'HYHORSHG DQG SXEOLVKHG XQGHU FRQWUDFW ZLWK WKH 1H
5HFRJQLWLRQ &RUSRUDWLRQ
&RS\ULJKW ‹ E\ WKH 1HZ <RUN 6WDWH (GXFDWLRQ 'HSDUW

Chapter 2: Classical Item Statistics (Standard 4.10)

7KLV FKDSWHU SURYLGHV DQ RYHUYLHZ RI WKH WZR PRVW ID
LWHP DQDO\VLV LWHP GLIILFXOW\ DQG LWHP GLVFULPLQDWL
RSHUDWLRQDO 5HJHQWV ([DPLQDWLRQ LQ *OREDO +LVWRU\ L

,WHP 'LIILFXOW\

$W WKH PRVW JHQHUDO OHYHO DQ LWHP¶V GLIILFXOW\ LV L
H J JUDGH OHYHO

)RU& LWHPV RXU SRSXODWLRQ VSHFLILFDWLRQ UHTXLUHV DQ DYHUDJH RI [SHFWHG XH RI

Chapter 3: IRT Calibrations, Equating, and Scaling (Standards 2, and 4.10)

7KH LWHP UHVSRQVH WKHRU\ ,57 PRGHO XVHG IRU WKH 5HJ
WKH ZRUN RI *HRUJ 5DVFK 5DVFKD ORQJ7KWD5QGVFKJPRGHOQ
WHVWLQJ SURJUDPV ,57 KDV VHYHUDO DGYDQWDJHV RYHU F
SURFHGXUH IRU DQDO\]LQJ LWHP UHVSRQVH GDWD LQ ODUJH
DQG +DPEOHWRQ ³7KH FHQWUDO IHDWXUH RI ,57 LV WK
UHODWLQJ WKH SUREDELOLW\ RI DQ H[DPLQHH¶V UHVSRQVH
WKLV VHQVH FDQ EH WKRXJKW RI DV SHUIRUPDQFH RQ WKH W
REVHUYHG SHUIRUPDQFH RQ WKH WHVW RI LQWHUHVW´ +DPE
SHUIRUPDQFH YDOXH LV3RHUWRQPDHQHUGHQG WRGVLQWHUFKDQ
WKH UHPDLQGHU RI WKLV UHSRUW

$ IXQGDPHQWDO DGYDQWDJH RI ,57 LV WKDW LW OLQNV H[DP
DQG SODFHV WKHP RQ WKH VDPH VFDOH DOORZLQJ IRU DQ H
WKH GLIILFXOW\ RI WKH WHVW 7KLV LV SDUWLFXODUO\ YDOX
DV LW IDFLOLWDWHV D IXQGDPHQWDO DWWHQWLRQ WR IDLUQ

7KLV FKDSWHU RXWOLQHV WKH SURFHGXUHV XVHG IRU FDOLE
*OREDO +LVWRU\ LWHPV *HQHUDO\ LWHP FDOLEUDWLRQ LV
³ORFDWLRQ´ HVWLPDWH WR HDFK LWHP RQ DQ DVVHVVPHQW
7KLV FKDSWHU EULHIO\ LQWURGXFHV WKH 5DVFK PRGHO UHS
RI WKH 5DVFK DVVXPSWLRQV DQG VXPPDUL]HV WKH 5DVFK L

'HVFULSWLRQ RI WKH 5DVFK 0RGHO
7KH 5DVFK PRGHO 5DVFK ZDV XVHG WR FDOLEUDWH PX
PRGHO RU 3&0 :ULJKW DQG 0DVWHUV ZDV XVHG WR FD
3&0 H[WHQGV WKH 5DVFK PRGHO IRU GLFKRWRPRXV LWH
&5 LWHP GDWD 8QGHU WKH 3&0 PRGHO IRU DQ H[DPLQHH L
SHUVRQ QDQG LWHP P LV JLYHQ E\

ZKHUH HSUHVHQWV H[DPLQHH DELOLW\ DQG GHQRWHV WKH GLIILFXOW\ RI WKH M
GLFKRWRPRXV 0& LWHPV WKH 53&0 UHGXFHV WR WKH VWDQG
LV UHIHUUHG WR DV WKH LWHP¶V GLIILFXOW\ 7KH 5DVFK PR
LFRUUHFW DV IROORZV

$$P_{nj} = \frac{\exp(\theta_n - \delta_j)}{1 + \exp(\theta_n - \delta_j)}$$

7KH 5DVFK PRGHO SODFHV ERWK SHUIRUPDQFH DQG LWHP GL
ORJLWV RQ WKH VDPH FRQWLQXXP :KHQ WKH PRGHO DVVXP
HVWLPDWHV RI H[DPLQHH SHUIRUPDQFH DQG LWHP GLIILFXO
VDPSOHV RI WKH VDPH H[DPLQHH SRSXODWLRQ

6RIWZDUH DQG (VWLPDWLRQ $OJRULWKP
,WHP FDOLEUDWLRQ ZDV LPSOHPHQWHG YLD WKH :,167(36
ZKLFK HPSOR\V XQFRQGLWLRQDO 8&21 MRLQW PD[LPX

&KDUDFWHULVWLFV RI WKH 7HVWLQJ 3RSXODWLRQ
7KH GDWD DQDO\VHV UHSRUWHG KHUH DUH EDVHG RQ DOO V
+LVWRU\ LQ -XQH 7KH FKDUDFWHULVWLFV RI WKLV SRSX

,WHP 'LIILFXOW\ 6WXGHQW 3HUIRUPDQFH
7KH GLVWULEXWLRQV RI WKH 5DVFK LWHP ORJLWV LWHP GLI
VKRZQ RQ WKH LWHP-SHUSRQ SHUVRQ PDS SUHVHQWHG LQ)L
WKH ORFDWLRQ RI VWXGHQW SHUIRUPDQFH DQG LWHP GLIILF
GLVWULEXWLRQV DQG FXW VFRUHV LQGLFDWHG E\ WKH KRUL
LWHPV DQG KLJKHU H[DPLQHH SHUIRUPDQFH DW WKH WRS DQ
ERWWRP

)LJXUH 6WXGHQW 3HUIRUPDQFH 0DS 5HJHQWV ([DPLQ

&KHFNLQJ 7KH 5DVFK 0RGHO
6LQFH WKH 5DVFK PRGHO ZDV WKH EDVLV RI DOO FDOLEUDWI
WKH 5HJHQWV ([DPLQDWLRQ LQ *OREDO +LVWRU\ WKH YDOLG
WKH GHJUHH WR ZKLFK WKH DVVXPSWLRQV RI WKH PRGHO ZH

)LJXUH 6FUHH 3ORWV 5HJHQWV ([DPLQDWLRQ LQ

Local Independence

/RFDO LQGHSHQGHQFH /, LV D IXQGDPHQWDO DVVXPSWLRQ
SXUSRVHV DQG HVSHFLDOO\ WR DQ\ RQH LWHP VKRXOG QRW GHS
DQ\ RWKHU LWHP RQ WKH WHVW, WKDW LV DERXW VWDWLVWLFDOO\
ORFDOO\ LQGHSHQGHQW ZLWKLQ HDFK ODWHQW YD

$$P(x_i \mid \theta, x_{-i}) = P(x_i \mid \theta)$$

7KLV IRUPXOD HVVHQWLDOO\ VWDWHV WKDW WKH SUREDELOL
FRQGLWLRQLQJ RQ WKH UHVSRQVHV RQ DOO RWKHU VKRXO
RI WKH FRQGLWLRQDO SUREDELOLWLHV DFURVV HDFK LWHP
ZKHUH WKH MRLQW SUREDELOLWLHV DUH HTXDO WR WKH SUR
7KH HTXDWLRQ DERYH VKRZV WKH FRQGLWLRQ DIWHU VDWLVI
IRUP RI ORFDO LQGHSHQGHQFH \0F'RQDOG 7KH GLVWLQ
EHFDXVH PDQ\ LQGLFDWRUV RI ORFDO GHSHQGHQF\ DUH DFW
FRYDULDQFHV RI DOO SDLUV RI LWHP UHVSRQVHV FRQGLWLR
:KHQ WKLV DVVXPSWLRQ LV PHW WKH MRLQW SUREDELOW\ P
LV WKH SURGXFW RI WKH SUREDELOLWLHV RI U€P \ðp@W KHA0L
@X p € RW: °pRI HV RSRQ`DRQ RG0

ZKHQ UHVSRQVHV WR DQ LWHP GHSHQG RQ UHVSRQVHV WR D
LQGHSHQGHQFH DQG FDQ EH FDOOHG UHVSRQVH GHSHQGHQF
GHSHQGHQFH RQH FDQ VHH WKDW ZKLOH ORFDO LQGHSHQGH
GLIIHUHQW DVVXPSWLRQV DQG WKHUHIRUH UHTXLUH GLIIHUH

5HVLGXDO LWHP FRUUHODWLRQV SURYLGHG LQ :,167(36 IRU I
GHSHQGHQFH DPRQJ WKH 5HJHQWV ([DPLQDWLRQ LQ *OREDO
FRPSXWHG DV IROORZV)LUVW H[SHFWHG LWHP SHUIRUPDQF
 *T DQG LWHP SDUDPHWHU HVWLPDWHV 1H[W GHYLDWLRQV
REVHUYHG SHUIRUPDQFH LV GHWHUPLQHG IRU HDFK LWHP)L
WKH UHVSHFWLYH GHYLDWLRQV LV FRPSXWHG

7KUHH W\SHV RI UHVLGXDO FRUUHODWLRQV DUH DYDLODEOH
QRWHG WKDW WKH UDZ VFRUH UHVLGXDO4FRUUHODWLRQ LV RIWHQ
VWDWLVWLF XVHG WR DVVHVV ORFDO4LQGHSHQGHQFH DW ODJ
í Ní ZKHQ QR ORFDO GHSHQGHQFH H[LVWV DQG WKH
YDOXHV VKRXOG EH DSSUR[LPDWHO\ í IRU WKH LWHPV RQ
WKDQ LQGLFDWH D GHJUHH RI ORFDO GHSHQGHQFH WKDW
&KHQ 7KLVVHQ

6LQFH WKH WKUHH UHVLGXDO FRUUHODWLRQV DUH YHU\ VLP
:,167(36 ZDV XVHG IRU WKHVH DQDO\VHV 7DEOH VKRZV WKH
GHYLDWLRQ PLQLPXP PD[LPXP PHDQ DQG VWDQGDUG GHYLDWLRQ
FRUUHODWLRQV IRU HDFK WHVW 7KH WRWDO QXPEHU RI LWH
UHVLGXDO FRUUHODWLRQV JUHDWHU WKDQ DUH DOVR UH
ZLWK DEVROXWH UHVLGXDO FRUUHODWLRQV JUHDWHU WKDQ
QHJDWLYH $OO UHVLGXDO FRUUHODWLRQV ZHUH YHU\ VPDO
WKDW ORFDO LWHP LQGHSHQGHQFH JHQHUDOO\ KROGV IRU W

Item Fit

$Q LPSRUWDQW DVVXPSWLRQ RI WKH 5DVFK PRGHO LV WKDW
SURYLGHV WZR LWHP ILW VWDWLVWLFV LQILW DQG RXWILW
SUHGLFWV WKH REVHUYHG YLHOGHQWWHVWRILVRQVHV(DFKU ILW VWDWLV
D PHDQ VTXDUH 0Q6T VWDWLVWLF RU RQ D VWDQGDUGL]HG
0Q6T YDOXHV DUH PRUH RULHQWHG WRZDUG SUDFWLFDO VLJ
WRZDUG VWDWLVWLFDO VLJQLILFDQFH ,QILW 0Q6T YDOXHV D
GLIIHUHQFH EHWZHHQ WKH REVHUYHG VFRUH DQG WKH 5DVFK
5DVFK PRGHO YDULDQFH 7KHWLQWHOYDVDWLHVWLFLWHZHGJKW

7KH H[SHFWHG 0Q6T YDOXHUHPV QWDQGDUG'HYLDQWLRQ LQ H[FH
YDOXH FDQ EH LQWHUSUHWHG DV QRLVH RU ODFN RI ILW EHV
H[SHFWHG YDOXH FDQ EH LQWHUSUHWHG DV LWHP UHGXQGD
UHGXQGDQF\ DQG YDOXHV JUHDWHU WKDQ WKH H[SHFWHG
WRR PXFK QRLVH 5XOHV RI WKXPE UHJDUGLQJ ³SUDFWLFDO

7DEOH SUHVHQWV DWWKLVQWLXPPDUDQVDWXDWKHF5HJRQWVLQDPLQ
*OREDO +LVWRU\ LQFOXGLQJ WKH PHDQ VTXDUH GHYLDW

7KH QXPEHU RI LWHPV ZLWKLQ D WDUJHWDEOHDQJ7KHRIP>HDQ L
YDOXH LV ZLWKRPOEQJ LQ D WDUJHWHG UDQJH RI >
XVHG DV JXLGH IRU LGHDOUDQJHEQWLDGHXHVGRXQGVLYGEXDOWK
RXWVLGH RI WKLV LGHDO UDQJH RQO\ WZR ,QILW YDOXHV ZH

7DEOHXPP6DU\ RI ,QILW 0HDQ 6TXDU[HDWLDWLFVRQEDQ 5HVWRQV
,QILW 0HDQ 6TX
0HD 6' 0LQ 0D[>
*OREDO
+LVWRU

,WHPV 5HJHQHUDWHGWHV ([DPLQDWLRZHUEOHRGEOWHLVWWHRGLQ DQG
VHSDUDWH WHFKQLFDO UHSRUW ZDV SURGXFHG SHU ILHOG W

SUDFWLFH LW LV FOHDU WKDW ODUJHU FRHIILFLHQWV DUH P
OHVV LQIOXHQFHG E\ UDQGRP HUURU

Coefficient Alpha

5HOLDELOLW\ LV PRVW RIWHQ HVWLPDWHG XVLQJ WKH IRUPX
LQWHUQDO FRQVLVWHQF\ LQGH[,W FDQ EH FRQFHSWXDOL]H
IURP WKH VDPH GRPDLQ ZRXOG UHVXOW LQ D VLPLODU UDQN
UHIOHFWHG LQ WKLV LQGH[([FHVVLYH YDULDWLRQ LQ VWXG
QH[W VKRXOG EH RI SDUWLFXODU FRQFHUQ IRU DQ\ DFKLHYH

$ JHQHUDO FRPSXWDWLRQDO IRUPXOD IRU $OSKD LV DV IROO

$OSKD = (N / (N - 1)) * (1 - (Sum(Vi) / Vt))

ZKHUH N UHSUHVHQWV WKH QXPEHU RI LWHPV Vi UHSUHVHQWV WKH YDULDQFH RI WKH RE6HUYHG
WKH YDULDQFH RI SDUW

6WDQGDUG(UURU0HDVXUHPHQW 6WDQGDUGV
5HOLDELOLW\ FRHIILFLHQWV EHVW UHIOHFW WKH H[WHQW WR ZKLFK P
DEVHQW 7KH VWDQGDUG HUURU RI PHDVXUHPHQW LV DQRWK
VXLWHG IRU GHWHUPLQLQJ WKH HIIHFW RI PHDVXUHPHQW LQ
H[DPLQHHV 7KLV LV SDUWLFXODUO\ VR IRU FRQGLWLRQDO 6

Traditional Standard Error of Measurement

7KH VWDQGDUG HUURU RI PHDVXUHPHQW 6(0 LV GHILQHG D
REVHUYHG VFRUHV IRU VWXGHQWV ZLWK LGHQWLFDO WUXH V
YDULDELOLW\ LQ WHVW VFRUHV LQ WHVW VFRUH XQLWV LW
7KH 6(0 IRUPXOD LV SURYLGHG EHORZ

6(0 = SD ü| 6(0 = SD ü| (1 - ρ)

7KLV IRUPXOD FDOFXODWHV WKH YDULDQFH RI WKH 6(0 GHSHQGV RQ ERWK
FRHIILFLHQW DOSKD DV GHWDLOHG SUHYLRXVO\ DQG WKH V
ZHUH HTXDO WR WKH ORZHVW SRVVLEOH YDOXH WKH 6
WHVW VFRUHV ,I WHVW UHOLDELOLW\ ZHUH HTXDO WR W
RWKHU ZRUGV D SHUIHFWO\ UHOLDEOH WHVW KDV QR PHDVX
RI WKH 6(0 WDNHV WKH JURXS YDULDWLRQ L H VFRUH VWD
6(0 RI RQ D SRLQW WHVW ZRXOG EH YHU\ GLIIHUHQW WKD

Traditional Standard Error of Measurement Confidence Intervals

7KH 6(0 LV DQ LQGH[RI WKH UDQGRP YDULDELOLW\ LQ WHVW
ZK\ LW KDV VXFK JUHDW XWLOLW\ IRU WHVW VFRUH XVHUV 6
LQGLYLGXDO WHVW VFRUHV 6(0V KHOS SODFH ³UHDVRQDEOH
WKURXJK FRQVWUXFWLRQ RI DQ DSSUR[LPDWH VFRUH EDQG
EDQGV DUH FRQVWUXFWHG E\ XVLQJ WKH 6(0 DURXQG WKH

LWHPV)RU WHVWV VXFK DV WKH 5HJHQWV ([DPLQDWLRQV
EHWZHHQ DQG VFDOH VFRUHV WKH &6(0 IRU HDFK DFKLHYDE
WKH FRPSRXQG PXOWLQRPLpWKH?WLRQ CVUDV (DO QV LR[LSV

Results and Observations

7KH UHODWLRQVKLS EHWZHHQ UDZ DQG VFDOH VFRUHV IRU W

7(67 7:2		7(67 21(		
		/(9(/ ,	/(9(/ ,,	0$5*,1$/
	/(9(/ ,	M	M	M ”
	/(9(/ ,,	M	M	M ”
	0$5*,1$/	M’	M’	

	7(67 21(				
	/(9(/ ,	/(9(/ ,,	/(9(/ ,,,	/(9(/ ,9	0$5*,1$/
/(9(/ ,	M	M	M	M	

7DEOH+UURXS 0HDQV 5HJHQWV ([DPLQDWLRQ LQ *OREDO +LVWR

Demographics	Number	Mean Scale	Standard error of

7 D E O H V D W H 3 H

Chapter 5: Validity (Standard 1)

5HVWDWLQJ WKH SXUSRVH DQG XVHV RI WKH 5HJHQWV ([DPL
H[DPLQHH DFKLHYHPHQW DJDLQVW 1HZ <RUN 6WDWH¶V OHDU
H[DPLQDWLRQ FRPPLWWHHV DQG 1HZ <RUN 6WDWH 'HSDUWPH
DQG LGHQWLILHV WHDFKHUV DQG VWXGHQWV ZLWK LPSRUWDQW
SHUIRUPDQFH DJDLQVW WKH HVWDEOLVKHG FXUULFXOXP VWL
VWXGHQW VWUHQJWKV DQG QHHGV WR JXLGH FODVVURRP WH
VWXGHQWV SDUHQWV FRXQVHORUV DGPLQLVWUDWRUV DQ
XQGHUVWRRG DFKLHYHPHQW LQIRUPDWLRQ WKDW PD\ EH XVH
YRFDWLRQDO GHFLVLRQV DERXW VWXGHQWV $V D 6WDWH SU
([DPLQDWLRQ LQ *OREDO +LVWRU\ LV LQWHQGHG IRU XVH LQ
ZKR KDYH ILQLVKHG D FRXUVH RI LQVWUXFWLRQ LQ *OREDO
WRZDUG UHTXLUHPHQWV IRU D KLJK VFKRRO GLSORPD DV GH
UHTXLUHPHQWV ZZZ S Q\VHG JRY FLDL JUDGXDWLRQ5HTXLUHPHQWV *OREDO5
([DPLQDWLRQ LQ *OREDO +LVWRU\ PD\ DOVR EH XVHG WR VDV
WKURXJKRXW WKH 6WDWH

7KH YDOLGLW\ RI VFRUH LQWHUSUHWDWLRQV IRU WKH 5HJHQW
PXOWLSOH VRXUFHV RI HYLGHQFH &KDSWHU LQFOXGHV 3V\F
$(5$ HW DO VSHFLILHV ILYH VRXUFHV RI YDOLGLW\ HY
GRFXPHQW WR VXSSRUW YDOLGLW\ FODLPV IRU DQ DVVHVVPH

- WHVW FRQWHQW
- UHVSRQVH SURFHVVHV
- LQWHUQDO WHVW VWUXFWXUH
- UHODWLRQ WR RWKHU YDULDEOHV
- FRQVHTXHQFHV RI WHVWLQJ

,W LV LPSRUWDQW WR QRWH WKDW WKHVH FDWHJRULHV DUH
RIWHQ WRR OLWWOH LQWHUQDO RQH FDWHJRU\ DV GLVFXVVHG LQ PRUH
FODVVLILFDWLRQV SURYLGH GDWD RQ HDFK RI WKH ZRUN ZLWKLQ WK
DQG GRFXPHQWDWLRQ RI YDOLGLW\ HYLGHQFH VR WKH\ DUH

DXPLQLVW€UDWRUI V@RU ô•0PHSRUW ô• DQG KH\RQ

$FFRPPRGDWLRQ 3ODQV 3ODQV)XOOY DLODEOH PDLQLVWU
KWWS ZZZ S Q\VHG JRY DVVHVVPHQW KVJHQ

7KH LPSOHPHQWDWLRQ RI ULJRURXV VFRULQJ SURFHGXUHV C
WHVW VFRULQJ SUDFWLFHV WKHUHIRUH IRFXV RQ SURGXFLQ
VFRUHG YLD ORFDO VFDQQLQJ DW WHVWLQJ FHQWHUV DQG
7KHUH DUH PDQ\ VWXGLHV WKDW IRFXV RQ YDULRXV HOHPHQ
FRQVWUXFWHG UHVSRQVH LWHPV EXW JHQHUDOO\ DWWHQW
VFRUHV IRU FRQVWUXFWHG UHVSRQVH LWHPV €DOGLEXW GTY

%LDV DOVR LQFOXGHV SKHQRPHQD VXFK DV WKH KDOR HIIHF
RQH HOHPHQW RI WKH UXEULF HQFRXUDJHV LQDFFXUDWH VF
FDQ EH HIIHFWLYHO\ FRQWUROOHG E\ WUDLQLQJ SUDFWLFHV

7KH WUDLQLQJ SURFHVV IRU RSHUDWLRQDO VFRULQJ E\ VWD
DFWXDO VWXGHQW ZRUN RQ FRQVWUXFWHG UHVSRQVH WHVW
FKDUDFWHULVWLFV W\SLFDO RI H[DPLQHH UHVSRQVHV DV ZH
PDNH 7KLV LQIRUPDWLRQ LV XVHG WR WUDLQ UDWHUV RQ KI
UXEULF DFURVV WKH GRPDLQ RI VWXGHQW UHVSRQVHV

5DWHUV WKHQ UHFHLYH WUDLQLQJ FRQVLVWHQW ZLWK WKH J
DQG DUH DOORZHG WR SUDFWLFH VFRULQJ SULRU WR WKH VV
WKHUH DUH LPSRUWDQW SURFHGXUHV IRU FRUUHFWLQJ LQFR
IRU FRQVWUXFWHG UHVSRQVH LWHPV :KHQ PRQLWRULQJ DQ
FRQVWUXFW LUUHOHYDQW YDULDWLRQ PD\ EH LQWURGXFHG
UHYLHZ WKH FRQVLVWHQF\ RI VFRULQJ IRU WKHLU DVVLJQHG
IRU FRQVXOWDWLRQ WKURXJKRXW WKH VFRULQJ SURFHVV

$WWHQWLRQ WR WKH UXEULF GHVLJQ DOVR IXQGDPHQWDOO\
SURFHVVHV 7KH UXEULF VSHFLILHV ZKDW WKH H[DPLQHH QH
WKH TXHVWLRQ DVNHG 7KH PRUH H[SOLFLW WKH UXEULF DQ
H[SHFWDWLRQV DUH IRU H[DPLQHHV 7R IDFLOLWDWH WKH GH
WKH 1<6(' WUDLQLQJ IRU ZULWLQJ LWHPV LQFOXGHV VSHFLIL

- 7KH UXEULF VKRXOG FOHDUO\ VSHFLI\ WKH FULWHULD
- 7KH UXEULF VKRXOG EH DOLJQHG WR ZKDW LV DVNHG I NQRZOHGJH RU VNLOO EHLQJ DVVHVVHG
- :KHQHYHU SRVVLEOH WKH UXEULF VKRXOG EH ZULWWH RWKHU OHJLWLPDWH PHWKRGV

,Q VXSSRUW RI WKH JRDO RI YDOLG VFRUH LQWHUSUHWDWLR
SURFHGXUHV DUH LPSOHPHQWHG IRU WKH 5HJHQWV ([DPLQDV
VHOHFWHG EDVHG RQ H[SHUWLVH LQ WKH H[DP VXEMHFW DQ
PRUH WKDQ DSSUR[LPDWHO\ RQH KDOI RI WKH LWHP H
PRUHO\ P0W WQH
Vp €

WKDQ D UHVSRQVH HDUQLQJ D VFRUH RI ³ ´ DQG ³ ´ LV EHWV
RWKHU KDQG UHIHUV WR WKH FRPSDULVRQ RI PHPEHUV IURP
WKH PDWFKLQJ YDULDEOH²WKH WRWDO WHVW VFRUH LQ RXU

6L[RSHUDWLRQDO LWHP VKRZHG D PRGHUDWH OHYHO RI ',) C
LWHPV WHQGHG WR IDYRU IHPDOHV DQG WKRVH LQ WKH WHQGHG WR
7KHVH WHP ZHUH VXEVHTXHQWO\ UHPRYHG IURP WKH ILQDO
FRQWHQW EDVHG UHDVRQV ZK\ WKH\ PLJKW EH IXQFWLRQLQJ
VWXGHQWV &RQVHTXHQWO\ WKH LWHPV ZHUH XVHG LQ WKH

)XOO GLIIHUHQWLDO LWHP IXQFWLRQLQJ UHVXOWV IRU DOO LWHPV
ORFDWHG LQ WKH 6XSSOHPHQWDU\ 0DWHULDOV VHFWLRQ

IRT Model Fit
0RGHO ILW WR WKH 5DVFK PHWKRG XVHG WR HVWLPDWH ORFDWLR
5HJHQWV ([DPLQDWLRQ LQ *OREDO +LVWRU\ SURYLGH LPSRU
WHVW LV RI KLJK WHFKQLFDO TXDOLW\ 7KH QXPEHU RI LWHP
7DEOH 7KH PHDQ LQILW YDOXH LV ZLWK RI LWHPV
WKH UDQJH RI > @ LV XVHG DV JXLGH IRU LGHDO ILW I
LQGLYLGXDOO\ 2I WKH LWHPV RXWVLGH RI WKLV LGHDO UDQ
DQG

Test Reliability
$V GLVFXVVHG WHVW UHOLDELOLW\ LV D PHDVXUH RI WKH L
PHDVXUH RI WKH H[WHQW WR ZKLFK WKH LWHPV RQ D WHVW
RI WKH GRPDLQ 5HOLDELOLW\ VKRXOG XOWLPDWHO\ GHPRQV
FRQVLVWHQF\ DQG WKHUHIRUH PLQLPL]H HUURU RU WKHRUH
PXOWLSOH WLPHV ZRXOG JHW WKH VDPH VFRUH HDFK WLPH
([DPLQDWLRQ LQ *OREDO +LVWRU\ LV VKRZLQJ KLJK UHO
RI WKLV UHSRUW IRU DGGLWLRQDO GHWDLOV

Classification Consistency and Accuracy
$ GHFLVLRQ FRQVLVWHQF\ DQDO\VLV PHDVXUHV WKH DJUHHP
RYHUODSSLQJ HTXDOO\ GLIILFXOW IRUPV RI WKH WHVW ,I W
VWXGHQWV WKH FRQVLVWHQF\ RI WKH PHDVXUH ZRXOG EH U
GHFLVLRQV PDGH IURP WKH ILUVW VHW RI WHVW VFRUHV PDV
VFRUHV 'HFLVLRQ DFFXUDF\ LV DQ LQGH[WR GHWHUPLQH W
FODVVLILFDWLRQ GLIIHUHQW WKDQ H[SHFWHG IURP WKH WUX
SURYLGHV VWURQJ HYLGHQFH WKDW WKH LQWHUQDO VWUXFW

)RU WKH 5HJHQWV ([DPLQDWLRQ LQ *OREDO +LVWRU\ ERWK
KLJK LQGLFDWLQJ YHU\ JRRG FRQVLVWHQF\ DQG DFFXUDF\ R
FRQVLVWHQF\ UDQJHG IURP WR DQG WKH GHFLVLRQ
5HJHQWV ([DPLQDWLRQ LQ *OREDO +LVWRU\ ERWK GHFLVLRQ
SRLQWV DUH KLJK LQGLFDWLQJ YHU\ JRRG FRQVLVWHQF\ DQ
7DEOH IRU GHWDLOV

Dimensionality

,Q DGGLWLRQ WR PRGHO ILW D VWURQJ DVVXPSWLRQ RI WKH
WHVW LV XQLGLPHQVLRQDO 9LRODWLRQ RI WKLV DVVXPSWLO
RWKHU WKDQ WKH LQWHQGHG FRQWHQW DQG LQGLFDWH WKD

:HLQURWW / -RQHV % 2YHUW YHUVHV &RYHUW DVV
'HYHORSPHQW ±

:RHKU ' - +XIIFXWW $, 5DWHU WUDLQLQJ IRU SH
-RXUQDO RI 2FFXSDWLRQDO DQG 2UJDQL]DWLRQDO 3V\FKR

:ROIH (: *LWRPHU ' + 7KH LQIOXHQFH RI FKDQJH
SV\FKRPHWULF TXDOLWDWLYH RQ -REV 2FFXSDWLRQDO 7HVWLQJ 6

Appendix A Item Writing Guidelines

General Rules for Writing Multiple-Choice Items

1. Use either a direct question or an incomplete statement as the item stem, whichever seems more appropriate to effective presentation of the item.

   Some item ideas can be expressed more simply and clearly in the incomplete statement style of question. On the other hand, some items seem to require direct question stems for the most effective expression. Teachers should use the item style that seems most appropriate.

2. Items should be written in clear and simple language, with vocabulary kept as simple as possible.

   Like any other item, the multiple-choice item should be perfectly clear. Difficult and technical vocabulary should be avoided unless essential for the purpose of the question. The important elements should generally appear early in the statement of the item, with qualifications and explanations following.

3. Each item should have one and only one correct answer.

   While this requirement is obvious, it is not always fulfilled. Sometimes writers produce items involving issues so controversial and debatable that even experts are unable to agree on one correct answer. More often the trouble is failure to consider the full implications of each response.

4. Base each item on a single central problem.

   A multiple-choice item functions most effectively when the student is required to compare directly the relative merits of a number of specific responses to a definite problem. An item consisting merely of a series of u 3 Tr 0.52 [(M)-4 (o)7 44re

8. À }] Æ • •] À ^ Á] [}] Á] v P X _

The item should contain only material relevant to its solution, unless selection of what is relevant is part of the problem.

9. Make the responses grammatically consistent with the stem and parallel with one another in form.

10. Make all responses plausible and attractive to students who lack the information or ability tested by the item.

The incorrect responses should be plausible answers. So far as possible, each response should be designed specifically to attract students who have certain misconceptions or who tend to make certain common errors.

11. Arrange the responses in logical order, if one exists.

Where the responses consist of numbers or letters, they should ordinarily be arranged in ascending order. Events should be listed in the order in which they occurred, from earliest to most recent, except when this order would clue the answer. This practice helps insure the student will mark the answer correctly.

12. Make the responses independent and mutually exclusive.

Responses should not be interrelated in meaning. Responses that are not mutually-exclusive, aid the student in eliminating wrong answers and reduce the reliability of the item by decreasing the number of

CHECKLIST OF TEST CONSTRUCTION PRINCIPLES
(Multiple Choice Items)

)LJXUH % 6FDWWHUSORW 5HJHQWV ([DPLQDWLRQ

)LJXUH % 6WXGHQW 3HUIRUPDQFH 0DS 5HJHQWV ([DPL

)LJXUH % 6FUHH 3ORWV 5HJHQWV ([DPLQDWLRQ L

7DEOH X%P PD6U\,WRHP 5HVLGXDO &RUUHODWLRQ9RE5DHO+QLWWR[UDP
6WDWLVW9LDF7XEH
1
0HDQ
6'

)LJXUH & 6FDWWHUSORW 5HJHQWV ([DPLQDWLRQ

)LJXUH & 6WXGHQW 3HUIRUPDQFH 0DS 5HJHQWV ([DPL

)LJXUH & 6FUHH 3ORWV 5HJHQWV ([DPLQDWLRQ L

7DEOH X&P PDU\ RI ,WHP 5HVLGXDO &RUUHODWLRQV 5HJUHVVLRQV

6WDWLVWLF	9DOXH
1	
0HDQ	
6'	
0LQLPXP	

7DEOH X&PPDU\ RI ,QILW 0HDQ 6TXDUHQHVW(DWPLQQEVR+LVWRU\

	,QILW 0HDQ 6TX
	0HD 6' 0LQ 0D[>
*OREDO	
+LVWRU\	

7DEOH & L5WHDLV7EDLQG 6WDQGDUG (UURUV RI 0HDVXUHPHQW
+LVWRU\

	&RHIIL	
6XEMHI	$OSK	SEM
*OREDO +		

7DEOH & *URXS 0HDQV 5HJHQWV ([DPLQDWLRQ LQ *OREDO