in the US at this current time. After a historical perspective, the authors focus on the challenges of embedding change in fundamental pedagogy in busy schools. Subsequent chapters look at roles and responsibilities in the process, getting started on the journey of change and finally maintaining that change in the long term. Each chapter ends with a summary of key points and a set of questions for the reader to use for personal reflection. There are also some case studies of individuals at different stages in their career as illustration of the key messages. The authors present an academic approach to the material, providing references to research to support their narrative. To get the most out of this book the reader would need to be interested in the historical perspectives of science teaching and the management of science departments as well as the educational philosophy around change. The checklist questions at the end of each chapter could be helpful in designing a development plan for change within a department but, to me, the book lacks succinct practical advice of use to a busy middle manager attempting to shift the direction of a department. I have seen what I judge to be better examples of books focusing on the same topics on our UK bookshelves.

Janet Mitchell

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**Equipment review: Vernier Motion Encoder System**

**Product code:** VF129464

**Includes:** Combination 1.2 m dynamics track/optics bench; motion encoder cart with magnetic and hook-and-pile end-caps; motion encoder receiver; plunger cart with magnetic and hook-and-pile end-caps; 500 g mass; adjustable end-stop; 2 adjustable two-foot levellers; motion detector bracket; rod clamp; 2 photogate brackets £480

Compatible with Vernier’s LabQuest 2, LabQuest Mini, LabPro and Original LabQuest

If you have ever struggled to get noise-free position–time data from a dynamics experiment using an ultrasonic ranger then the Vernier Motion Encoder System is worth looking at. Most people using datalogging motion sensors will know that the slightest noise in the position–time data results in very spiky velocity–time and acceleration–time graphs. Aligning the motion sensor and ensuring that the tracked object gives strong reflections from suitable ranges is part of the art of using this equipment. It does mean that some time needs to be spent setting up the experiments for class use or demonstration. The encoder system does away with ultrasonic echolocation to produce noise-free position–time data. Two optical bar code sensors are used on a dynamics cart, to read a 4 mm period "bar code" type pattern attached to the track. The signal produced is sent on a narrow IR beam to a fixed detector at the end of the track. This signal can be processed to give cart position data to 1 mm resolution and this claim checks out on testing in the lab. The data collection rate is optimised at sampling rates of 15–30 Hz, but I collected good data at 10 Hz and it is not too noisy at 50 Hz. This is TV remote control technology put to excellent use. The signal can then be further processed, using LabQuest 2 and its LabQuest app or Logger Pro on a PC or Mac, to produce motion graphs. The LabQuest app and Logger Pro software are both excellent and very easy to use. You can set up braking distance or collision scenarios very easily and produce textbook position, velocity and acceleration–time data very quickly. You are limited to 1D motion along the strip and motion sensors are more flexible, allowing falling objects, coffee filters and so on to be studied, but as a piece of demo lab equipment this optical encoder technology is very nice indeed.

Stephen Hearn

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**Reviewers**

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