NGSS

1H[W *HQHUDWLRQ 6FLHQFH 6V

8QWDQJOLQJ 6FLHQFH (QJLQHHULQJ 'HVLJQ

&DU\ 6QHLGHU

6FLHQFH WHDFKHUV KDYH OR
LQFOXGH LQTXLU\² IRU WKH EDV
VWUDWHJ\ IRU WHDFKLQJ D
WR EH OHDUQHG 7KH VSHF
VNLOOV RI LQTXLU\ ZHUH G
National Science Education Standards 15&
DQG LQ PDQ\ VWDWH V
WKH Next Generation Science Standards
1*66 /HDG 6WDWHV UH
VWXGHQWV DOVR OHDUQ DE
GHVLJQ

%HIRUH KH EHFDPH D McGraw-Hill author, Cary Sneider helped in the creation of the Next Generation Science Standards as a writing team leader. He is currently an associate research professor at Portland State University in Portland, Oregon where he teaches courses in research methodology for teachers.
2YHU KLV FDUHHU &DU\ KDV GLUHF
VWDWH DQG IHGHUDO JUDQW SUR
VHYHUDO WKDW LQYROYHG WKH GH
RI QHZ FXUULFXOD DQG PHWKRGV R

0DQ\ H[SHULHQFHG VFLHQFH WHDFKHUV DOUHDG\ SUHVHQW H
'HVLJQ DFWLYLWLHV FRPPRQ LQ VFLHQFH FODVVHV LQFOXGH
VWXGHQWV GHVLJQ D KROGHU WR FXVKLRQ D UDZ HJJ VR L
WRZHU EXLOW IURP D OLPLWHG DPRXQW RI QHZVSDSHU DQ
WDSH WKDW ZLOO KROG XS D PD[LPXP DPRXQW RI ZHLJKW
EXW WKH\ GR QRW QHFHVVDULO\ PHHW WKH UHTXLUHPHQW

7KH 1*66 VSHFLILHV WKDW HQJLQHHULQJ GHVLJQ FKDOOHQJH
SUDFWLFHV RI HQJLQHHULQJ ZKLFK LQYROYH PRUH WKDQ
3HUKDSV WKH FOHDUHVW RYHUYLHZ RI VFLHQFH DQG HQJLQ
LV D WDEOH LQ A Framework for K-12 Science and Engineering 15& ZKLFK
HVWDEOLVKHG WKH RYHUDOO YLVLRQ RI WKH QHZ VWDQGD
DSSHDUV DW WKH HQG RI WKLV SDSHU :KLOH WKH SUDFWL
VLPLODU WKH\ DUH QRW H[DFWO\ WKH VDPH 7R LOOXVWU
FKDOOHQJH PLJKW EH DGDSWHG IRU D PLGGOH VFKRRO SK
IROORZLQJ SHUIRUPDQFH H[SHFWDWLRQ IURP WKH 1*66

MS-PS3-1. Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object.

Define the problem: 5DWKHU WKDQ JLYLQJ WKH VWXGHQWV D GH
WKH VWXGHQWV ZLWK D YDJXH SUREOHP ZLWK LQVWUXFW
H[DPSOH ³$ PDQXIDFWXUHU RI ELF\FOH HTXLSPHQW ZDQV

DUH VRPH PDWHULDOWWRKFDWDVXHDQRXGVHD RI D KHOPHW
WKDW FDQ UHSUHVHQW D SHUVRQ¶V KHDG %HIRUH \RX E
XVH WR MXGJH D VXFFHVVIXO GHVLJQ DQG H[SODLQ KRZ
ZKLFK EHVW PHHW WKH FULWHULD <RXU FRQVWUDLQWV
ILQLVK \RXU PRGHO E\ WKH HQG RI WRGD\¶V FODVV VR \

PKRQOLQHQJVVP 6FLHQFH ,QTXLU\ DQG (QJLQHHULQ

VFLHQFH EXW DOVR H[SODLQ ZKHWKHU RQH D ELF\FOH GHVLJQ

6LQFH WKH 1*66 FDOOV IRU DOO VWXGHQWV WR OHDUQ HQJ
LPSRUWDQW IRU WHDFKHUV WR GHVLJQ VXFK H[SHULHQFHV
GLVWLQFWLRQ LV FOHDU LQ FDVHV VXFK DV WKH DERYH W
HQJLQHHULQJ DFWLYLW\ LV QRW DOZD\V REYLRXV &RQVLG
SHUIRUPDQFH H[SHFWDWLRQ IURP WKH 1*66

> MS-PS2-3. Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.

1RZ FRPSDUH WKH IROORZLQJ FKDOOHQJHV JLYHQ WR VWX
WKDW ZLOO KHOS WKHP DFKLHYH WKLV SHUIRUPDQFH H[SH

> Use these materials (wire, iron nail, battery, and paper clips) to determine the factors that affect the strength of an electromagnet.

> Use these materials (wire, iron nail, battery, and paper clips) to design an electromagnet that will pick up as many paper clips as possible.

7KH ILUVW FKDOOHQJH ZKLFK DVNV VWXGHQWV WR DQVZHU
DQG FRQGXFW DQ VFLHQFH H[SHULPHQW ,Q WKH FODVVURRP VW
WHQG WR FRQWURO YDULDEOHV FDUHIXOO\ IRU H[DPSOH G
FKDLQ WKH\ FDQ PDNH ZLWK D JLYHQ OHQJWK RI ZLUH 7KH
PRUH FUHDWLYLW\ VXFK DV XVLQJ ERWK HQGV RI WKHLU H
SDSHU FOLSV DV SRVVLEOH ,Q ERWK FDVHV VWXGHQWV GH
H[SHULPHQWV EXW WKH SURFHVV LV TXLWH GLIIHUHQW

,Q FRQFOXVLRQ WKLV SDSHU HPSKDVL]HV WZR SRLQWV)L
QHFHVVDU\ PHHW WKH UHTXLUHPHQWV RI WKH 1*66 XQOHVV
SUDFWLFHV RI HQJLQHHULQJ GHVLJQ DW WKH DSSURSULDW
QRW EHFDXVH ZH H[SHFW DOO VWXGHQWV WR EHFRPH HQJL
EH LQWHUHVWHG EXW EHFDXVH OHDUQLQJ WR VROYH SUR
6HFRQG WKH GLVWLQFWLRQ EHWZHHQ VFLHQFH DQG HQJLQ
WKH\ FRXOG LQYROYH WKH VDPH PDWHULDOV DQG HYHQ VL
XQWDQJOLQJ VFLHQFH IURP HQJLQHHULQJ LV WR DVN WKH
DFFRPSOLVK ,I WKH\ DUH WU\LQJ WR DQVZHU D TXHVWLRQ
WU\LQJ WR VROYH D SUREOHP WKH\ DUH GRLQJ HQJLQHHU

Distinguishing Practices in Science from Those in Engineering

$ G D S W H G Framework for K-

5HIHUHQFHV

1*66 /HDG 6WDWHV 1H[W JHQHUDWLRQ VFLHQFH VWD
:DVKLQJWRQ '& 7KH 1DWLRQDO $FDGHPLHV 3UHVV

1DWLRQDO 5HVHDUFK &RXQFLO ± VFLHQFH HGXFDWLRQ 3U
FURVVFXWWLQJ FRQFHSWV DQG FRUH LGHDV :DVKLQJWRQ
3UHVV

1DWLRQDO 5HVHDUFK &RXQFLO 1DWLRQDO VFLHQFH H
'& 7KH 1DWLRQDO $FDGHPLHV 3UHVV