

**STEM Academy for Teachers and
Leaders : 2017 Academy Evaluation**

STEM Academy of Teachers and Leaders : 2017 Academic Evaluation

"#\$%&'(!)'**(!•!+,*#-' , / \$0 1 , \$!2 ' ' % ' * ! • ! 3 , 4 # ' ! 5 * , 4 4 , # \$! • ! 6 , & & , \$ % * , ! 7 , 4 8 # ' - % ! • " ' , \$ \$ ' !
2 9 ! 3 ' 4 4 ' * # \$: ; ' - - ' * !
<= / 4 > ' * \$! + ' 4 > = % # & 4 ! ? \$ @ ' * & # 4 (!

Fall 2017

!

!

*

"#\$%#&#" ' () * + , - & !

E c i e S m a

L23!6LA : !YB,43 ? 5!679!6B*3+B3!L3,B2391!,+4!D3,4391!>97Z3B8!*!.,!>,98+3912*>!038R33+!

*<

"#\$%#&#" '()*+,-&!

Table f C e

G,B^V97/+4!	h
F<39<*3R!7@!823!6LA : !YB,43 ? 5!@79!L3,B2391!,+4!D3,4391!.97Z3B8!	'
./9>713!7@!82*1!d3>798!	g
N7+83+8!,+4!689/B8/93!7@!823!6LA : !YB,43 ? 5!@79!L3,B2391!,+4!D3,4391!	`
YB8*<*8*31!R*82*+!823!6LA : !YB,43 ? 5!@79!L3,B2391!,+4!D3,4391!05!N7+83+8!Y93,!	"#
Maker-Based Instruction	10
Project-Based Learning	11
Social and Emotional Learning	12
Geographic Information Systems	12
Community-based STEM Educational Resources	12
.,98*B*>.,8*+V!L3,B2391!*+!N72798!"!	"J
Teacher Demographic Information	14
Teacher Experience	14
Teacher Education and Certification Information	14
Previous Professional Development	16
Y>>3+4*H!Y!k!.9313+839!G*71!	%I
Y>>3+4*H!G!k!d3@393+B3!D*18!	%'
Y>>3+4*H!N!k!6/9<35!S+189/ ? 3+8!	%`
!	!

Overview of the STEM Academy Teacher and Leadership Project

L23!6LA : !YB,43 ? 5!@79!6B*3+B3!L3,B2391!,+4!D3,4391!>97Z3B8!*1!*+83+434!87!* ?>,B8!'#!>39B3+8!
7@!823! ? *44-3!1B277-!1B*3+B3!83 ,B2391!05!823!@7/982!53 ,9!7@!823!>97Z3B8Q!L23!83 ,B239!1 />>798!@79!
823!>97Z3B8!R ,1!43<3-7>34!87!*+B- /43!82933!>2 ,131Q!!

!

! @7B/131!7+!*+a/*95\$0,134!*+189/B8*7+k!1B*3+8*@*B!>97B311!18,+4,941K!83 ,B239!2(B)1Tf84* ,*34!*+199ZBB

**C e a d S c e f h e S T E M A c a d e m y
Teache**

@7B/134!7+!3B7-7V*B,-!1/BB311*7+!,+4!/134!US6!,1!823!>9*?,95!877-0!L3,B2391!>9313+834!823*9!
>97Z3B81!87!823*9!>3391!,+4!93B3*34!@3340,B^!8297/V2!N,+<,1Q!!

!

=/9*+V!823! K!>,98*B*>,+81!1/0?*8834!,!93@-3B8*7+!<*437!,+4!
?,^391>,B3!49,R*+VK!1*?*,9!87!823!,11*V+?3+81!8235!B7?>-3834!4/9*+V!823!>93\$,B,43?5!7+*+3!
?74/-3K!/1*+V!823!^+7R-34V3!8235!V,*+34!4/9*+V!823!6LA:!YB,43?5Q!L3,B2391!,-17!R,8B234!
?793!<*4371!,+4!93,4!?793!,98*B-31!82,8!93*839,834!17?3!7@!823!87>*B1!@97?!823!@,B3\$87\$@,B3!
,B,43?5K!*+B-/4*+V!?,^391>,B31K!877-1!,+4!?,839*,-1K!823!97-3!7@!823!83,B239K!,11311?3+8!K!,+4!
?,^39!?*+4138!Q!D,18-5K!83,B2391!1/0?*8834!,!438,*-34!7+3\$>,V3!>-,+!@79!27R!87!*?>-3?3+8!,+!
:GS!3H>39*3+B3K!/1*+V!823*9!R79^!@97?!823*9!7R+!>9313+8,8*7+1!79!823!*+@79?,8*7+!>97<*434!
4/9*+V!823!6LA:!YB,43?5Q!

P jec -Ba ed Lea i g

=/9*+V!823! K!>,98*B*>,+81!R393!*+8974/B34!87!.GD!8297/V2!
13<39,-!,98*B-31!,+4!<*4371Q!6>3B*@*B,--5K!8235!-3,9+34!,07/8!823!I!^351!87!.GD0!"\!318,0-*12*+V!
93,-\$R79-4!B7++3B8*7+1K!&!B7++3B8*+V!87!9*V797/1!B7+83+8K!%\!189/B8/9*+V!18/43+8!B7--,079,8*7+K!J\
@,B*-*8,8*+V!18/43+8\$49<3+!-3,9+*+VK!,+4!I!\!3?0344*+V!,11311?3+8!8297/V27/8!.GD!/+*81Q!
. ,98*B*>,+81!-3,9+34!,07/8!823!3113+8*,-!a/318*7+K!R2*B2!49*31!823!/+*8!,+4!1*8/,831!*8!*+!,+!
*+a/95!B7+83H8Q!Y@839!*43+8*5*+V!2*V2\$>9*79*85!LAm6!,+4!-3,9+*+V!,07/8!823!0,1*B!189/B8/93!7@!
.GDK!83,B2391!B7--,079,834!,+4!09,*+1879?34!*43,1!@79!.GD!/+*81!82,8!R393!-,839!93@*+34!,+4!
,4,>834!4/9*+V!823!@,B3\$87\$@,B3!6LA:!YB,43?5Q!!

!

S+!823! !7@!823!6LA:!YB,43?5K!83,B2391!18,9834!R*82!,!4,5!7@!>251*B1!,+4!
97B^3895!*+189/B8*7+!-34!05!=9Q!.,/-!m9/3V39

B7 ?>-3834!8R7!,4 *8*7+,-!,11*V+ ? 3+81!82,8!3 ?>2,1*W34!823!B/-8/93!7@!,+!*+a/*95\$0,134!
B-,11977 ?Q!L3,B2391!R9783!,07/8!,+4!B93,834!,B8*7+!>-,+1!,97/+4!* ?>-3 ? 3+8,8*7+!7@!17 ? 3!7@!823!
3@@3B8*<3!189,83V*3 !8,/V28!*+!823!.GD!,+4!6AD!@,B3\$87\$@,B3!1311*7+1Q!

S c i a l a d E m i a l L e a i g

6AD!*+<7-<31!823!>7B31131!8297/V2!R2*B2!,4/-8!!,+4!B2*-493+!43<3-7>!17B*,-,+4!3 ? 78*7+,-!
B7 ?>383+B*31!*+!@*<3!,93,10!

! 63-@\$,R,93+311 r ^+7R*+V!57/9!1893+V821!,+4!* ? *8,8*7+1!!

! 63-@ \$? ,+,V3 ? 3+8 r 03*+V!,0-3!87!18,5!*+!B7+897-!,+4!>3913<393!8297/V2!B2,--3+V31!!

! 67B*,-,R,93+311 r /+43918,+4*+V!,+4!3 ?>,82*W*+V!R*82!782391!!

! d3-,8*7+12*!1^*--1 r 03*+V!,0-3!87!R79^!*+!83, ? !!,+4!9317-<3!B7+@-*B81!!

! d31>7+1*0-3!43B*1*7+\$? ,^*+V r ? ,^*+V!382*B,-!,+4!1,@3!43B*1*7+1!

=/9*+V!823!6AD!89,*+*+V!4/9*+V!823! !7@!823!6LA : !YB,43 ? 5K!=9Q!=,9,!d711!
@,B*-*8,834!*+189/B8*7+!@79!83,B2391!87!^+7Rk!/+43918,+4k!,+4!,>>-5!6AD!83B2+*a/31!*+!823! ? *44-3\$
1B277-!B-,11977 ?Q!L23!83,B2391!3+V,V34!R*82!,B8*<*8*31!82,8!,-7R34!823 ? !87!/+43918,+4!823!

>798*7+!7@!823!6LA : !YB,43 ? 5K!8235!R3+8!87!823!= , --, !!c77Q!L23!13B7+4!R33^!7@!823!6LA : !
YB,43 ? 5K!83 ,B2391!R3+8!87!823!L9*+*85!d* <39!Y /4/07+!N3+839Q!L23!>/9>713!7@!823!13!@*3-4!
3H>39*3+B31!R, 1!87!433>3+!83 ,B2391!]/+43918, +4*+V!7@!823!>7R39!7@!+@79 ? , -!-3, 9+*+VK!R2*-3! , -17!
3H>71*+V!823 ? !87!>711*0-3!@*3-4!89*>1!@79!823*9!7R+!18/43+8!Q!L23!1>3B*@*B!-3, 9+*+V!V7 , -1!R393!@79!
83 ,B2391!870!

"Q! ; +43918, +4!27R!*+@79 ? , -!-3, 9+*+V!B7+83H8!B, +!@, B*-8, 83!18/43+8!-3, 9+*+V!7@!93-3< , +8!
LAm6Q!

&Q! AH>- , *+!27R!*+839318K! ? 78*< , 8*7+k! , +4! , !13+13!7@!43+8*85!B, +!03!3+2, +B34!05!3H>71*+V!
18/43+8!187!B7 ? ? /+*85\$0, 134!6LA : !B7+83H81Q!!!!

%Q! ; +43918, +4! , +4! , >>-5! , !@9 , ? 3R79^!B7+1*439*+V!823!< , -/3!7@! , +!+@79 ? , -!-3, 9+*+V!B7+83H8!
@79!1/ >>798*+V!6AD!V7 , -1Q!!!!

! "#\$%&' '%

L23!= , --, !!c77J!182933!83+381! , 930!B7+139< , 8*7+k! , +* ? , -!R3-@ , 93K! , +4!34/B, 8*7+Q!L23!" #h\$, B93!W77!!!!
3 ? 0341!82*1! ? *11*7+!*+!3<395! , 1>3B8!7@!823*9!< , 9*7/!-3, 9+*+V! ? 74/-31!82, 8!1> , +1!3, 9-5!B2*-42774!!!!
34/B, 8*7+k!27 ? 31B277-!34/B, 8*7+k!B- , 11977 ? !>97V9 , ? 1K!@ , ? *-5!>97V9 , ? 1! , 1!R3--! , 1!34/B, 879!
R79^127>1Q!!

Y8!823!W77K!823!83 , B2391!03V, +!823*9! ? 79+*+V!R*82! , +!*+8974/B8*7+!87!1B*3+8*@*B!7/9+ , -! , +4!
70139<34!< , 9*7/! , +* ? , -!+!823*9!2, 0*8, 81Q!L, H7+7 ? *B!B- , 11*@*B, 8*7+!/8*-W*+V!B- , 47V9 , ? 1!R393!
/134!8297/V27/8!823!4, 5! , 1! , +!70139< , 8*7+!877-! , 1!83, B2391!93B79434! , +* ? , -1!R*82*+!823!
239>38, 9* / ? K!9 , >879!3+B-71/93K!@*12! , +4!R*-4-*@3!@ , B*-85K! , +4!B2* ? > , +W33!2, 0*8, 8Q!Y!< , 9*385!7@!
LAm6!R393!B7<3934K!*+B- /4*+V!82713!7+!0*74*<391*85K!93- , 8*7+12*>1!*+! , +13B715183 ? K! , +4!
3+<*97+ ? 3+8, -!B2, +V31! , +4!* ? > , B81!7+!823!3+<*97+ ? 3+8Q!63<39 , -!7@!823!1B*3+8*@*B!>9, B8*B31!*+!823!
LAm6K!1/B2! , 1!13-3B8*+V! , >>97>9* , 83!877-1! , +4! / 1*+V!3<*43+B3K!R393!*+B79>79, 834!+87!823!c77!
@*3-4!3H>39*3+B3Q!!

() * + , - % . * / 0) % 12324 ' + % 50 + , 0

G*7B23 ? *1895k!, +4!A+<*97+ ? 3+8, -!Y+, -51*1Q! b 2*-3!823! ? , 779*85!7@!823!83, B2391!2, <3!43V9331!*+!
6LA : !@*3-4!K! ? , +5!7@!823!83, B2391!47!+78!, +4!2, <3!43V9331!*+!A+V-*12K! . 15B27-7V5K!79! : , 11!
N7 ? ? /+*B, 8*7+k!@79!3H, ? >-3Q!F+3\$@7/982!7@!823!83, B2391!, -17!27-4! : , 1839]1!43V9331Q!

L, 0-3!%Q! : , 779!@79!>, 98*B*>, 8*+V!83, B2391]!G, B23-79]1!43V9331!

G, B23-79]1! = 3V933!	1 / ? 039!7@!L3, B2391!
Y>>-*34!Y981!C!6B*3+B31!	"!
G*7B23 ? *1895!	"!
G*7-7V5!	h!
G/1*+311!Y4 ? *+*189, 8*7+!	"!
A+V-*12!	"!
A+<*97+ ? 3+8, -!Y+, -51*1!	"!
S+8394*1B*>-*+, 95!68/4*31!	"!
m*+31*7-7V5!	"!
: , 11!N7 ? ? /+*B, 8*7+!	"!
: , 823 ? , 8*B1!	"!
. 15B27-7V5!	"!

!

L23!83, B2391!, -17!27-4!, !<, 9*385!7@!83, B2*+V!B398*@*B, 8*7+1Q!6*H!83, B2391![% 'QI e \!27-4!8R7!79! ? 793!
B398*@*B, 8*7+1K!R2*-3!h&QI e !7@!823!83, B2391!27-4!, !1*+V-3!1/OZ3B8\$, 93, !B398*@*B, 8*7+![133!L, 0-3!J\Q!!!

L, 0-3!JQ! 1 / ? 039!7@!B398*@*B, 8*7+1!@79!>, 98*B*>, 8*+V!83, B2391!!

N398*@*B, 8*7+1!	1 / ? 039!7@!L3, B2391!
"!1/OZ3B8\$, 93, !B398*@*B, 8*7+!	"#!
&!1/OZ3B8\$, 93, !B398*@*B, 8*7+1!	I!
%!1/OZ3B8\$, 93, !B398*@*B, 8*7+1!	"!

!

L23!+/ ? 039!, +4!85>31!7@!83, B2*+V!B398*@*B, 8*7+1!B, +!03!133+!*+!) *V/93!"Q!L23! ? 718!B7 ? ? 7+!
B398*@*B, 8*7+!*1!6B*3+B3!@79!U9, 431!J\$gk!R2*-3!823!13B7+4! ? 718!B7 ? ? 7+!B398*@*B, 8*7+!*1!U3+39, -*18!
@79!U9, 431!J\$gQ!Y>>97H* ? , 83-5!h` e !7@!823!83, B2391!27-4!1B*3+B3!B398*@*B, 8*7+1!7@!17 ? 3!^*+4K!
R2*-3!%" e !27-4!V3+39, -*18!B398*@*B, 8*7+1!, +4!47!+78!27-4!1B*3+B3!B398*@*B, 8*7+1Q![6*+B3!17 ? 3!
83, B2391!27-4! ? 793!82, +!7+3!B398*@*B, 8*7+k!82393!, 93! ? 793!82, +!"h!4, 8, !>7*+81!*+!) *V/93!"Q\!!!

!

Q! 1 / ? 039!, +4!85>31!7@!83, B2*+V!B39*!@*B, 8*7+1!@79!>, 98*B*>, 8*+V!83, B2391Q!

!
P e i P f e i a l D e e l m e

L23!83, B2391!2, 4!, --!>, 98*B*>, 834!*+!>93<*7/1!1B*3+B3!>97@311*7+, -!43<3-7> ? 3+8!, +4!>97@311*7+, -!
43<3-7> ? 3+8!7+!78239!87>*B1Q!

.9*79!87!823!6LA : !YB, 43 ? 5!@79!L3, B2391!, +4!D3, 4391K!, --!83, B2391!1>3+8!8* ? 3!7+!*+\$139<*B3!
34/B, 8*7+!93-, 834!87!1B*3+B3!B7+83+8!*+!823!>, 18!53, 9![133!)*V/93!&!

!

Q!6B*3+B3!>97@311*7+,-!43<3-7> ? 3+8!05!87>*BQ!

!

!

L3,B2391!,-17!2,4!<,9*34!-3<3-1!7@!>93<*7/1!>97@311*7+,-!43<3-7> ? 3+8!7+!6ADK!18/43+81!R*82!
4*1,0*-*8*31K!,+4!A+V-*12\$-,+V/,V3!-3,9+391![133!L,0-3!h!,+4!)*V/93!%\Q!Y>>97H* ? ,83-5!gg e !,+4!
`J e !7@!83,B2391!2,4!-311!82,+!1*H!27/91!7@!>97@311*7+,-!43<3-7> ? 3+8!*+!823!>,18!53,9!7+!6AD!79!
18/43+81!R*82!4*1,0*-*8*31K!931>3B8* <3-5Q!E7R3<39K!7<39!2,-@!7@!823!83,B2391!2,4!93B3* <34!7<39!"h!
27/91!7@!>97@311*7+,-!43<3-7> ? 3+8!7+!A+V-*12\$-,+V/,V3!-3,9+391Q!!

L,0-3!hQ!.97@311*7+,-!43<3-7> ? 3+8!05!87>*B!

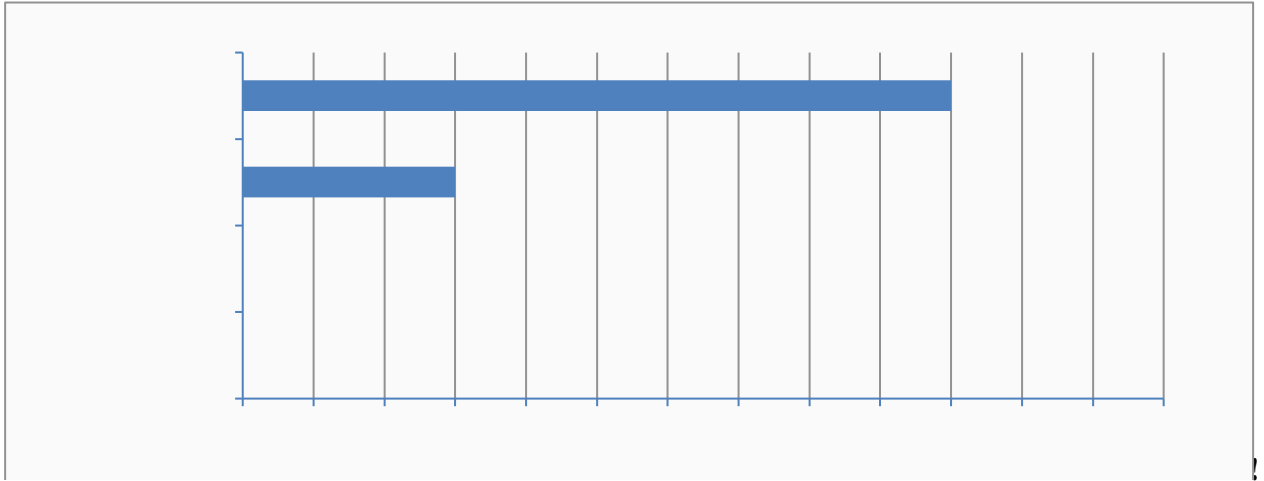
L7>*B!	17+3!	D311!82,+! h!E7/91!	h\$" I! E7/91!	"h\$I! E7/91!	: 793! 82,+!%I!
--------	-------	------------------------	-------------------	------------------	--------------------

" "

"#\$%#&#" ' ()*+,-&!

"#!L23!6LA : !YB,43 ? 5!R,1!,!<,-/,0-3!>97@311*7+,-!43<3-7> ? 3+8!7>>798/+*85Q!
!

!



!
!

d31>7+13!	N7/+8!	e!
6897+V-5!YV933!	"#!	'hQ` e!
YV933!	%!	&%Q" e!
=*1, V933!	#!	# e!
6897+V-5!4*1, V933!	#!	# e!

!
!
!!

!

"%\$!L23!6LA : !YB,43 ? 5!433>3+34! ? 5!/ +43918,+4*+V!7@0

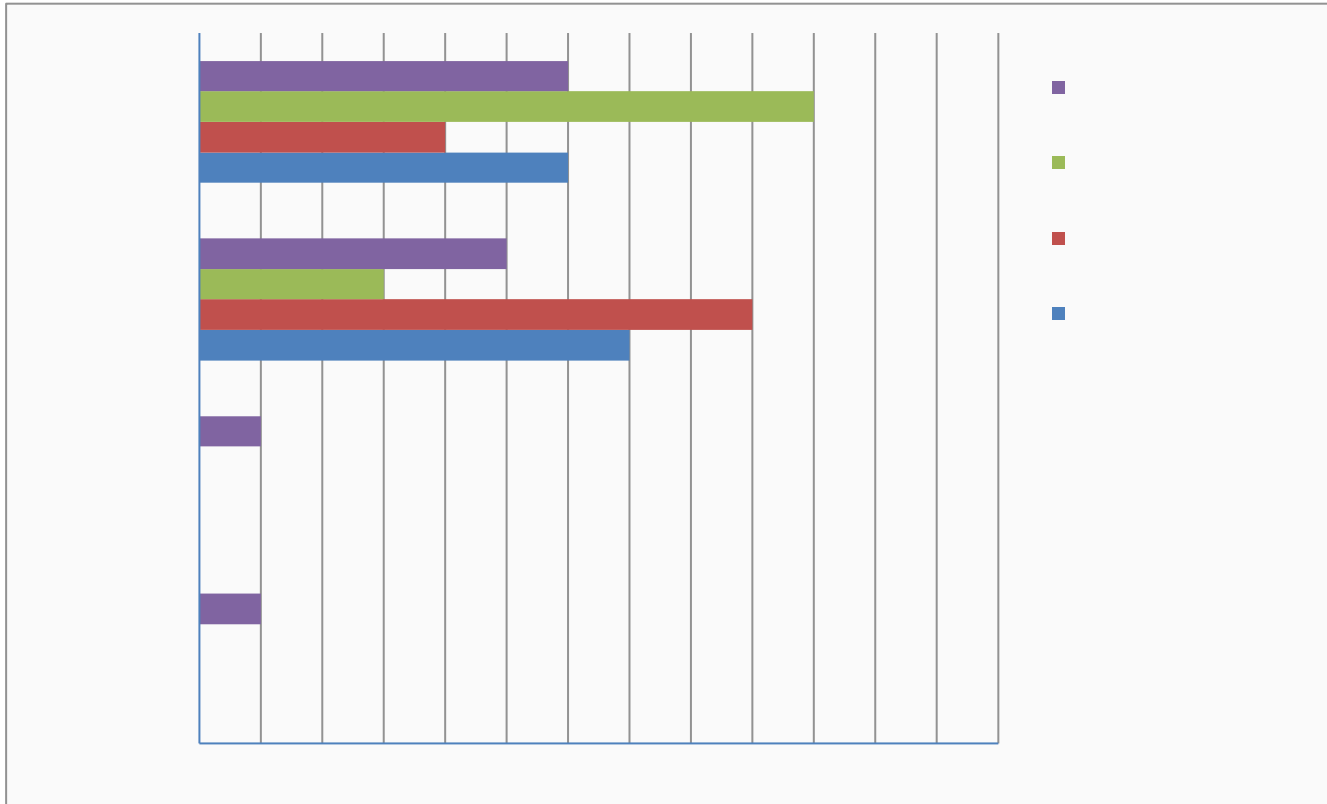
&"

"#\$%#\$&#" ' ()*+,-&!

"&\$!L23!6LA : !YB,43 ? 5!>97<*434! ? 3!R*82!823!877-1!S!+334!87!,>>-5!*+! ? 5!B-,11977 ? !823!>9*+B*>-31!
7@0!

- ! .9773B8\$G,134!D3,9+*+V!
- ! : ,^39\$G,134!S+189/B8*7+!
- ! 67B*,-!,+4!A ? 78*7+,-!D3,9+*+V!
- ! U37V9,>2*B!S+@79 ? ,8*7+!65183 ? 1!

!
!



!

u /318*7+!	6897+V-5! =*1,V933!		=*1,V933!		YV933!		6897+V-5!YV933!	
	N7/+8!	e!	N7/+8!	e!	N7/+8!	e!	N7/+8!	e!
.9773B8\$G,134!D3,9+*+V!	#!	#e!	#!	#e!	'!	I%Qge!	h!	JhQ&e!
: ,^39\$G,134!S+189/B8*7+!	#!	#e!	#!	#e!	`!	h`Q&e!	J!	%#Qge!
67B*,-!,+4!A ? 78*7+,-! D3,9+*+V!	#!	#e!	#!	#e!	%!	&%Q"e!	"#!	'hQ`e!
U37V9,>2*B!S+@79 ? ,8*7+! 65183 ? 1!	"!	'Q'e!	"!	'Q'e!	I!	%gQIe!	h!	JhQ&e!

!
!
!

!

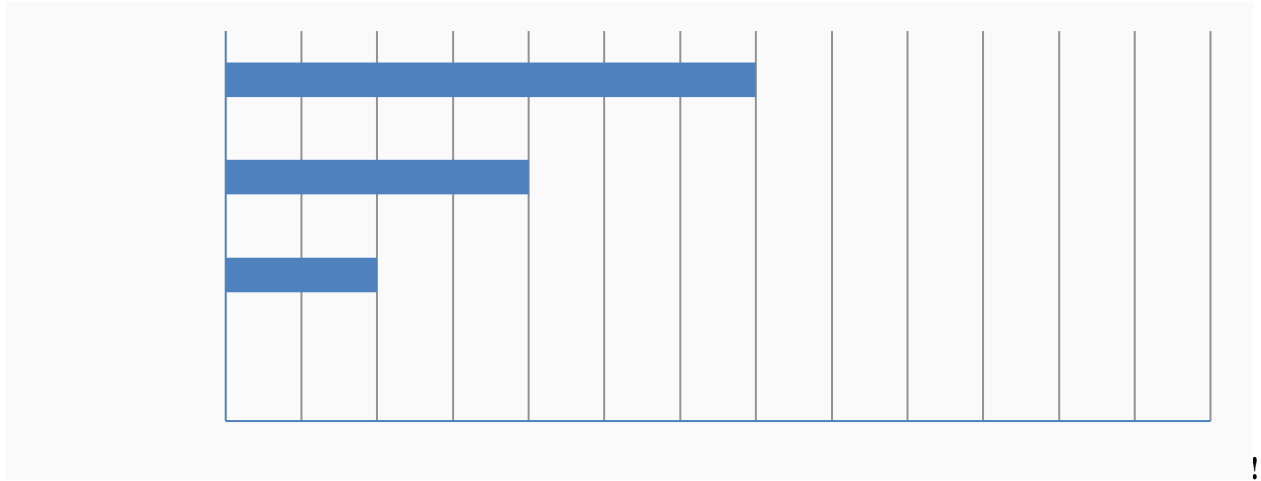
" '\$!L23!^+7R-34V3!S!V,*+34!,8!823!6LA : !YB,43 ? 5!R*--!23->! ? 3!* ? >97<3! ? 5!1B*3+B3!*+189/B8*7+Q!
!

!

!

d31>7+13!	N7/+8!	e!
6897+V-5!YV933!	g!	h"QI e!
YV933!	I!	%gQI e!
=*1,V933!	#!	#e!
6897+V-5!*=*1,V933!		

" (Q!L23!B7+83+8!7@!823!6LA : !YB,43 ? 5! ? 38! ? 5!3H>3B8,8*7+1Q!
!



!
!

d31>7+13!	N7/+8!	e!
6897+V-5!YV933!	'!	I%Q` e!
YV933!	J!	%#0g e!
=*1, V933!	&!	"IQJ e!
6897+V-5! =*1, V933!	#!	# e!

!
!
!
!
!

!

")\$!L23!189/B8/93!7@!823!6LA : !YB,43 ? 5!3+2,+B34! ? 5!/+43918,+4*+V!7@!823!1B*3+B3!B7+83+8!S!
83,B2Q!
!



!

d31>7+13!	N7/+8!	e!
6897+V-5!YV933!	h!	JhQ&e!
YV933!	J!	%#0ge!
=*1,V933!	&!	"IQJe!
6897+V-5!*=1,V933!	"!	'q' e!

!
!
!
!
!

!

"*! L23! @7--7R\$/>! B7, B2*+V! , +4! 1/>>798! >-, ++34! @79! 823! 1B277-! 53, 9! R*--! 23->! ? 3! ,>>-5! 823!
@7--7R*+V! B7+B3>81!*+! ? 5! 1B*3+B3!*+189/B8*7+0!
!

!
!
!

u /318*7+!	6897+V-5! =*1, V933!	=*1, V933!	YV933!	6897+V-5! YV933!
	N7/+8! e!	N7/+8! e!		

!"+\$!L23!@*3-4!89*>!87!823!=,--,1!c770!
!

!
!

!

u /318*7+!	6897+V-5! =*1, V933!	=*1, V933!	YV933!	6897+V-5!YV933!
	N7/+8! e!	N7/+8! e!	N7/+8! e!	N7/+8! e!

.97<*434! ? 3!R*82!*43, 1!7+!

27R!87!1/>>-3 ? 3+8!*+\$

B-, 11!-3, 9+*+V!R*82!, !89*>!

87!, !B7 ? ? /+*85!0, 134!

6LA : !34/B, 8*7+!9317/9B3!

"! 'q' e! "!'q' e! h! Jh0&e! I! %g(I e!

&'

"#\$%#\$&#" ' ()*+,-&!

"#,\$!

&g

"#\$%#&#" '()*+,-&!

"#%\$!6>3,^391!,8!823!6LA : !YB,43 ? 5!R79^127>1!43-*<3934!2*V2\$a / ,-*85!*+@79 ? ,8*7+!,07/80!
!

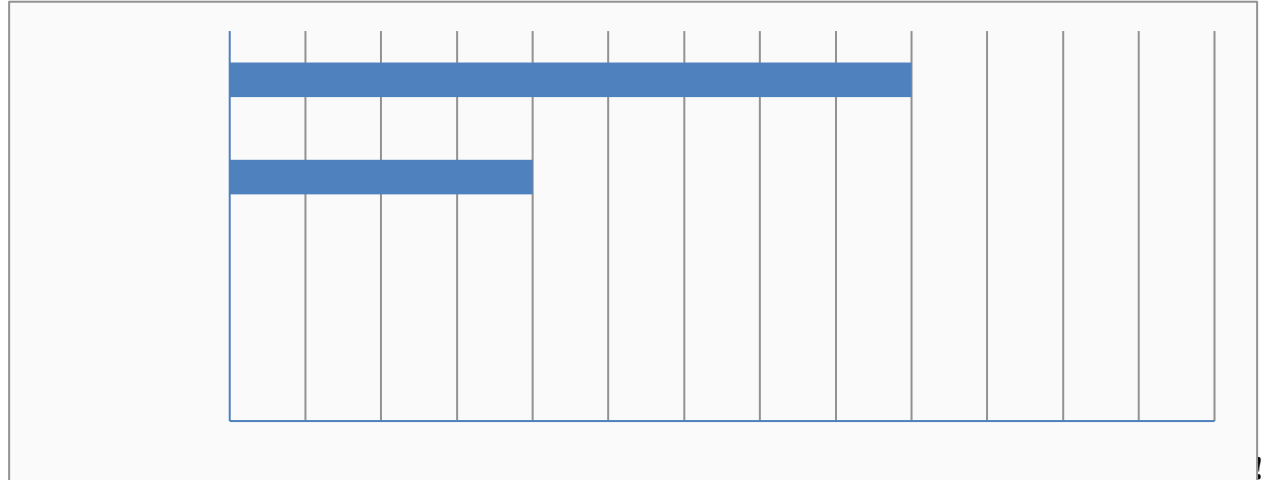
!
!
!

!

u /318*7+!	6897+V-5! =*1, V933!	=*1, V933!	YV933!	6897+V-5!YV933
------------	-------------------------	------------	--------	----------------

"#&\$!L23!6LA : !YB,43 ? 5!R, 1!*+839,B8*<3Q!

!



!

!

d31>7+13!	N7/+8!	e!
6897+V-5!YV933!	`!	h`Q&e!
YV933!	J!	%#0ge!
=*1,V933!	#!	#e!
6897+V-5!=*1,V933!	#!	#e!

!

!

!

!

!

!

!

"# \$! b 2, 8!, 93, 1!7@!823!6LA : !YB, 43 ? 5!R393! ? 718!/13@/-!87!57/w! . -3, 13!3H>- , *+Q!

!

F>3+!3+434!931>7+131!*+4*B, 83!82, 8!83, B2391!@3-8!82, 8!*+189/B8*7+!7+! : GSK! . GDK!, +4!6AD!R, 1!

3H893 ? 3-5!/13@/-!87!823*9!>9, B8*B3Q! : GS!R, 1! ? 3+8*7+34! ' !8* ? 31K! . GD!I!8* ? 31K!, +4!67B*, -\$

A ? 78*7+, -!D3, 9+*+V! ' !8* ? 31Q!L23!83, B2391!+7834!823!2, +4!\$7+!+, 8/93!7@!*+189/B8*7+K!, >> *B, 0*-*85!

87!823*9!7R+!B-, 11977 ? 1K!, +4!a/ , -*85!>9313+8391!, 1!03*+V!@, B8791!82, 8!* ? >, B834!823*9!931>7+13Q!

Y44*8*7+, --5K!8R7!83, B2391!+7834!823!7>>798/+*85!87!B7--, 079, 83!R*82!782391!, 1!03*+V!/13@/-K!R2*-3!

7+3!83, B2391+7834!823!@*3-4!89*>1!R393! ? 718!/13@/-Q!

!

!

!

!

!

!

!

!

!

"# (\$! b 2*B2!, 93, 1!7@!823!6LA : !YB, 43 ? 5!+334!* ? >97<3 ? 3+8w! . -3, 13!3H>- , *+Q!!

!

F<39, --K! ? 718!7@!823!1/VV318*7+1!@79!* ? >97<3 ? 3+8!B3+83934!7+!823!<*1*81!87!823!B7 ? ? /+*85\$0, 134!

S a f Re l

A<395!83,B239!["## e T!"%f"%!\,V9334!82,8!823!6LA : !YB,43 ? 5!R,1!,!<,-/,0-3!>97@311*7+,-!
43<3-7> ? 3+8!7>>798/+*85!,+4!82,8!823!^+7R-34V3!V,*+34!,8!823!6LA : !YB,43 ? 5!R7/-4!23->!823 ?!
* ?>97<3!823*9!1B*3+B3!83,B2*+VK!R*82!' ' e !["#f"%!\,+4!h& e ![gf"%!\!1897+V-5!,V933*+VK!

A e di A P e e e Bi

: /-8*>-3!3H>3981!139<34!, !!>9313+8391!, 8!823!6LA : !YB, 43 ? 5!@79!L3, B2391!, +4!D3, 4391Q!Y!09*3@!
0*7V9, >2*B, -!1^38B2!*1!*+B-/434!03-7RQ!!

!

- ./01!234567880! b *82!7<39!"g!53, 91!7@!3H>39*3+B3!, !!, +!34/B, 879K!d705+!E, 98W3--!2, 1!
2, 4!823!7>>798/+*85!87!139<3!*+!, !<, 9*385!7@!97-31!*+B-/4*+V!83, B239K!*+189/B8*7+, -!B7, B2K!
*+839<3+8*7+*18K!89, *+39K!, +4!B7+1/-8, +8Q!623!R, 1!, !B-, 11977 ? !83, B239!@79!3*V28!53, 91!03@793!
? 7<*+V!*+87!, +!*+839<3+8*7+*18fB7, B2*+V!>71*8*7+Q!Y@839!3-3<3+!53, 91!7@!83, B2*+V!, +4!
B7, B2*+VK!E, 98W3--!89, +1*8*7+34!87!823!97-3!7@!N7+1/-8, +8K!823+! . 97V9, ? !N7794*+, 879!@79!
823!13B7+4!-, 9V318!A4/B, 8*7+, -!639<*B3!N3+839!*+!823!18, 83!7@!L3H, 1Q! b 2*-3!82393K!123!
43<3-7>34!, +4!>97<*434!89, *+*+V!@79!m\$" &!83, B2391!, +4!*+189/B8*7+, -!B7, B231!*+!>/0-*BK!
>9*<, 83K!, +4!B2, 9839!1B277-1Q! : 718!93B3+8-5K!123!2, 1!033+!139<*+V!, !!, +!, 4Z/+B8!*+189/B879!
@79!6 : ; !*+!823!L3, B2*+V!, +4!D3, 9+*+V!=3>, 98 ? 3+8!R2393!123!2, 1!2, 4!823!7>>798/+*85!87!
83, B2!, !V9, 4/ , 83!-3<3-!B7/913!7+! . GD!82, 8!R, 1!B93, 834!*+!>, 98+3912*>!R*82! = , --, 1!S6=Q!

!

93:8! ; 4:7<74

A e di B Refe e ce Li

G,997+k!GQK!C!=,9-*+V\$E, ? ? 7+4K!DQ![&##g\Q!L3,B2*+V!@79! ? 3,+*+V@/-!-3,9+*+V0!Y!93<*3R!7@!
9313,9B2!7+!*+a/*95\$0,134!,+4!B77>39,8* <3!-3,9+*+VQ!
Q!6,+!)9,+B*1B7K!NY0!_71135\$G,11Q!

G,997+k!GQK!6B2R,98WK!=Q!DQK!n53K!1Q!_QK! : 7793K!YQK!.38971*+7K!YQK!c3B2K!DQ!["` ` g\Q!=7*+V!R*82!
/+43918,+4*+V0!D3117+1!@97 ? !9313,9B2!7+!>970-3 ? \$!,+4!>97Z3B8\$0,134!-3,9+*+VQ!
[%fJ\K!&' "\$%" "Q!

N9711K!NQLQK!C!1 ,8*7+,-!N-3,9*+V27/13!@79!N7 ? >9323+1* <3!6B277-!d3@79 ? Q![&##J\Q!. /88*+V!823!
>*3B31!87V382390!D3117+1!@97 ? !B7 ? >9323+1* <3!1B277-!93@79 ? !9313,9B2Q! b ,12*+V87+k!=N0!
1 ,8*7+,-!N-3,9*+V27/13!@79!N7 ? >9323+1* <3!6B277-!d3@79 ? Q!!

Condliffe, B., Visher, M. G., Bangser, M. R., Drohojowska, S., & Saco, L. (2016).!
Q! : = dNQ!

=7/V23985K!=Q![&#"&\Q!L23! ? ,^39! ? 7<3 ? 3+8Q! K! [%\K!" "\$" JQ!

=7/V23985K!=Q![&#" %\Q!L23! ? ,^39! ? *+4138Q!S+! : Q!E7+35!C!=Q!m,+839![A41\K!
! ! [>>Q!"\$h\Q!D7+47+0!d7/8-34V3Q!!

)3+*B23-K! : QK!,+4!6B2R3*+V9/039K!EQYQ![&#"#\Q!
Q!G7,94!7+!6B*3+B3!A4/B,8*7+k!N3+839!@79!A4/B,8*7+k!=* <*1*7+!7@!
G32,<*79,-!,+4!67B*,-!6B*3+B31!,+4!A4/B,8*7+Q! b ,12*+V87+k!=N0!L23!1 ,8*7+,-!
YB,43 ? *31!.9311Q!

E,-<3917+k!AQdQK!C!6239*4,+K!mQ! : Q![&#" J\Q!L23! : ,^39! : 7<3 ? 3+8!*+!
K!gJ[J\K!J` IQ!

E,+K!6QK!N,>9,97K!dQK!C!N,>9,97K! : Q : Q![&#" I\Q!E7R!6B*3+B3K!L3B2+7-7V5K!A+V*+339*+VK!,+4!
: ,823 ? ,8*B1![6LA : \!>97Z3B8\$

689703-k!_72, ++31Qk!C!<, +!G, 9+3<3-4k!Y+V3-, Q![&###` \Q! b 23+!*1! .GD! ? 793!3@@3B8*<3w!Y! ? 38, \$
15+8231*1!7@! ? 38, \$, +, -5131!B7 ?>, 9*+V! . GD!87!B7+<3+8*7+, -!B-, 11977 ? 1![Y0189, B8\Q!
["\k!J JQ!

L27 ? , 1k!_Q! b Q![&###\Q!Y!93<*3R!7@!9313, 9B2!7+!>97Z3B8\$0, 134!-3, 9+*+VQ!

b , -^39k!YQ!C!D3, 95k!EQ![&###` \Q!Y!>970-3 ? \$0, 134!-3, 9+*+V! ? 38, \$, +, -51*10! =*@@393+B31!, B9711!
>970-3 ? !85>31k!* ? >-3 ? 3+8, 8*7+!85>31k!4*1B*>-*+31k!, +4!, 11311 ? 3+8!-3<3-1![Y0189, B8\Q!
["\0!"&\$J%Q!

!

!

A e di C S e l e

CDE F !G?3H7 > 0! I. 4!D73?J74B!31H!K73H74BL!G?3H7 > 0!EM38 : 35-. 1!

!

L7!R2, 8!3H83+8!47!57/!, V933!R*82!823!@7--7R*+V!18, 83 ? 3+8!w!!

!

!	6897+V-5! =*1, V933!	=*1, V933!	YV933!	6897+V-5!YV933!
"Q! L23!6LA : !YB, 43 ? 5!R, !, !<, -/, 0-3! >97@311*7+, -143<3-7> ? 3+8! 7>>798/+*85Q!	!	!	!	!
&Q! L23!6LA : !YB, 43 ? 5!433>3+34! ? 5! /+43918, +4*+V!7@0! ! .97Z3B8\$0, 134!-3, 9+*+V! ! : , ^39\$0, 134!*+189/B8*7+! ! 67B*, -, +4!3 ? 78*7+, -! -3, 9+*+V! ! U37V9, >2*B!*+@79 ? , 8*7+! 15183 ? 1![US6\! ! N7 ? ? /+*85\$0, 134!6LA : ! 34/B, 8*7+!9317/9B31!!	!	!	!	!
%Q! L23!6LA : !YB, 43 ? 5!>97<*434! ? 3! R*82!823!877-1!S!+334!87!, >>-5!*+! ? 5! B-, 11977 ? !823!>9*B*>-31!7@0! ! .97Z3B8\$0, 134!-3, 9+*+V! ! : , ^39\$0, 134!*+189/B8*7+! ! 67B*, -, +4!3 ? 78*7+, -! -3, 9+*+V! ! U37V9, >2*B!*+@79 ? , 8*7+! 15183 ? 1![US6\!	!	!	!	!
JQ! L23!^+7R-34V3!S!V, *+34!, 8!823! 6LA : !YB, 43 ? 5!R*--!23->! ? 3! * ? >97<3! ? 5!1B*3+B3!*+189/B8*7+Q!	!	!	!	!
IQ! L23!B7+83+8!7@!823!6LA : !YB, 43 ? 5! ? 38! ? 5!3H>3B8, 8*7+1Q!	!	!	!	!

!

hQ! L23!189/B8/93!7@!823!6LA : !
YB, 43 ? 5!3+2, +B34! ? 5!
/+43918, +4*+V!7@!823!1B*3+B3!B7+83+8!
S!83, B2Q!

!

!>-, ++34!@79!823!1B277-!53, 9!R*--!23->!
? 3!, >>-5!823!@7--7R*+V!B7+B3>81!*+!
? 5!1B*3+B3!*+189/B8

"%0! b 2,8!,93,1!7@!823!6LA : !YB,43 ? 5!R393! ? 718!/13@/-!87!57/w!!

!
!
!

"JQ! b 2*B2!,93,1!7@!823!6LA : !YB,43 ? 5!+334!* ? >97<3 ? 3+8w!!

!
!
!

"IQ!S1!82393!,+582*+V!3-13!57//!R7/-4!-*^3!87!12,93!,07/8!823!6LA : !YB,43 ? 5w!

!
!