STEM Academy Teacher Outcomes Program Evaluation: Cohorts 1 and 2

RESEARCH IN MATHEMATICS EDUCATION

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>J36&$)ℕ! _)!-%')/3)*!'"X0"8":60.!*"88)/)0:)'!%).O))0!:+:&)'!.O-!60*!8-$/F!.O-!60*!')3)0F!60*!
8-$/!60*!'"@ℕ!
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G6%&)!a!
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DA!

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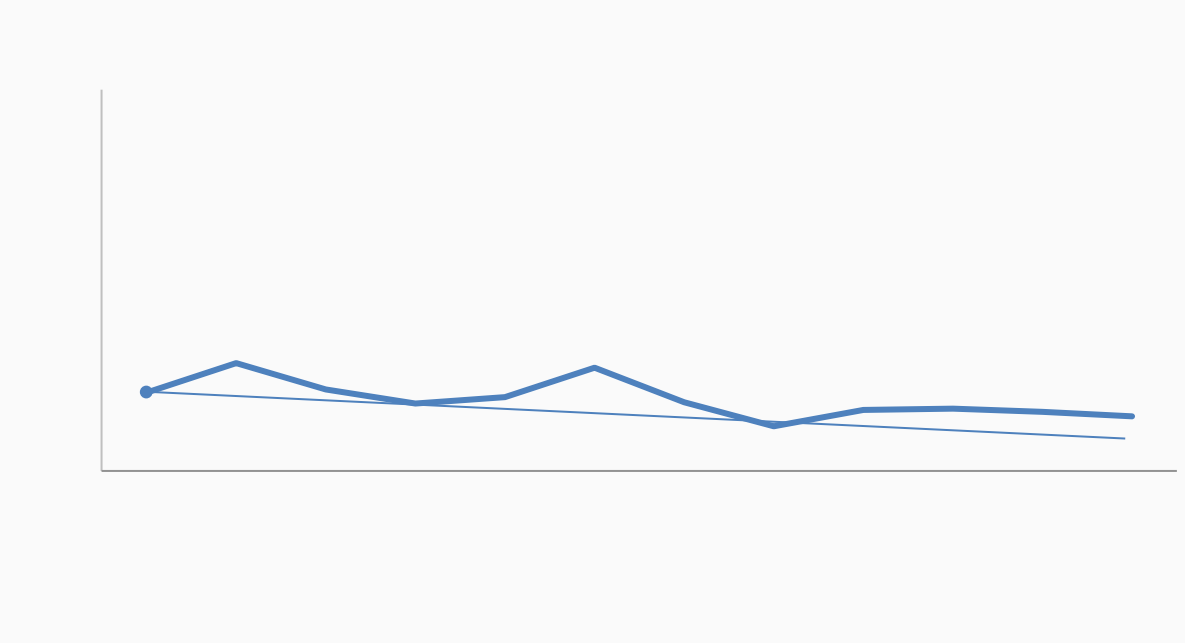
IJE!	JCNIUU!	CNCCbuu!
IJA!	JCNICa!	CNCUDu!
EJc!	CNDac!	CNCEcu!

R.‹*L!uvCNCBF!uuvCNCD!

)*+*,-!"!./0,!"!

Q"X$/)!b!'(-O'!.()!':6&)!':-/)'!8-/!)6:(!."7)5-"0.!8-/!:-(-/.!I!.)6:()/'!O(-!:-75&).)*!%-.(!+)6/'!-8!.()!,G9 1![:6*)7+N!_("&)!.()!1606X)7)0.!60*!4"':"5&"0)!':6&)!':-/)'!*):/)6')*!6:/-''!6&&!."7)5-"0.'F!.()!:(60X)!"'!0-.!6'!*/676.":!6'!.(6.!'))0!"0!:-(-/.!DF!60*!.()!"0./6J+)6/!*/-5'!O)/)!0-.!6'!5/-0-$0:)*N!!Q$/.()/7-/)F!O("&)!:-(-/.!D!(6*!5)6Z'!"0!.()"/!1606X)7)0.!60*!4"':"5&"0)!':6&)!':-/)!6.!:+:&)!D!-8!)6:(!+)6/!8-&&-O)*!%+!*):/)6'"0X!':-/)'F!.("'!./)0*!"'!0-.!6556/)0.!"0!:-(-/.!IN!!,G9 1!P0'./$:."-0!'(-O'!'&"X(.!*):/)6')'!-3)/!.()!.O-!+)6/!5)/"-*N!



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>3)/6&&F!O)!-%')/3)*!'"X0"8":60.!*"88)/)0:)'!%).O))0!."7)5-"0.'!-0!.()!,G9 1!G>#!6'!)3"*)0:)!%+!.()!/)5)6.)*!7)6'$/)'![d>s[!"0!G6%&)!DDN!!G6%&)!DI!5/-3"*)'!.()!G$Z)+J6*Y$'.)*!56"/O"')!:-756/"'-0'!8-/!:-(-/.!I"0!+)6/!IN!

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G6%&)!DD!

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,-$/:)!	,$7'!-8!,^$6/)'!	*8!	1,!	Q!	*HJ*s 6&$)!
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9//-/!	cNUaI!	aa!	CNCcEc!	!	!

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G6%&)!DI!

Db!

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!0610-0'(1<%"7Y,A()IZ73<*)%>(0/=03*%'.+>(/03.13%*

K+:&)!#6"/'!	1)60!4"88)/)0:)!	*HJ*s 6&$)!
kD!K+:&)!IJk I!K+:&)!E!	JCNUaB!	CNCUEu!

Da!

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G6%&)!DU!5/-3"*)'!.()!/)'$&.'!8-/!.()!/)5)6.)*!7)6'$/)'![d > s [!-3)/!.()!8"3)!."7)!5-"0.'ℕ! ,"X0"8":60.!/)'$&.'!5/-75.)*!5-'.J(-:!606&+')'ℕ!G6%&)!DE!*)':/"%)'!.()!G$Z)+J6*Y$'.)*!56"/O"')! 606&+')'ℕ! _)!*).):.)*!'"X0"8":60.!*"88)/)0:)!"0!7)60!2G>#!':-/)'!%).O))0!,5/"0X!ICDb!60*!Q6&&! ICDaF!,5/"0X!ICDb!60*!,5/"0X!ICICF!Q6&&!ICDb!60*!Q6&&!ICDaF!60*!Q6&&!ICDb!60*!,5/"0X!ICICℕ!!

G6%&)!DU!

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, -$/:)! ,$7'!-8!,^$6/)'! *8! 1 ,! Q! *HJ*s 6&$)!

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K&6''/--7!K$&.$/)!	!	!	!
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P75&)7)0.6."-0!	!	!	!
!	,5/"0X!Db!e!Q6&&!Da!	DNDEU!	CNCIDu!
!	Q6&&!Db!e!Q6&&!Da!	DNIbc!	CNCCbuu!
!	Q6&&!Db!e!,5/"0X!IC!	DNDEU!	CNCIDu!
,:")0:)!K-0.)0.!	!	!	!

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G6%&)!Db!

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K&6''/--7!K$&.$/)!	!	!	!	!	!	!

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Q"06&&+F!.()/)!6/)!*"88)/)0:)'!%).O))0!.()!7)60!':-/)'!-8!.()!.O-!:-(-/.'!-8!.)6:()/'N!!K-(-/.!D!':-/)*!("X()/!-0!%-.(!.()!,G9 1!##K!60*!.()!2G>#!.(60!:-(-/.!IN!!93)0!O()0!.()!+)6/!"'!6*Y$'.)*!8-/!*$/6."-0!-8!56/.":"56."-0F!.()!:-(-/.!D!.)6:()/'!')&8J/)5-/.)*!("X()/!8/)^$)0:")'!-8!6:."3)!&)6/0"0X!'./6.)X+!$')!60*!.()!)@.)/06&!2G>#!-%')/3)/'!:65.$/)*!("X()/!&)3)&'!-8!"75&)7)0.6."-0F!&)''-0!'./$:.$/)F!:&6''/--7!:$&.$/)F!60*!':")0:)!:-0.)0.N!!!

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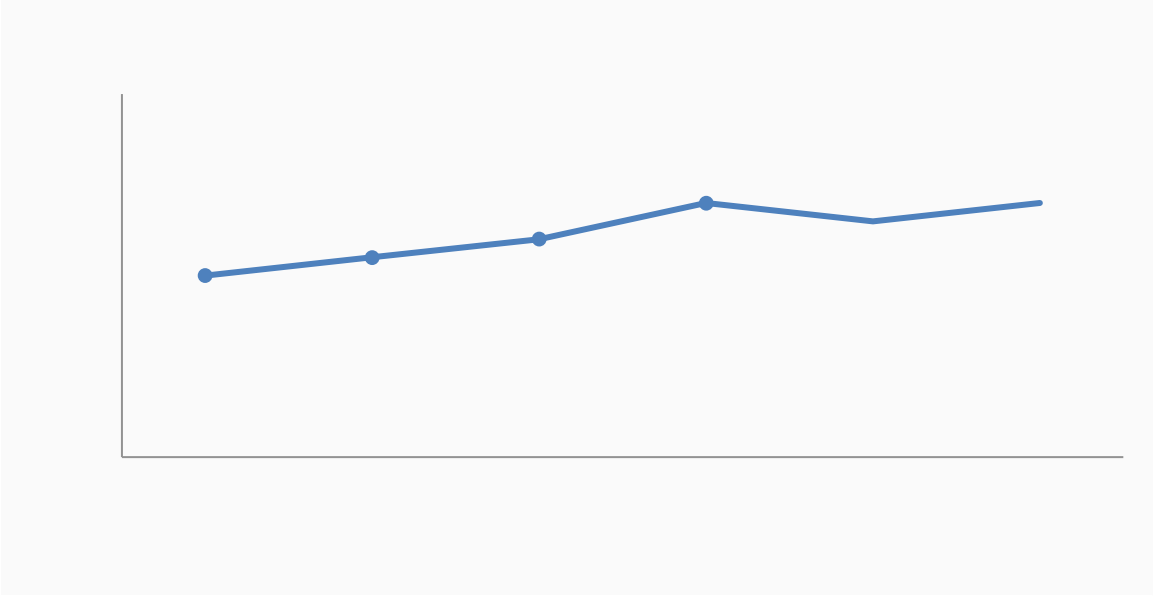

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5067/%8V9!K-(-/.!D!G)6:()/'R!1)60!,:")0:)!#)*6X-X":6&!K-0.)0.!]0-O&)*X)!V#K]W![:/-''!G"7)!

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G-!*).)/7"0)!.()!)@"'.)0:)!-8!6!'"X0"8":60.!:(60X)!6:/-''!."7)!5-"0.'F!6!/)5)6.)*!7)6'$/)'!
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G6%&)!IU!
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H"##$1&240$-&+"00$+#&-(/ / $)&567:&*01&-G)40.&567:&#"&4014+*#$&#, *##&#, 4-&#4 / $G"40#&@*-&0"#&+"22$+#$1&=")&+", ")#&7&
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G6%&)!IB!*).6"&'!.()!/)'$&.'!-8!6!/)5)6.)*!7)6'$/)'![d > s [!606&+'"'F!O(":(!/)3)6&)*!0-!7)60!
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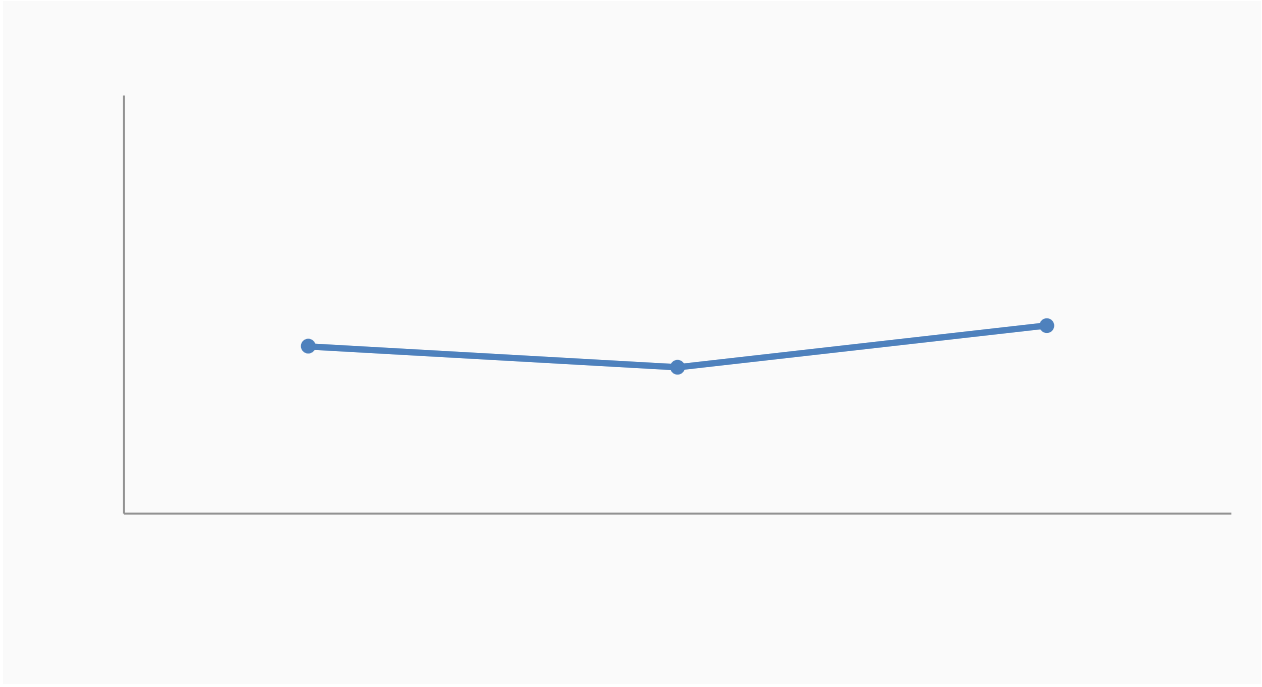
Q"X$/)!Da!'(-O'!.(6.!8-/!:-(-/.!I!.)6:()/'!O(-!:-75&).)*!.()!8"/'.!+)6/F!.()!5)/'-06&!':")0:)!
.)6:("0X!)88":6:+!%)&")8'!*):/)6')*!8/-7!'$77)/!ICDb!.-!86&&!ICDb!%$.!/).$/0)*!.-!%6')&"0)!"0!
'5/"0X!ICDaN!!Q-/!':")0:)!.)6:("0X!-$.:-7)!)@5):.60:+F!.()!77)60'!/)76"0)*!'.6%&)!*$/"0X!.()!
.(/))!."75-"0.'!77)6'$/)*!*$/"0X!.("'!+)6/N!!!



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%)&")8'!.(6.!60!6:."-0!O"&&!(63)!6!863-/6%&)!/)'$&.!V-$.: - 7)!)@5): .6."-0W!60*!.(6.!.( )+!: 60!
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("X( )/!')&8J)88":6:+!8-/!.)6: ("0X!6/)! 7 -/)!&"Z)&+!.-!"7 5&) 7)0.!"00-36."3)F!)3"*)0:)J%6')*!
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G)6:()/!:-08"*)0:)!"0!.()"/!6%"&".+!.-!.)6:(!,G9 1!:-//)&6.)'!O".(!.)6:()/'R!K]!60*!)06:.)*!
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[*6 7 'F!9ℕ!<ℕF!=6.8")&*F!KℕF! ; !])..)/&"0!T)&&)/F!<ℕ!`ℕ!VICDbWℕ!*!"# $ %&'()*+,%-./%!'0*1'*%
"*('2*/3%(1)%4*()*/3\%

ED!

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"*'210'(B%Q*>./<!VG):(N!`)5N!d-N!DaJCBWN!46&&6'F!GHL!,-$.()/0!1).(-*"'.!20"3)/'".+F!
`)')6/:(!"0!16.()76.":'!9*$:6."-0N!

K()0!HNF!;!_)Z-F!GN!VICCaWN!,.$*)0.'!O(-!'.$*+!':")0:)F!.):(0-&-X+F!)0X"0))/"0XF!60*!
76.()76.":'!V,G91W!"0!5-'.'):-0*6/+!)*$:6."-0N!*R(<0.1(B%E*1<*/%-./%#)7'(<0.1%
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] /68.F! 1 NF! [N! ; ! ? &6\6/F! 4 N!V I CDAWN!P0*"3"*$6&"\ )*!: -6: ("0X!.-!" 7 5/-3)!.)6: ( )/!5/6:.":)!6:/-''!
X/6*)'!60*!'$%Y):.'L! d)O!)@5)/" 7)0.6&!)3"*)0:)N!*#)7'(<0.1(B%H.B0',I%P8VAWF!DCUUJDCcbN!

<6%6/))F! 4 N!QN!VDaaAWN!#$%&":!X--*'F!5/"36.)!X--*'L!G()! [7)/":60!'./$XX&)!-3)/!)*$:6."-06&!
X-6&'N!&+*/0'(1%*)7'(<0.1(B%/*3*(/'2%Z.7/1(BF!PUVDWF!UaJbDN

EU!

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#)//+F!<NF!`))*)/F! 1 NfNF!?/6..6"0F!]NF!=6.8")&*F!KNF!;!])..)/&"0!T)&&)/F!<N!VICDAWN!!"#$%&'()*+,%

EE!

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#C(B7(<0.1!VG):(N!`)5N!d-N!DaJDCWN!46&&6'F!GHL!,-$.()/0!1).(-*"'.!20"3)/'".+F!`)')6/:(!
"0!16.()76.":'!9*$:6."-0N!

,56/Z'F![NF![*67'F!9N!<NF!#)//+F!<NF!;!])..)/&"0JT)&&)/F!<N!`N!VICICWN!"2*%)*C*B.>+*1<%.-%(1%
*013</7+*1<%<.%+*(37/*%<*('2*/3`%>*/'*><0.13%.-%!"#$%>/('<0'*9%#65)/!.-!%)!5/)')0.)*!6.!
.()!d6."-06&![''-:"6."-0!8-/!`)')6/:(!"0!,:")0:)!G)6:("0X!Vd[`,GW!`)')6/:(!
K-08)/)0:)F!#-/.&60*F!>`N!VK-08)/)0:)!:60:)&)*W!

G':(600)0J1-/60F!1NF!;!1:16'.)/F!#N!VICCaWN!,-

EB!

!

Appendix A – STEM PPC

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Ec!

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! "#$%& ' "($) *%*$+"%&#+&$#(, -(6 *7"%0 ' *#"1("18$*+&, 35(
! "#$%& ' "(*3("9* 6 .2"(, -() , : (; , 8() *<"(&3+"4%*+"1(6 *+) " 6 *+&$#(&3+, (*(#$&"3$"(2"##, 35(
! "#$%& ' "(*(+; . &$*2(. %, -"##&, 3*2(2"*%3&34($, 6 6 83&+; (6 ""+&34(, 3(; , 8%($* 6 . 8#5((
=) *+(&3-, % 6 *2(2"*%3&34(#"++&34#() *<"(; , 8(8#"1(+, ("3) *3$"(; , 8%(&3#+%8$+&, 3(*31("34*4"(; , 8%(
#+81"3+#>!

EA!

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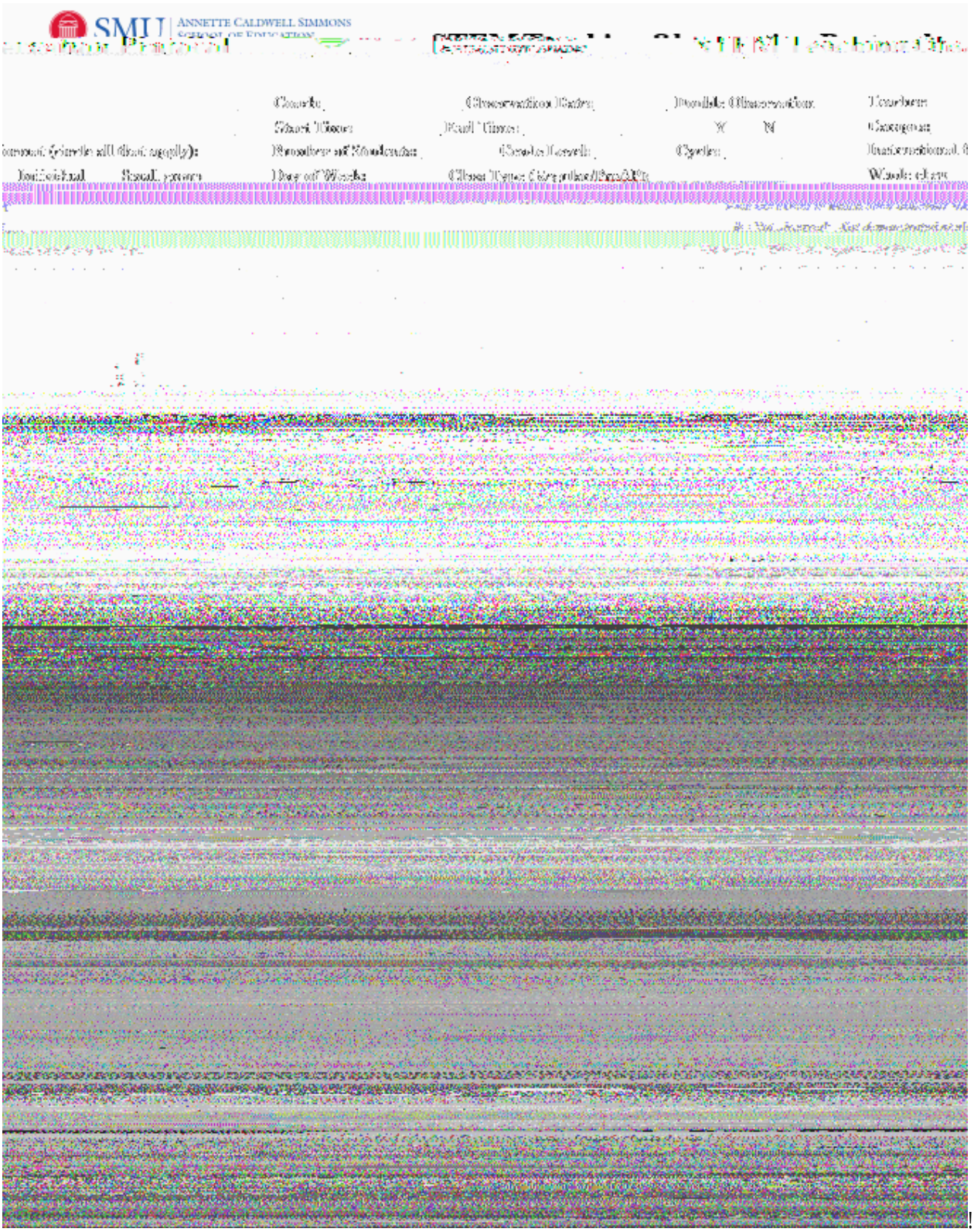
Appendix B – STEM TOP



!

Eb!

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Ea!

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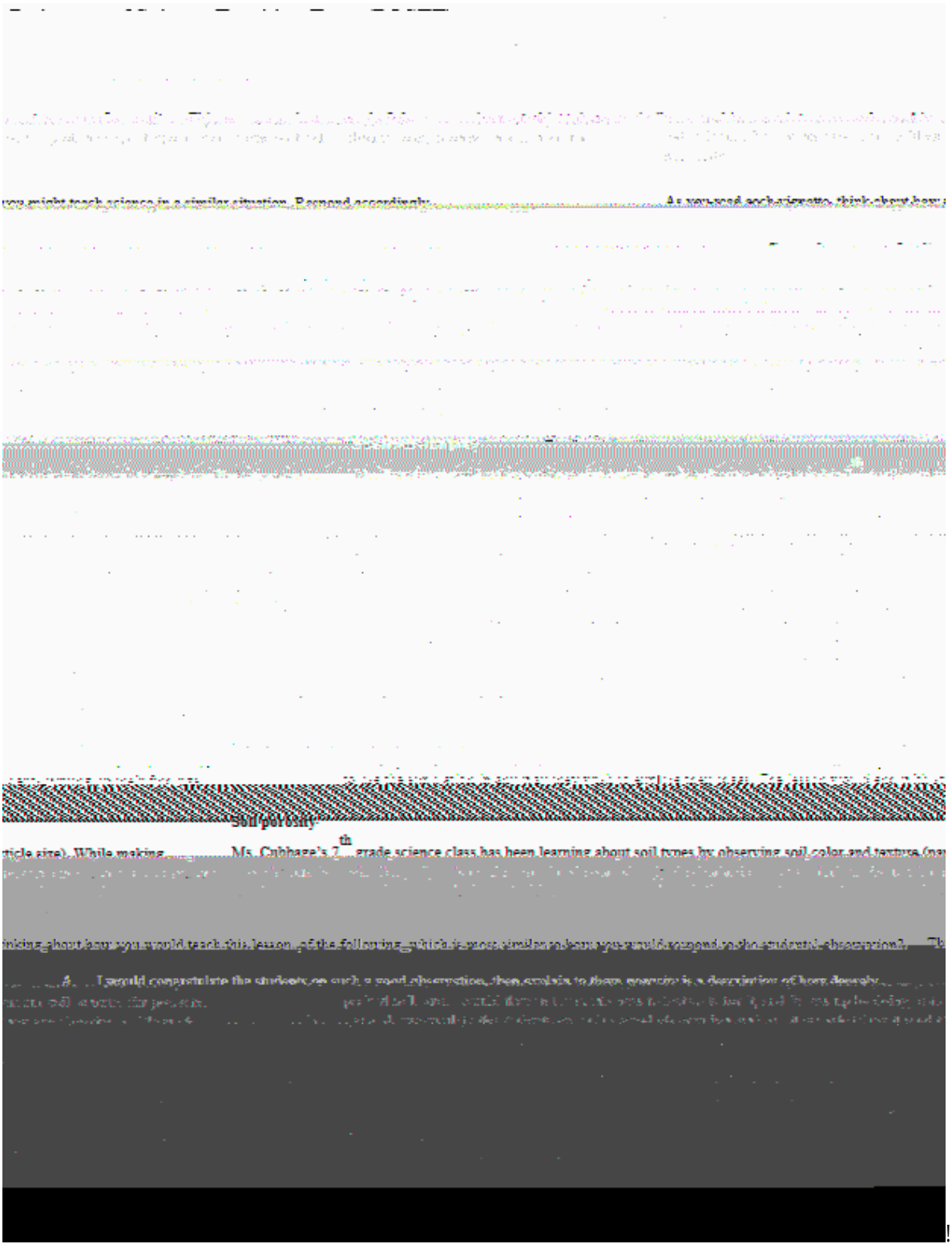
Appendix C – POSTT

1,/&2/3-4!



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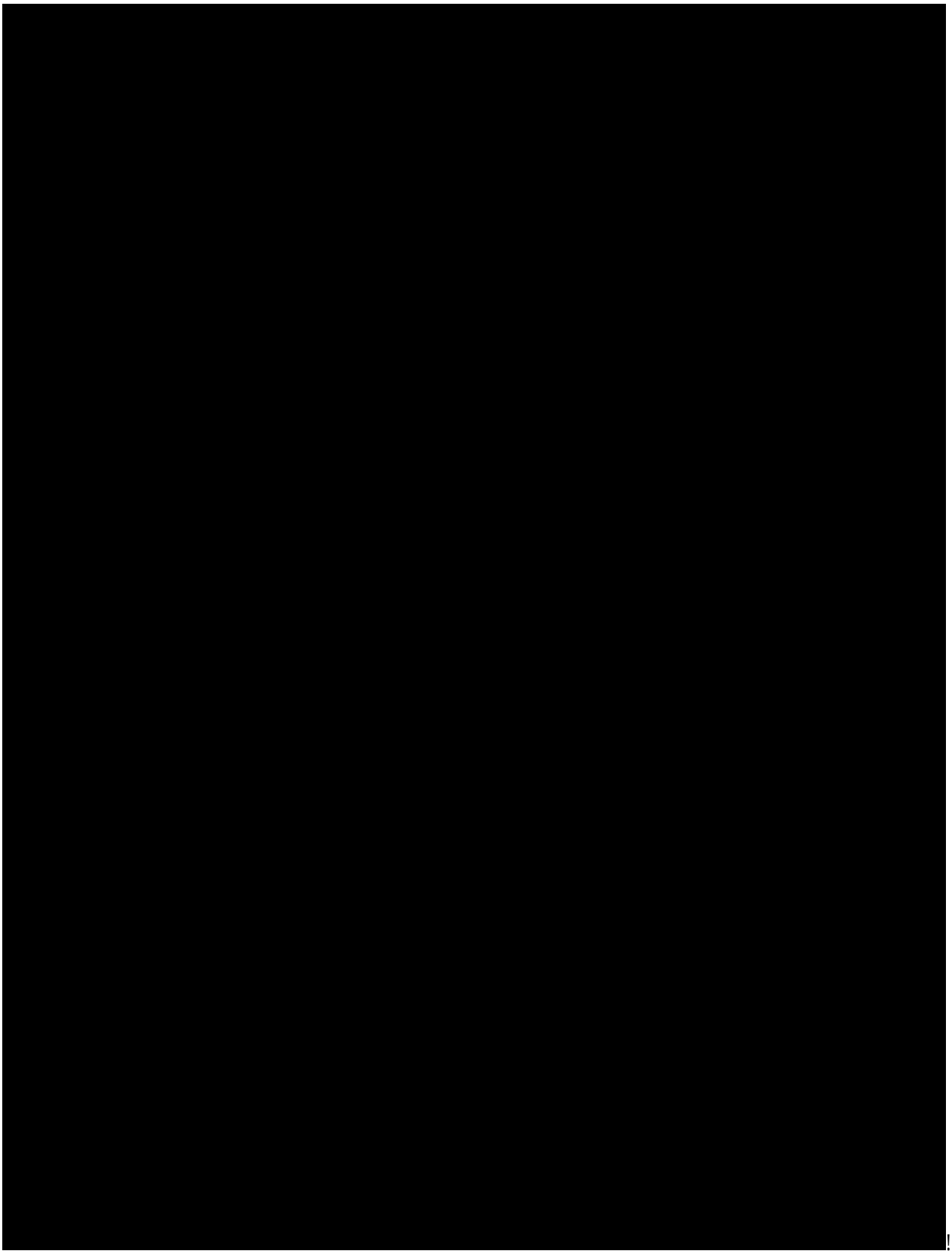
!

BD!

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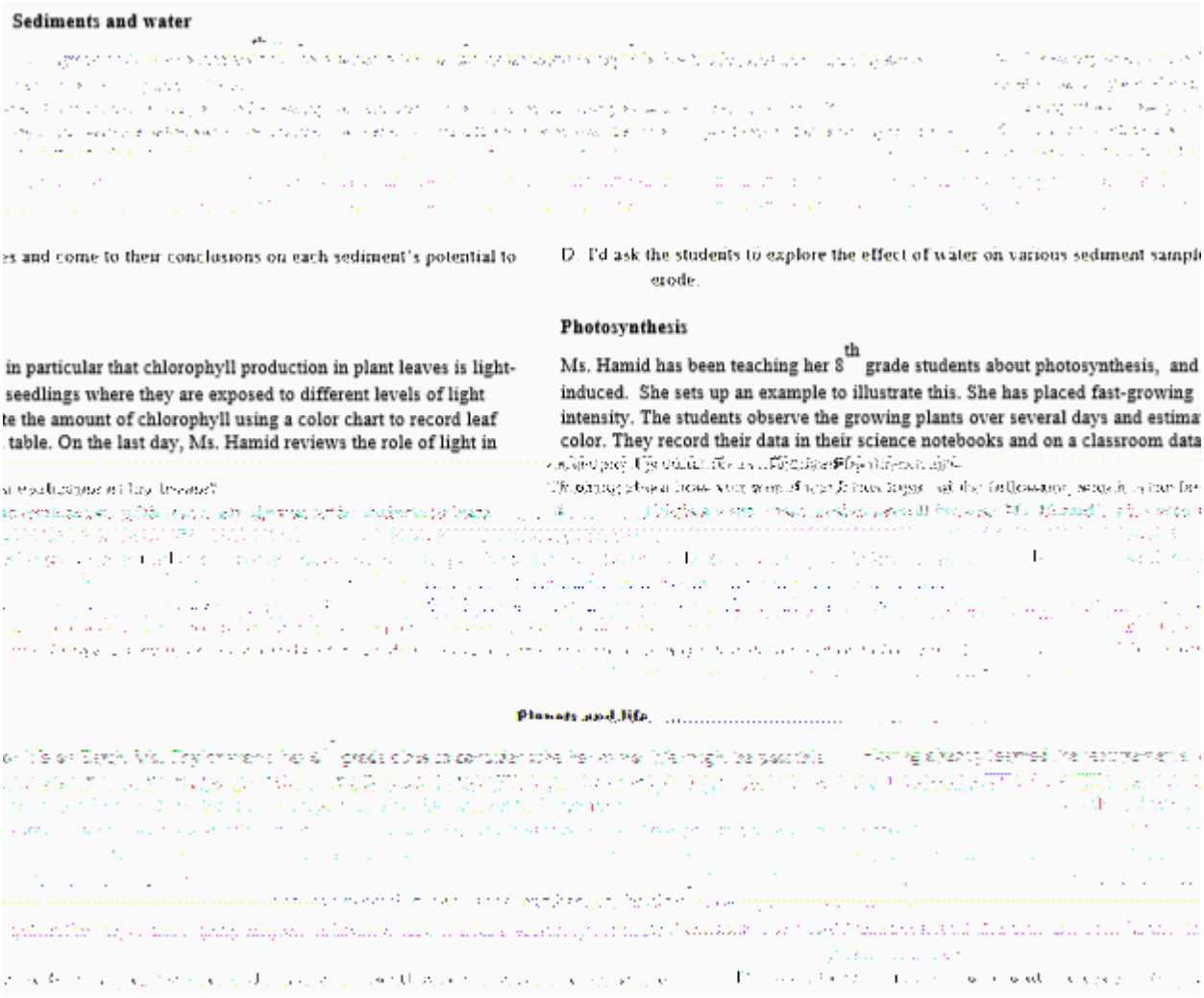
Sediments and water
es and come to their conclusions on each sediment's potential to
D. I'd ask the students to explore the effect of water on various sediment sampl
erode.
Photosynthesis
in particular that chlorophyll production in plant leaves is light-
seedlings where they are exposed to different levels of light
te the amount of chlorophyll using a color chart to record leaf
table. On the last day, Ms. Hamid reviews the role of light in
Ms. Hamid has been teaching her 8th grade students about photosynthesis, and
induced. She sets up an example to illustrate this. She has placed fast-growing
intensity. The students observe the growing plants over several days and estima
color. They record their data in their science notebooks and on a classroom data
Planets and life
!

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BI!

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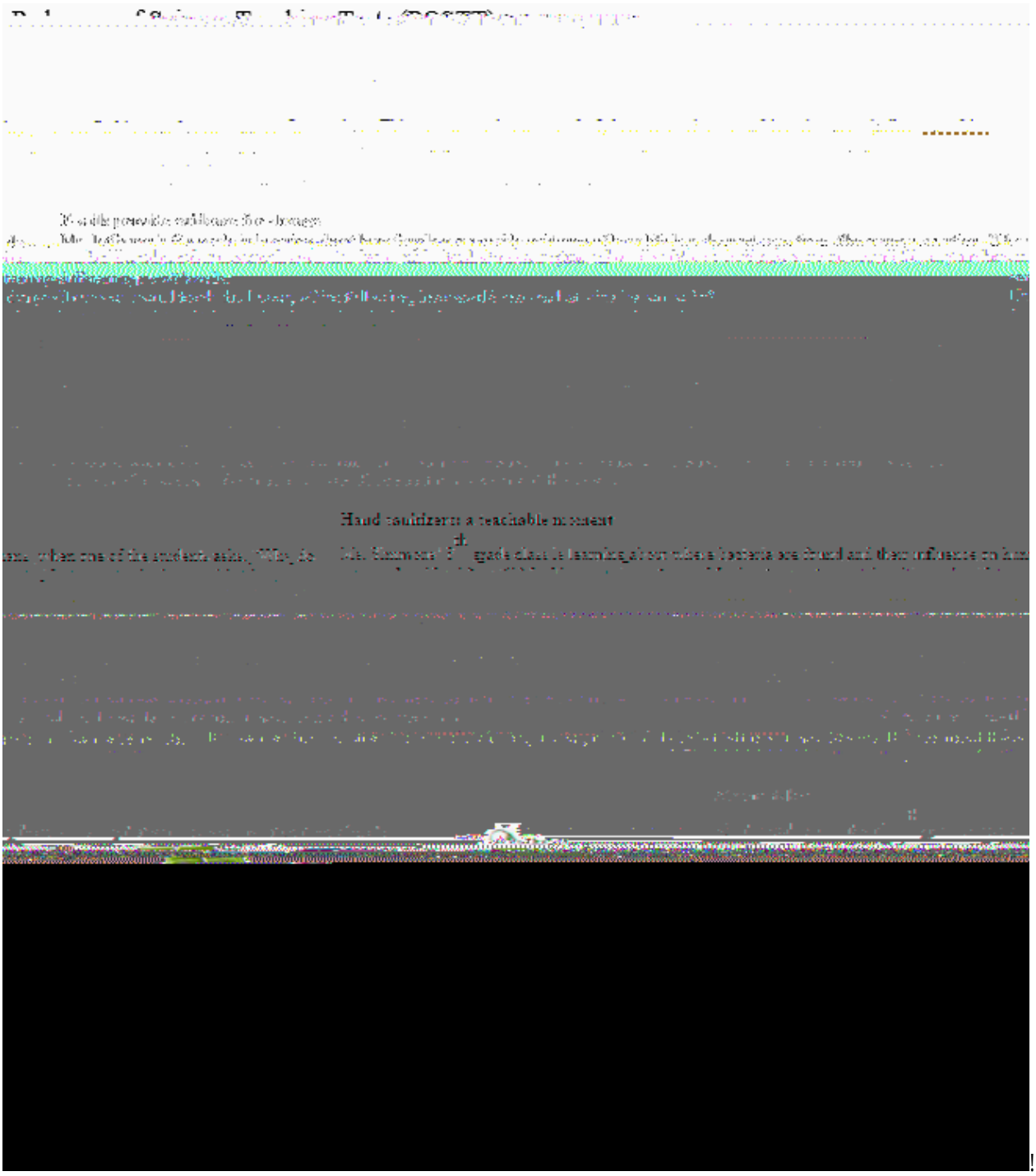
1*3-&2/3-4!



!

BU!

!

Bacteria

Ms. Simon's 8th grade class is studying bacteria. She tells her students that it is important to wash our hands before eating, even though we cannot see bacteria on them. Ms. Simon explains that, although we cannot see individual organisms, [illegible] given nutrients, thousands more bacteria

Frog dissection 1

Mr. Goodchild is doing a frog dissection with his 8th graders to help teach them about anatomy.
Thinking about how you would teach a lesson of the following, which is most similar to what you believe is the best way to incorporate a

Comets

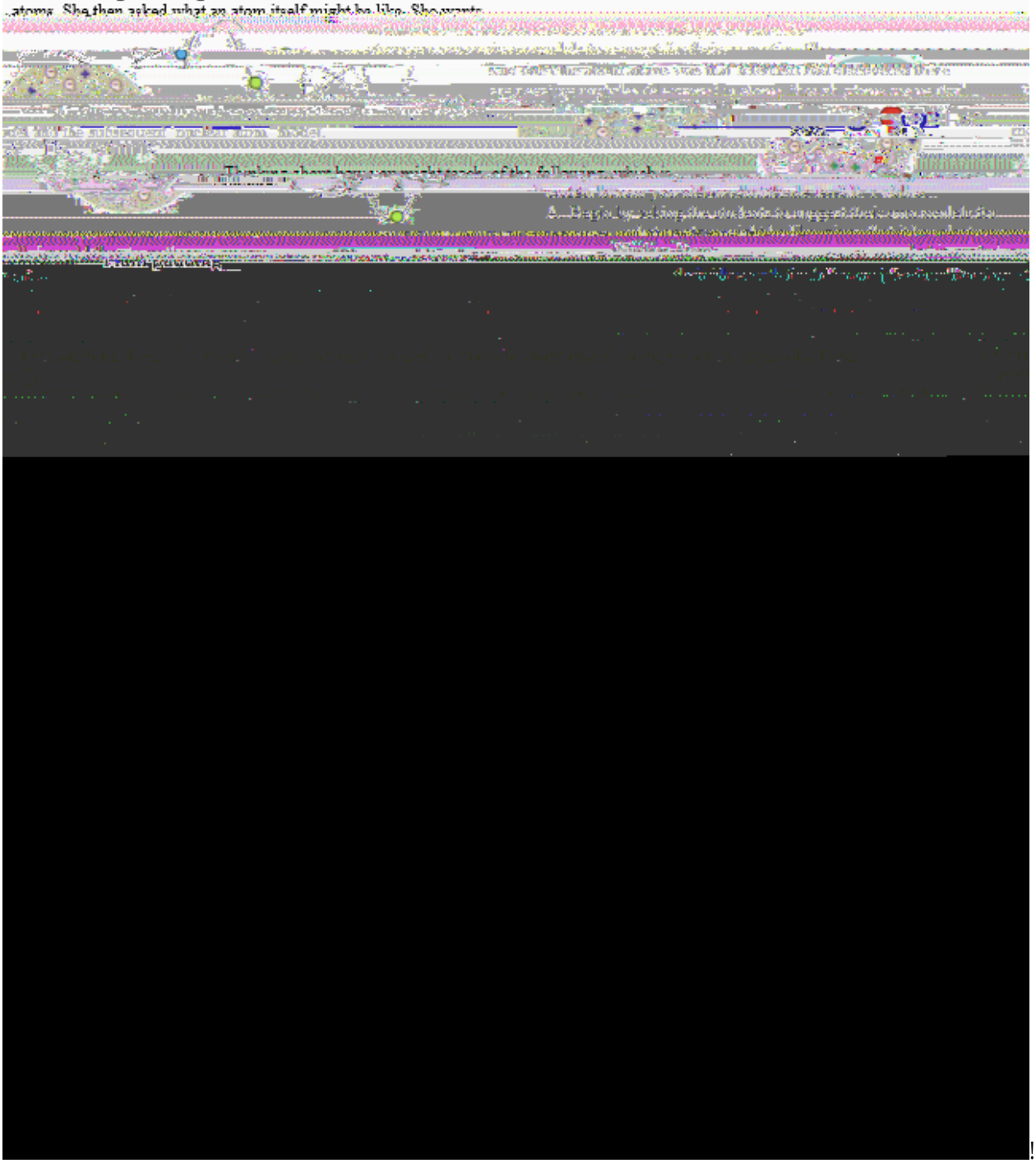
!

BE!

!

What is an atom like?

Ms. Dalton taught her 8th grade students that matter is made of atoms. She then asked what an atom itself might be like. She wants



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BB!