available at www.tel.ac.uk and at www.haptel.kcl.ac.uk and the BBC Web pages at <http://www.bbc.co.uk/news/health-13867881>. The project, directed by Professor Margaret Cox, is part of the Technology Enhanced Learning (TEL) Research programme. This is...

- a £12m programme funded by the UK ESRC and EPSRC from 2007-2012;
- designing and evaluating systems to advance our understanding of learning and teaching in a technological context;
- supporting eight large interdisciplinary projects;
- working to achieve impact for emerging research results;
- mapping progress on key themes.

Details of its research team, based at King's College London Dental Institute, can be found at www.haptel.kcl.ac.uk.



tel.ac.uk

Technology Enhanced Learning Research Programme
London Knowledge Lab, Institute of Education,
University of London, 23-29 Emerald Street,
London, WC1N 3QS

youtube: [youtube.com/tlrptel](https://www.youtube.com/tlrptel)

twitter: @TLRPTEL

email: tlrptel@gmail.com

phone: +44 (0)20 7911 5577

