**Clustering students based on their weekly course activities**

The following variables were used for (hierarchical) clustering:

* EQT.TOT = EQT.CO + EQT.IN; EQT.CO is the number of correctly solved, and EQT.IN is the number of incorrectly solved multiple choice questions (MCQs) embedded in the lecture materials
* EQT.DIFF = EQT.CO - EQT.IN
* EQT.SH – the number of times the student requested to see solution to MCQs embedded in the lecture materials
* EXC.TOT = EXC.CO + EXC.IN; EXC.CO/EXC.IN stand for the number of correctly/incorrectly solved exercises/problems
* EXC.DIFF = EXC.CO - EXC.IN
* VEQ.TOT = VEQ.CO + VEQ.IN; VEQ.CO/VEQ.IN stand for the number of correctly/incorrectly solved MCQs associated with the course videos
* VEQ.DIFF = VEQ.CO - VEQ.IN
* VEQ.SH – the number of times the student requested to see solution to MCQs associated with the course videos
* VID.TOT = VID.PA + VID.PL; VID.PA/VID.PL stand for the number of times the course videos were played/paused
* ORG.VIEW – the number of times the schedule and the learning objective pages were accessed
* DBOARD.VIEW – the number of times the dashboard screen was accessed
* HOF.VIEW – the number of times the Hall of Fame page was accessed (social comparison)
* GDEN – density of the transition graph; the transition graph is computed using the trace data (originally prepared for process mining)

All variables are computed on weekly bases and per each individual student.

A note regarding the two variables appear in the tables bellow:

- SC\_MT\_TOT – the score on the midterm exam

- SC\_FE\_TOT – the score on the final exam

They were used just to try to understand how students’ behavior and the corresponding clusters (that reflect this behavior) are associated with the exam scores.

WEEK2 (N = 272)

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attributes Median; (Q1, Q3) Median; (Q1, Q3) Median; (Q1, Q3) Median; (Q1, Q3) Median; (Q1, Q3)

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cluster 1 2 3 4 5

freq 41 62 36 40 95

EQT.TOT 0; (0, 0) 9; (3.25, 14.75) 24; (10.5, 59.25) 0; (0, 0) 4; (0, 12.5)

EQT.DIFF 0; (0, 0) 2; (0, 5) 3; (1, 11.75) 0; (0, 0) 0; (0, 2.75)

EQT.SH 0; (0, 0) 1; (0, 4) 3; (0, 10) 0; (0, 0) 0; (0, 2)

EXC.TOT 0; (0, 0) 37; (30.25, 48) 42; (31.75, 48.25) 44.5; (31.5, 63) 30; (21.25, 40)

EXC.DIFF 0; (0, 0) 4; (-1, 8.75) 5.5; (-4.5, 13) 0; (-22, 9.25) 0; (-2, 8.75)

VEQ.TOT 0; (0, 0) 17; (13.25, 20) 21; (15.75, 25.75) 0; (0, 0) 8; (4.25, 12)

VEQ.DIFF 0; (0, 0) 6; (1, 8.75) 4; (1.75, 9.25) 0; (0, 0) 2; (0, 4)

VEQ.SH 0; (0, 0) 4; (2.25, 6) 2; (1, 6) 0; (0, 0) 1; (0, 3)

VID.TOT 0; (0, 0) 18; (6.25, 54.75) 15; (8, 29.25) 0; (0, 1) 6; (2, 20)

ORG.VIEW 0; (0, 0) 1.5; (0, 5.5) 3; (0, 10) 0; (0, 3.25) 0; (0, 3)

DBOARD.VIEW 0; (0, 0) 2; (0, 4) 17; (10, 21) 0; (0, 1) 0; (0, 0.75)

HOF.VIEW 0; (0, 0) 0; (0, 0) 0; (0, 0) 0; (0, 0) 0; (0, 0)

GDEN 0.01; (0, 0.03) 0.24; (0.2, 0.26) 0.3; (0.26, 0.32) 0.08; (0.05, 0.12) 0.18; (0.14, 0.22)

SC\_FE\_TOT 14; (10, 19.25) 19; (14, 28.75) 17.5; (14.75, 29) 14.5; (11, 19.25) 18; (14, 26.75)

SC\_MT\_TOT 11; (9, 15) 15; (12, 17.75) 15; (12.75, 17.25) 12.5; (10, 15) 14; (11.25, 16)

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| CLUSTER | INITIAL (ORIGINAL) CODING | COMPACT CODING SCHEME[[1]](#footnote-1) | CODE |
| 1 | disengaged | disengaged | DENG |
| 2 | active, engaged in all kinds of course activities; correct solutions outnumber incorrect ones on all forms of assessment | active, engaged in all kinds of course activities; correct solutions outnumber incorrect ones on all forms of assessment | A\_POS-DIFF |
| 3 | active, engaged in all kinds of course activities; correct solutions outnumber incorrect ones on all forms of assessment; (meta-cog) orientation and evaluation activities are present | active, engaged in all kinds of course activities; correct solutions outnumber incorrect ones on all forms of assessment | A\_POS-DIFF |
| 4 | restricted to summative assessment; balance is kept between correct and incorrect solutions | restricted to summative assessment; balance is kept between correct and incorrect solutions | SAS-ONLY\_BAL |
| 5 | mostly focused on summative assessment, though low level of other activities is also present; balance is kept between correct and incorrect solutions on all forms of assessment | moderately active, engaged in all kinds of course activities; good balance is kept between correct and incorrect solutions on all forms of assessment | MA\_ALL-ACT\_BAL |

WEEK 3 (N=284)

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attributes Median; (Q1, Q3) Median; (Q1, Q3) Median; (Q1, Q3) Median; (Q1, Q3) Median; (Q1, Q3)

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cluster 1 2 3 4 5

freq 58 45 104 44 33

EQT.TOT 11; (3, 17) 41; (26, 63) 22; (11, 32) 0; (0, 5.5) 0; (0, 0)

EQT.DIFF 2.5; (0, 5) 8; (4, 15) 4; (0, 7) 0; (0, 0) 0; (0, 0)

EQT.SH 1; (0, 3) 5; (1, 16) 3; (0, 6) 0; (0, 1) 0; (0, 0)

EXC.TOT 55.5; (35.5, 64.5) 71; (59, 83) 68; (51.75, 80) 92; (81.75, 117.25) 1; (0, 21)

EXC.DIFF -4.5; (-15, 1) -17; (-27, -6) -8.5; (-22.25, 0) -31.5; (-42, -25) 0; (-2, 0)

VEQ.TOT 0.5; (0, 5) 33; (21, 47) 23.5; (14.75, 33) 0; (0, 0.25) 0; (0, 0)

VEQ.DIFF 0; (0, 1) 6; (2, 13) 3.5; (0.75, 8) 0; (0, 0) 0; (0, 0)

VEQ.SH 0; (0, 1) 3; (0, 10) 2; (0, 6) 0; (0, 0) 0; (0, 0)

VID.TOT 4; (0, 17.5) 22; (8, 34) 15; (7.75, 35.25) 0; (0, 2) 0; (0, 0)

ORG.VIEW 0; (0, 0) 0; (0, 1.25) 0; (0, 5.25) 0; (0, 1.5) 0; (0, 0)

DBOARD.VIEW 0; (0, 3) 23; (16.75, 30.25) 3; (0, 7) 0; (0, 1) 0; (0, 0)

HOF.VIEW 0; (0, 0) 0; (0, 0) 0; (0, 0) 0; (0, 0) 0; (0, 0)

GDEN 0.17; (0.13, 0.2) 0.29; (0.27, 0.32) 0.24; (0.21, 0.27) 0.11; (0.07, 0.16) 0.03; (0.01, 0.05)

SC\_FE\_TOT 19; (13.25, 27.75) 17; (12, 27) 20; (15, 29) 15; (11, 16) 14; (10, 18)

SC\_MT\_TOT 15; (11, 16.75) 14; (12, 16) 15; (12.75, 17) 11.5; (9.75, 14) 11; (8, 14)

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| CLUSTER | INITIAL (ORIGINAL) CODING | COMPACT CODING SCHEME | CODE |
| 1 | mostly focused on summative assessment, though low level of other activities is also present; incorrect solutions outnumber correct ones on summative assessment | mostly focused on summative assessment, though low level of other activities is also present; incorrect solutions outnumber correct ones on summative assessment | SAS-MOSTLY\_NEG-DIFF |
| 2 | highly active; incorrect solutions outnumber correct ones on summative assessment; (meta-cog) evaluation activities are also present | highly active; incorrect solutions outnumber correct ones on summative assessment; (meta-cog) evaluation activities are also present | HA\_NEG-DIFF\_MC |
| 3 | active, engaged in all kinds of course activities; incorrect solutions outnumber correct ones on summative assessment | active, engaged in all kinds of course activities; incorrect solutions outnumber correct ones on summative assessment | A\_NEG-DIFF |
| 4 | restricted to summative assessment; incorrect solutions dominate[[2]](#footnote-2) over correct ones | restricted to summative assessment; incorrect solutions outnumber correct ones | SAS-ONLY\_NEG-DIFF |
| 5 | disengaged | disengaged | DISENGAGED |

WEEK 4 (N=284)

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attributes Median; (Q1, Q3) Median; (Q1, Q3) Median; (Q1, Q3) Median; (Q1, Q3) Median; (Q1, Q3)

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cluster 1 2 3 4 5

freq 48 89 62 61 24

EQT.TOT 49; (29, 61) 3; (0, 10) 0; (0, 0) 0; (0, 5) 0; (0, 0)

EQT.DIFF 11.5; (4.5, 18) 0; (0, 1) 0; (0, 0) 0; (0, 1) 0; (0, 0)

EQT.SH 4; (0.75, 11.25) 0; (0, 2) 0; (0, 0) 0; (0, 0) 0; (0, 0)

EXC.TOT 61; (46.25, 84.75) 57; (47, 75) 91; (73.5, 104.75) 53; (36, 64) 0; (0, 21.75)

EXC.DIFF 1; (-17.5, 9.25) -3; (-17, 6) -33; (-46.5, -22.5) -5; (-17, 1) 0; (0, 0)

VEQ.TOT 30.5; (16.75, 38.25) 20; (11, 29) 0; (0, 0) 0; (0, 7) 0; (0, 0)

VEQ.DIFF 8; (2.5, 12) 1; (0, 7) 0; (0, 0) 0; (0, 2) 0; (0, 0)

VEQ.SH 1.5; (0, 7) 2; (0, 5) 0; (0, 0) 0; (0, 0) 0; (0, 0)

VID.TOT 19; (10, 43) 24; (11, 51) 0; (0, 1.75) 6; (0, 19) 0; (0, 0)

ORG.VIEW 0; (0, 2) 0; (0, 0.25) 0; (0, 0) 0; (0, 10.25) 0; (0, 0)

DBOARD.VIEW 8; (4.75, 15.25) 1.5; (0, 8) 0; (0, 0) 0; (0, 1) 0; (0, 0)

HOF.VIEW 0; (0, 0) 0; (0, 0) 0; (0, 0) 0; (0, 0) 0; (0, 0)

GDEN 0.28; (0.24, 0.3) 0.22; (0.2, 0.24) 0.06; (0.05, 0.1) 0.13; (0.1, 0.17) 0.01; (0.01, 0.04)

SC\_FE\_TOT 24; (16.75, 32.25) 19; (14, 28) 13.5; (10.25, 17) 17; (14, 22) 14.5; (10, 22)

SC\_MT\_TOT 16; (13, 18) 15; (12, 17) 12; (9, 14) 13; (11, 16) 12; (9.75, 14.25)

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| CLUSTER | INITIAL (ORIGINAL) CODING | COMPACT CODING SCHEME | CODE |
| 1 | highly active; good balance is kept between correct and incorrect solutions on all forms of assessment; (meta-cog) evaluation activities are also present | highly active; good balance is kept between correct and incorrect solutions on all forms of assessment; (meta-cog) evaluation activities are also present | HA\_BAL\_MC |
| 2 | active, engaged in all kinds of course activities; incorrect solutions outnumber correct ones on summative assessment | active, engaged in all kinds of course activities; incorrect solutions outnumber correct ones on summative assessment | A\_NEG-DIFF |
| 3 | restricted to summative assessment; incorrect solutions dominate over correct ones | restricted to summative assessment; incorrect solutions outnumber correct ones | SAS-ONLY\_NEG-DIFF |
| 4 | mostly focused on summative assessment, though some minimum level of other activities is also present; incorrect solutions outnumber correct ones on summative assessment | mostly focused on summative assessment, though some minimum level of other activities is also present; incorrect solutions outnumber correct ones on summative assessment | SAS-MOSTLY\_NEG-DIFF |
| 5 | disengaged | disengaged | DISENGAGED |

WEEK 5 (N=284)

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attributes Median; (Q1, Q3) Median; (Q1, Q3) Median; (Q1, Q3) Median; (Q1, Q3)

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cluster 1 2 3 4

freq 112 94 20 58

EQT.TOT 11; (5.5, 23.25) 0; (0, 0) 54; (44.75, 94.75) 0; (0, 0)

EQT.DIFF 2; (0, 4) 0; (0, 0) 7; (3.75, 17.25) 0; (0, 0)

EQT.SH 1; (0, 3) 0; (0, 0) 15; (9, 20.5) 0; (0, 0)

EXC.TOT 46.5; (35, 69) 76; (65, 93.75) 82.5; (67.75, 95.25) 16.5; (0, 29)

EXC.DIFF 2; (-13.25, 11) -27; (-39.75, -16) -26.5; (-39.75, -18.5) 0; (0, 12.5)

VEQ.TOT 12; (0, 21) 0; (0, 0) 24; (17, 32.75) 0; (0, 0)

VEQ.DIFF 1; (0, 5) 0; (0, 0) 4; (2.5, 7) 0; (0, 0)

VEQ.SH 0; (0, 2) 0; (0, 0) 5.5; (0.75, 10) 0; (0, 0)

VID.TOT 8.5; (2, 25) 0; (0, 2) 16.5; (10.5, 31.5) 0; (0, 0)

ORG.VIEW 0; (0, 3) 0; (0, 0.75) 0; (0, 2) 0; (0, 0)

DBOARD.VIEW 1; (0, 5) 0; (0, 0) 10; (4, 15.25) 0; (0, 0)

HOF.VIEW 0; (0, 0) 0; (0, 0) 0; (0, 0) 0; (0, 0)

GDEN 0.2; (0.17, 0.23) 0.08; (0.05, 0.12) 0.28; (0.24, 0.32) 0.05; (0.03, 0.08)

SC\_FE\_TOT 19; (14, 30) 16; (12, 20.75) 18.5; (14, 23) 15; (11.25, 22)

SC\_MT\_TOT 15; (12, 17) 13; (11, 16) 14; (11.75, 16) 12.5; (10, 16)

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| CLUSTER | INITIAL (ORIGINAL) CODING | COMPACT CODING SCHEME | CODE |
| 1 | moderately active, engaged in all kinds of course activities; good balance is kept between correct and incorrect solutions on all forms of assessment | moderately active, engaged in all kinds of course activities; good balance is kept between correct and incorrect solutions on all forms of assessment | MA\_ALL-ACT\_BAL |
| 2 | restricted to summative assessment, incorrect solutions dominate over correct ones | restricted to summative assessment; incorrect solutions outnumber correct ones | SAS-ONLY\_NEG-DIFF |
| 3 | highly active; incorrect solutions dominate over correct ones on summative assessment; (meta-cog) evaluation activities are also present | highly active; incorrect solutions outnumber correct ones on summative assessment; (meta-cog) evaluation activities are also present | HA\_NEG-DIFF\_MC |
| 4 | restricted to summative assessment; balance is kept between correct and incorrect solutions | restricted to summative assessment; balance is kept between correct and incorrect solutions | SAS-ONLY\_BAL |

WEEK 6 (N=287)

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attributes Median; (Q1, Q3) Median; (Q1, Q3) Median; (Q1, Q3) Median; (Q1, Q3) Median; (Q1, Q3)

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cluster 1 2 3 4 5

freq 133 17 68 41 28

EQT.TOT 23; (6, 42) 25; (5, 54) 0; (0, 6) 122; (96, 162) 58.5; (25.25, 83)

EQT.DIFF 3; (0, 9) 5; (0, 21) 0; (0, 1) 45; (20, 55) 19; (1.75, 24.5)

EQT.SH 2; (0, 7) 5; (2, 12) 0; (0, 1) 9; (4, 27) 4.5; (0, 20.5)

EXC.TOT 36; (11, 80) 34; (11, 144) 8; (0, 25) 99; (46, 159) 138; (115, 182)

EXC.DIFF 1; (-2, 14) 1; (-2, 55) 0; (-1, 2) 10; (1, 55) 27; (-3.5, 68)

VEQ.TOT 11; (2, 26) 0; (0, 4) 0; (0, 0) 9; (2, 35) 82.5; (50.5, 99.75)

VEQ.DIFF 1; (0, 6) 0; (0, 0) 0; (0, 0) 1; (0, 5) 17.5; (7.5, 25.75)

VEQ.SH 1; (0, 4) 0; (0, 3) 0; (0, 0) 1; (0, 2) 10.5; (0.75, 17)

VID.TOT 19; (4, 48) 1; (0, 45) 0; (0, 1.25) 15; (6, 34) 73.5; (30, 156.75)

ORG.VIEW 0; (0, 1) 14; (12, 16) 0; (0, 0) 1; (0, 5) 0; (0, 1.25)

DBOARD.VIEW 0; (0, 1) 0; (0, 1) 0; (0, 0) 1; (0, 11) 0; (0, 2)

HOF.VIEW 0; (0, 0) 0; (0, 0) 0; (0, 0) 0; (0, 1) 0; (0, 0)

GDEN 0.22; (0.19, 0.25) 0.21; (0.13, 0.28) 0.1; (0.04, 0.13) 0.26; (0.23, 0.31) 0.29; (0.26, 0.32)

SC\_FE\_TOT 17; (13, 25) 16; (13, 28) 15; (10.75, 22) 19; (15, 31) 18.5; (14.75, 29)

SC\_MT\_TOT 13; (11, 16) 13; (11, 16) 13; (8, 15.25) 14; (13, 17) 15; (12.75, 16.25)

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| CLUSTER | INITIAL (ORIGINAL) CODING | COMPACT CODING SCHEME | CODE |
| 1 | active, engaged in all kinds of course activities; good balance is kept between correct and incorrect solutions on all forms of assessment | active, engaged in all kinds of course activities; correct solutions outnumber incorrect ones on all forms of assessment | A\_POS-DIFF |
| 2 | moderately active, engaged in many (but not all) kinds of course activities; good balance is kept between correct and incorrect solutions on all forms of assessment; (meta-cog) orientation activities are also present | moderately active, engaged in many (but not all) kinds of course activities; good balance is kept between correct and incorrect solutions on all forms of assessment; meta-cog activities are also present | MA\_MANY-ACT\_BAL\_MC |
| 3 | disengaged | disengaged | DENG |
| 4 | highly active; good balance is kept between correct and incorrect solutions on all forms of assessment; (meta-cog) evaluation activities are also present | highly active; good balance is kept between correct and incorrect solutions on all forms of assessment; (meta-cog) evaluation activities are also present | HA\_BAL\_MC |
| 5 | highly active; good balance is kept between correct and incorrect solutions on all forms of assessment | highly active; good balance is kept between correct and incorrect solutions on all forms of assessment | HA\_BAL |

WEEK 7 (N=285)

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attributes Median; (Q1, Q3) Median; (Q1, Q3) Median; (Q1, Q3) Median; (Q1, Q3)

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cluster 1 2 3 4

freq 79 61 134 11

EQT.TOT 1; (0, 16) 0; (0, 0) 0; (0, 0) 0; (0, 4)

EQT.DIFF 0; (0, 2) 0; (0, 0) 0; (0, 0) 0; (0, 1)

EQT.SH 0; (0, 0) 0; (0, 0) 0; (0, 0) 0; (0, 0)

EXC.TOT 50; (39, 58) 70; (65, 84) 34.5; (20.25, 46) 35; (22, 42)

EXC.DIFF -4; (-12.5, 7) -25; (-38, -20) 0; (-6, 6) 5; (-0.5, 14)

VEQ.TOT 21; (18, 26) 0; (0, 0) 0; (0, 0) 17; (0, 21)

VEQ.DIFF 1; (-1, 4) 0; (0, 0) 0; (0, 0) 0; (0, 4)

VEQ.SH 2; (0, 6.5) 0; (0, 0) 0; (0, 0) 0; (0, 1.5)

VID.TOT 16; (6, 33.5) 0; (0, 0) 0; (0, 4) 4; (0, 14)

ORG.VIEW 0; (0, 0) 0; (0, 0) 0; (0, 0) 0; (0, 0)

DBOARD.VIEW 2; (0, 5.5) 0; (0, 0) 0; (0, 0) 0; (0, 2.5)

HOF.VIEW 0; (0, 0) 0; (0, 0) 0; (0, 0) 7; (6, 8)

GDEN 0.21; (0.19, 0.24) 0.06; (0.04, 0.08) 0.06; (0.04, 0.1) 0.18; (0.07, 0.22)

SC\_FE\_TOT 19; (14.5, 28) 14; (10, 21) 17; (13, 24.5) 28; (14.5, 35)

SC\_MT\_TOT 15; (12, 17) 12; (10, 16) 13; (11, 16) 16; (15, 17)

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| CLUSTER | INITIAL (ORIGINAL) CODING | COMPACT CODING SCHEME | CODE |
| 1 | active, engaged in all kinds of course activities; incorrect solutions outnumber correct ones on summative assessment | active, engaged in all kinds of course activities; incorrect solutions outnumber correct ones on summative assessment | A\_NEG-DIFF |
| 2 | restricted to summative assessment; incorrect solutions dominate over correct ones | restricted to summative assessment; incorrect solutions outnumber correct ones | SAS-ONLY\_NEG-DIFF |
| 3 | restricted to summative assessment; balance is kept between correct and incorrect solutions | restricted to summative assessment; balance is kept between correct and incorrect solutions | SAS-ONLY\_BAL |
| 4 | moderately active, engaged in many (but not all) kinds of course activities; good balance is kept between correct and incorrect solutions on all forms of assessment; (meta-cog) evaluation activities also present (HOF.VIEW) | moderately active, engaged in many (but not all) kinds of course activities; good balance is kept between correct and incorrect solutions on all forms of assessment; meta-cog activities also present | MA\_MANY-ACT\_BAL\_MC |

WEEK 8 (N=286)

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attributes Median; (Q1, Q3) Median; (Q1, Q3) Median; (Q1, Q3) Median; (Q1, Q3) Median; (Q1, Q3)

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cluster 1 2 3 4 5

freq 49 80 66 36 55

EQT.TOT 0; (0, 0) 13; (7.75, 16.25) 0; (0, 0) 0; (0, 0) 0; (0, 0)

EQT.DIFF 0; (0, 0) 1; (0, 4) 0; (0, 0) 0; (0, 0) 0; (0, 0)

EQT.SH 0; (0, 0) 0; (0, 3) 0; (0, 0) 0; (0, 0) 0; (0, 0)

EXC.TOT 74; (67, 93) 38; (27, 52) 39.5; (25.25, 51.75) 14; (0, 19) 48; (43, 51)

EXC.DIFF -34; (-44, -27) 0; (-12, 11) -2; (-13, 5.75) 0; (-1.25, 6.25) -10; (-13, -6.5)

VEQ.TOT 0; (0, 0) 18; (9, 24.25) 0; (0, 1.75) 0; (0, 0) 0; (0, 0)

VEQ.DIFF 0; (0, 0) 1; (0, 4) 0; (0, 0) 0; (0, 0) 0; (0, 0)

VEQ.SH 0; (0, 0) 0; (0, 2.5) 0; (0, 0) 0; (0, 0) 0; (0, 0)

VID.TOT 0; (0, 5) 13.5; (5, 42.25) 4; (0, 22.75) 0; (0, 0) 0; (0, 0)

ORG.VIEW 0; (0, 0) 0; (0, 0) 0; (0, 0) 0; (0, 0) 0; (0, 0)

DBOARD.VIEW 0; (0, 0) 0; (0, 4) 0; (0, 1) 0; (0, 0) 0; (0, 0)

HOF.VIEW 0; (0, 0) 0; (0, 0) 0; (0, 0) 0; (0, 0) 0; (0, 0)

GDEN 0.05; (0.04, 0.07) 0.19; (0.16, 0.22) 0.11; (0.07, 0.13) 0.02; (0, 0.04) 0.04; (0.04, 0.05)

SC\_FE\_TOT 17; (13, 21) 21.5; (14.75, 32.25) 19; (14.25, 28) 14.5; (11, 17.25) 14; (10, 20.5)

SC\_MT\_TOT 13; (11, 15) 16; (13, 18) 14; (11.25, 17) 13; (11, 15) 13; (10, 15)

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| CLUSTER | INITIAL (ORIGINAL) CODING | COMPACT CODING SCHEME | CODE |
| 1 | restricted to summative assessment; incorrect solutions dominate over correct ones | restricted to summative assessment; incorrect solutions outnumber correct ones | SAS-ONLY\_NEG-DIFF |
| 2 | moderately active, engaged in all kinds of course activities; good balance is kept between correct and incorrect solutions on all forms of assessment | moderately active, engaged in all kinds of course activities; good balance is kept between correct and incorrect solutions on all forms of assessment | MA\_ALL-ACT\_BAL |
| 3 | mostly focused on summative assessment, though low level of other activities is also present; incorrect solutions outnumber correct ones on summative assessment | mostly focused on summative assessment, though low level of other activities is also present; incorrect solutions outnumber correct ones on summative assessment | SAS-MOSTLY\_NEG-DIFF |
| 4 | restricted to summative assessment; balance is kept between correct and incorrect solutions | restricted to summative assessment; balance is kept between correct and incorrect solutions | SAS-ONLY\_BAL |
| 5 | restricted to summative assessment; incorrect solutions outnumber correct ones | restricted to summative assessment; incorrect solutions outnumber correct ones | SAS-ONLY\_NEG-DIFF |

WEEK 9 (N=280)

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attributes Median; (Q1, Q3) Median; (Q1, Q3) Median; (Q1, Q3) Median; (Q1, Q3)

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cluster 1 2 3 4

freq 112 68 28 73

EQT.TOT 0; (0, 0) 5.5; (0, 11.25) 23; (10.25, 31) 0; (0, 0)

EQT.DIFF 0; (0, 0) 0; (0, 2.25) 4; (1, 10.25) 0; (0, 0)

EQT.SH 0; (0, 0) 0; (0, 1) 1; (0, 8.25) 0; (0, 0)

EXC.TOT 30; (20, 49.5) 51.5; (36.75, 66.25) 60.5; (37, 80.75) 72; (64, 87)

EXC.DIFF -4; (-13.5, 0.5) -10.5; (-20.25, 0) -15.5; (-24, 11.5) -29; (-43, -24)

VEQ.TOT 0; (0, 0) 13; (0, 23) 22; (17.25, 31.25) 0; (0, 0)

VEQ.DIFF 0; (0, 0) 0; (0, 2) 1.5; (-1, 5) 0; (0, 0)

VEQ.SH 0; (0, 0) 0; (0, 3) 1; (0, 8.25) 0; (0, 0)

VID.TOT 0; (0, 0) 15; (5, 50.75) 15; (6, 25.75) 0; (0, 0)

ORG.VIEW 0; (0, 0) 0; (0, 0) 0; (0, 0) 0; (0, 0)

DBOARD.VIEW 0; (0, 0) 0; (0, 2) 8; (1, 12) 0; (0, 0)

HOF.VIEW 0; (0, 0) 0; (0, 0) 0; (0, 0) 0; (0, 0)

GDEN 0.05; (0.04, 0.06) 0.18; (0.16, 0.2) 0.22; (0.19, 0.26) 0.05; (0.04, 0.09)

SC\_FE\_TOT 15; (12.5, 23.5) 22; (15.75, 30.25) 19; (15.75, 29.75) 15; (11, 20)

SC\_MT\_TOT 13; (11, 16) 15; (12.75, 17) 16; (12.75, 18.25) 13; (10, 15)

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| CLUSTER | INITIAL (ORIGINAL) CODING | COMPACT CODING SCHEME | CODE |
| 1 | restricted to summative assessment; incorrect solutions outnumber correct ones | restricted to summative assessment; incorrect solutions outnumber correct ones | SAS-ONLY\_NEG-DIFF |
| 2 | active, engaged in all kinds of course activities; incorrect solutions outnumber correct ones on summative assessment | active, engaged in all kinds of course activities; incorrect solutions outnumber correct ones on summative assessment | A\_NEG-DIFF |
| 3 | highly active; incorrect solutions outnumber correct ones on summative assessment; (meta-cog) evaluation activities are also present | highly active; incorrect solutions outnumber correct ones on summative assessment; (meta-cog) evaluation activities are also present | HA\_NEG-DIFF\_MC |
| 4 | restricted to summative assessment; incorrect solutions dominate over correct ones | restricted to summative assessment; incorrect solutions outnumber correct ones | SAS-ONLY\_NEG-DIFF |

WEEK 10 (N=275)

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attributes Median; (Q1, Q3) Median; (Q1, Q3) Median; (Q1, Q3) Median; (Q1, Q3) Median; (Q1, Q3)

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cluster 1 2 3 4 5

freq 106 48 76 12 34

EQT.TOT 0; (0, 0) 0; (0, 0) 3; (0, 12.5) 14.5; (5, 22) 0; (0, 0)

EQT.DIFF 0; (0, 0) 0; (0, 0) 0; (0, 2) 2; (0, 7.25) 0; (0, 0)

EQT.SH 0; (0, 0) 0; (0, 0) 0; (0, 0) 0.5; (0, 5.25) 0; (0, 0)

EXC.TOT 31; (23.25, 35) 0; (0, 11) 24; (14, 35) 46.5; (29.25, 68.75) 48; (46, 56.75)

EXC.DIFF -9; (-13, -2) 0; (0, 11) 0; (-10, 7.5) -6.5; (-20, 2.5) -25; (-31, -23)

VEQ.TOT 0; (0, 0) 0; (0, 0) 15; (3.5, 21.5) 22; (14.5, 31.5) 0; (0, 0)

VEQ.DIFF 0; (0, 0) 0; (0, 0) 0; (-3, 1) 0.5; (-1.25, 5) 0; (0, 0)

VEQ.SH 0; (0, 0) 0; (0, 0) 0; (0, 3) 5.5; (0, 10) 0; (0, 0)

VID.TOT 0; (0, 2) 0; (0, 0) 9; (3, 21) 136; (29, 194) 0; (0, 0)

ORG.VIEW 0; (0, 0) 0; (0, 0) 0; (0, 0) 0; (0, 8.25) 0; (0, 0.25)

DBOARD.VIEW 0; (0, 0) 0; (0, 0) 0; (0, 2.75) 0; (0, 2.25) 0; (0, 0)

HOF.VIEW 0; (0, 0) 0; (0, 0) 0; (0, 0) 0; (0, 0) 0; (0, 0)

GDEN 0.05; (0.04, 0.07) 0.01; (0, 0.01) 0.16; (0.1, 0.18) 0.22; (0.18, 0.24) 0.04; (0.04, 0.05)

SC\_FE\_TOT 17; (12, 24.75) 17; (13.75, 22.25) 21; (14.5, 31.5) 16; (13.25, 26) 14; (11, 17.75)

SC\_MT\_TOT 13; (11, 16) 14; (11, 16) 16; (12, 17.5) 13.5; (12.75, 14.25) 13; (10.25, 15)

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| CLUSTER | INITIAL (ORIGINAL) CODING | COMPACT CODING SCHEME | CODE |
| 1 | restricted to summative assessment; incorrect solutions outnumber correct ones | restricted to summative assessment; incorrect solutions outnumber correct ones | SAS-ONLY\_NEG-DIFF |
| 2 | disengaged | disengaged | DENG |
| 3 | moderately active, engaged in all kinds of course activities; good balance is kept between correct and incorrect solutions on all forms of assessment | moderately active, engaged in all kinds of course activities; good balance is kept between correct and incorrect solutions on all forms of assessment | MA\_ALL-ACT\_BAL |
| 4 | highly active; incorrect solutions outnumber correct ones on summative assessment; (meta-cog) activities are somewhat present | highly active; incorrect solutions outnumber correct ones on summative assessment; (meta-cog) evaluation activities are also present | HA\_NEG-DIFF\_MC |
| 5 | restricted to summative assessment; incorrect solutions dominate over correct ones | restricted to summative assessment; incorrect solutions outnumber correct ones | SAS-ONLY\_NEG-DIFF |

WEEK 11 (N=281)

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attributes Median; (Q1, Q3) Median; (Q1, Q3) Median; (Q1, Q3) Median; (Q1, Q3)

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cluster 1 2 3 4

freq 75 61 105 41

EQT.TOT 2; (0, 17.5) 0; (0, 1) 0; (0, 0) 0; (0, 0)

EQT.DIFF 0; (0, 1) 0; (0, 0) 0; (0, 0) 0; (0, 0)

EQT.SH 0; (0, 1) 0; (0, 0) 0; (0, 0) 0; (0, 0)

EXC.TOT 37; (25, 50) 36; (22, 47) 48; (34.75, 59) 16; (0, 17)

EXC.DIFF -3; (-16, 9.5) -5; (-13, 4) -17; (-25, -8) 14; (0, 16)

VEQ.TOT 12; (8, 16) 0; (0, 0) 0; (0, 0) 0; (0, 0)

VEQ.DIFF 1; (-1, 2) 0; (0, 0) 0; (0, 0) 0; (0, 0)

VEQ.SH 0; (0, 3) 0; (0, 0) 0; (0, 0) 0; (0, 0)

VID.TOT 21; (9, 35) 0; (0, 12) 0; (0, 0) 0; (0, 0)

ORG.VIEW 0; (0, 0) 0; (0, 2) 0; (0, 0) 0; (0, 0)

DBOARD.VIEW 1; (0, 6) 0; (0, 0) 0; (0, 0) 0; (0, 0)

HOF.VIEW 0; (0, 0) 0; (0, 0) 0; (0, 0) 0; (0, 0)

GDEN 0.18; (0.17, 0.22) 0.1; (0.08, 0.13) 0.04; (0.04, 0.05) 0.01; (0, 0.03)

SC\_FE\_TOT 19; (14, 30) 20; (14, 31) 15; (11, 20) 17; (13, 26)

SC\_MT\_TOT 15; (12, 17) 14; (13, 17) 12; (10, 15) 15; (10, 16)

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| CLUSTER | INITIAL (ORIGINAL) CODING | COMPACT CODING SCHEME | CODE |
| 1 | active, engaged in all kinds of course activities; incorrect solutions outnumber correct ones on summative assessment | active, engaged in all kinds of course activities; incorrect solutions outnumber correct ones on summative assessment | A\_NEG-DIFF |
| 2 | restricted to summative assessment; incorrect solutions outnumber correct ones | restricted to summative assessment; incorrect solutions outnumber correct ones | SAS-ONLY\_NEG-DIFF |
| 3 | restricted to summative assessment; incorrect solutions dominate over correct ones | restricted to summative assessment; incorrect solutions outnumber correct ones | SAS-ONLY\_NEG-DIFF |
| 4 | restricted to summative assessment; correct solutions dominate over incorrect ones | restricted to summative assessment; balance is kept between correct and incorrect solutions | SAS-ONLY\_BAL |

WEEK 12 (N=279)

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attributes Median; (Q1, Q3) Median; (Q1, Q3) Median; (Q1, Q3) Median; (Q1, Q3)

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cluster 1 2 3 4

freq 107 72 70 30

EQT.TOT 0; (0, 0) 0; (0, 8) 0; (0, 0) 0; (0, 0)

EQT.DIFF 0; (0, 0) 0; (0, 0.25) 0; (0, 0) 0; (0, 0)

EQT.SH 0; (0, 0) 0; (0, 0) 0; (0, 0) 0; (0, 0)

EXC.TOT 46; (38, 54) 36.5; (26, 48.25) 14; (0, 19) 74.5; (68.25, 81.5)

EXC.DIFF -13; (-21, -7) 1.5; (-9.25, 11.5) 1.5; (0, 13.75) -40.5; (-45, -32.25)

VEQ.TOT 0; (0, 0) 17; (8.75, 25.25) 0; (0, 0) 0; (0, 0)

VEQ.DIFF 0; (0, 0) 0; (-2, 2) 0; (0, 0) 0; (0, 0)

VEQ.SH 0; (0, 0) 1; (0, 5) 0; (0, 0) 0; (0, 0)

VID.TOT 0; (0, 0) 12; (3.75, 28.25) 0; (0, 0) 0; (0, 0)

ORG.VIEW 0; (0, 2) 0; (0, 1) 0; (0, 0) 0; (0, 0)

DBOARD.VIEW 0; (0, 0) 0; (0, 5.25) 0; (0, 0) 0; (0, 0)

HOF.VIEW 0; (0, 0) 0; (0, 0) 0; (0, 0) 0; (0, 0)

GDEN 0.05; (0.04, 0.07) 0.18; (0.15, 0.2) 0.04; (0.01, 0.05) 0.04; (0.04, 0.06)

SC\_FE\_TOT 16; (12.5, 20) 20.5; (14, 31) 19; (14, 27.75) 15; (11, 20.75)

SC\_MT\_TOT 13; (11, 16) 15; (12.75, 17) 15; (11, 17) 11; (8, 13)

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| CLUSTER | INITIAL (ORIGINAL) CODING | COMPACT CODING SCHEME | CODE |
| 1 | restricted to summative assessment; incorrect solutions outnumber correct ones | restricted to summative assessment; incorrect solutions outnumber correct ones | SAS-ONLY\_NEG-DIFF |
| 2 | moderately active, engaged in many (but not all) kinds of course activities; good balance is kept between correct and incorrect solutions on all forms of assessment | moderately active, engaged in many (but not all) kinds of course activities; good balance is kept between correct and incorrect solutions on all forms of assessment | MA\_ALL-ACT\_BAL |
| 3 | restricted to summative assessment; balance is kept between correct and incorrect solutions | restricted to summative assessment; balance is kept between correct and incorrect solutions | SAS-ONLY\_BAL |
| 4 | restricted to summative assessment; incorrect solutions dominate over correct ones | restricted to summative assessment; incorrect solutions outnumber correct ones | SAS-ONLY\_NEG-DIFF |

WEEK 13 (N=287)

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attributes Median; (Q1, Q3) Median; (Q1, Q3) Median; (Q1, Q3) Median; (Q1, Q3) Median; (Q1, Q3)

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cluster 1 2 3 4 5

freq 97 41 25 107 17

EQT.TOT 0; (0, 9) 19; (6, 30) 177; (148, 210) 48; (30, 78.5) 121; (56, 137)

EQT.DIFF 0; (0, 1) 3; (-1, 8) 66; (48, 94) 9; (3, 18) 12; (-1, 23)

EQT.SH 0; (0, 1) 1; (0, 3) 4; (1, 23) 8; (2, 15) 6; (3, 21)

EXC.TOT 8; (2, 37) 94; (36, 193) 219; (4, 304) 149; (19.5, 261.5) 367; (149, 494)

EXC.DIFF 0; (-4, 2) 1; (-4, 17) 14; (1, 80) 6; (-3, 54) -1; (-16, 188)

VEQ.TOT 0; (0, 5) 65; (36, 101) 0; (0, 8) 5; (0, 18) 104; (72, 212)

VEQ.DIFF 0; (0, 0) 4; (0, 16) 0; (0, 1) 0; (0, 1) 11; (0, 30)

VEQ.SH 0; (0, 0) 8; (1, 15) 0; (0, 2) 0; (0, 4) 10; (3, 42)

VID.TOT 2; (0, 16) 149; (76, 247) 42; (0, 83) 23; (2.5, 87.5) 76; (44, 239)

ORG.VIEW 0; (0, 0) 0; (0, 0) 0; (0, 2) 0; (0, 0) 0; (0, 0)

DBOARD.VIEW 0; (0, 0) 0; (0, 0) 0; (0, 0) 0; (0, 0) 0; (0, 0)

HOF.VIEW 0; (0, 0) 0; (0, 0.5) 0; (0, 0) 0; (0, 0) 0; (0, 0)

GDEN 0.01; (0, 0.03) 0.02; (0, 0.03) 0.03; (0.01, 0.06) 0.04; (0.02, 0.08) 0.04; (0.01, 0.14)

SC\_FE\_TOT 16; (12, 21) 17; (15, 22) 30; (21, 35) 17; (13, 29) 18; (12, 26)

SC\_MT\_TOT 13; (11, 15) 13; (10, 15) 17; (13, 18) 15; (12, 16) 13; (10, 15)

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| CLUSTER | INITIAL (ORIGINAL) CODING | COMPACT CODING SCHEME | CODE |
| 1 | restricted to summative assessment; balance is kept between correct and incorrect solutions | restricted to summative assessment; balance is kept between correct and incorrect solutions | SAS-ONLY\_BAL |
| 2 | active, engaged in all kinds of course activities; correct solutions outnumber incorrect ones on all forms of assessment | active, engaged in all kinds of course activities; correct solutions outnumber incorrect ones on all forms of assessment | A\_POS-DIFF |
| 3 | highly active; correct solutions outnumber incorrect ones on all forms of assessment | highly active; good balance is kept between correct and incorrect solutions on all forms of assessment | HA\_BAL |
| 4 | active, engaged in all kinds of course activities; good balance is kept between correct and incorrect solutions on all forms of assessment | active, engaged in all kinds of course activities; correct solutions outnumber incorrect ones on all forms of assessment | A\_POS-DIFF |
| 5 | highly active; good balance is kept between correct and incorrect solutions on all forms of assessment | highly active; good balance is kept between correct and incorrect solutions on all forms of assessment | HA\_BAL |

1. In this and all subsequent tables, blue text color is used to mark those clusters whose descriptions were slightly modified to make more compact cluster coding scheme [↑](#footnote-ref-1)
2. Dominant here (and throughout the document) means considerably outnumber [↑](#footnote-ref-2)