Clear the workspace:

```
rm(list=ls())                                          #clear work area
```

Specify the target subdirectory:

```
datadir="mixed01"
```

Read the names of the files in the target subdirectory into a list:

```
files=list.files(datadir)                              #list files in target subdirectory
n=length(files)                                        #count of files
#n=4
print(n)

## [1] 200
```

Read the files from the target directory and extract the growth scores (SGP), constructing a new dataframe with one column for the growth scores in each file:

```
for (i in 1:n){                                        #read each file and extract SGP values
  fname=paste(datadir,"/",files[[i]],sep="")     #file to load
  load(fname)
  if(i==1){                                            #initialize data frame with column of le
    df=data.frame(seq(1,nrow(MCAS_sgp$Panel_Data)))
    colnames(df)=c("ID")
  }
  df=cbind(df,MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP)   #add column for SGP values
}
str(df)

## 'data.frame': 69977 obs. of  201 variables:
##  $ ID                                          : int  1 2 3 4 5 6 7 8 9 10 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  85 41 66 99 87 79 54 86 81 72 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  65 54 51 79 98 94 69 93 82 92 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  70 82 93 75 73 97 89 89 36 79 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  70 74 93 78 80 60 93 89 40 51 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  85 94 74 99 86 99 66 87 60 98 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  60 54 93 97 84 60 87 84 74 69 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  91 81 88 69 96 72 86 83 75 82 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  99 99 93 75 72 94 88 57 81 71 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  99 96 26 96 82 88 36 36 99 71 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  98 67 57 88 72 96 88 80 75 71 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  94 91 97 57 92 86 99 58 42 80 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  90 53 98 93 77 98 98 88 68 70 ...
```

```
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  79 98 71 92 92 84 71 89 94 86 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  50 82 97 77 66 99 78 68 94 95 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  98 31 56 75 93 80 14 80 94 98 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  87 99 96 91 90 87 60 89 33 79 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  82 84 92 71 20 86 86 40 98 94 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  98 94 73 62 62 96 65 83 41 87 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  91 54 91 90 73 50 77 89 40 96 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  95 74 67 91 92 79 82 86 68 96 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  95 71 42 91 72 84 87 78 96 79 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  84 66 82 78 92 96 71 75 75 89 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  64 41 80 88 78 85 85 15 94 48 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  88 94 97 71 90 96 61 73 96 98 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  71 93 76 71 92 88 92 69 59 50 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  97 97 56 97 24 96 93 90 74 72 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  90 54 74 95 95 95 86 74 96 86 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  98 60 88 96 80 76 82 67 67 86 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  93 87 83 57 86 96 86 40 93 88 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  90 82 74 99 87 96 70 80 81 94 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  90 99 83 88 74 99 95 88 60 96 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  75 89 26 99 88 57 64 96 91 75 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  10 99 91 92 46 70 90 79 96 99 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  86 88 96 84 84 51 59 85 81 98 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  60 40 85 97 91 71 98 89 81 79 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  79 93 89 97 62 95 79 92 82 51 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  93 85 57 47 91 64 92 69 91 71 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  97 99 88 82 95 85 70 57 41 66 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  69 59 39 89 56 71 32 56 31 80 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  84 41 96 93 79 91 95 95 66 78 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  96 98 88 92 82 93 71 88 93 99 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  79 92 78 97 94 66 83 96 40 91 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  95 89 96 95 79 70 43 89 42 79 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  64 88 93 62 84 98 97 67 61 74 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  34 66 54 99 92 97 97 94 66 84 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  49 83 97 79 61 90 71 71 81 90 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  47 97 37 80 84 75 71 93 41 64 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  64 53 81 88 80 95 71 69 53 74 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  85 66 80 83 81 49 71 55 66 99 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  86 91 96 89 96 50 86 88 96 75 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  65 98 81 92 88 71 79 94 68 99 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  97 80 89 82 97 84 38 89 53 41 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  85 88 97 83 99 65 87 94 88 99 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  96 66 27 80 75 81 85 92 61 66 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  82 84 67 25 71 88 14 53 82 88 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  86 66 98 95 91 98 78 92 81 99 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  39 94 55 99 96 79 86 67 81 57 ...
```

```
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  98 60 68 94 93 79 79 90 60 82 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  64 88 27 75 99 90 96 78 93 79 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  79 93 81 45 89 95 91 81 96 84 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  98 82 89 71 93 89 28 96 67 94 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  89 54 91 94 99 79 96 88 81 71 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  95 66 68 97 83 96 71 68 94 91 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  98 60 92 99 95 70 51 55 75 64 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  85 74 68 91 68 90 45 79 82 94 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  94 92 81 69 92 77 80 93 82 80 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  69 75 79 75 77 82 60 96 99 96 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  49 94 74 91 92 87 79 74 94 79 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  94 53 76 79 67 71 96 82 93 64 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  91 71 87 77 99 92 84 79 81 92 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  86 59 56 74 96 77 66 79 40 97 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  59 82 86 91 54 87 88 89 75 88 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  89 72 99 95 93 79 84 89 96 74 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  79 89 80 62 98 87 93 80 81 38 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  71 30 99 61 97 90 98 89 74 95 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  75 51 52 92 80 29 79 67 60 74 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  90 89 29 20 99 78 95 88 67 69 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  71 74 67 75 90 79 79 80 39 86 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  72 93 97 95 88 94 93 99 81 79 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  94 93 96 87 94 94 96 88 60 88 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  94 38 57 94 75 79 90 83 94 94 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  96 99 55 99 96 70 98 97 81 59 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  95 81 95 47 48 88 95 97 94 98 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  79 89 89 88 96 94 69 83 60 90 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  62 89 85 94 92 98 83 92 94 95 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  91 84 66 71 97 88 96 99 41 72 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  95 84 79 86 62 96 95 97 74 98 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  28 96 79 96 80 64 10 92 67 60 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  79 93 89 82 97 77 84 45 35 88 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  93 81 68 79 88 92 77 83 60 88 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  71 51 91 56 92 98 79 87 74 82 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  96 99 54 64 89 90 90 67 54 53 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  90 84 72 95 68 84 99 79 68 82 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  75 79 96 70 86 49 96 96 93 86 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  64 99 83 65 80 69 82 56 60 92 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  98 89 70 71 94 36 99 70 68 84 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  99 90 71 74 88 90 97 88 83 93 ...
##  $ MCAS_sgp$SGPercentiles$MATHEMATICS.2010$SGP: int  84 94 83 65 72 93 72 88 31 80 ...
##   [list output truncated]

ncol(df)

## [1] 201
```

```
load("Rdata/mixed01a.Rdata")
classize=29
str(thetas)
```

```
## 'data.frame': 69977 obs. of  4 variables:
##  $ theta1: num  0.153 0.882 -1.744 -0.196 -0.375 ...
##  $ theta2: num  0.75 1.478 -1.147 0.4 0.222 ...
##  $ tval  : num  0.597 0.597 0.597 0.597 0.597 ...
##  $ e     : num  0.153 0.882 -1.744 -0.196 -0.375 ...
```

```
mean(thetas$e)
```

```
## [1] -0.001374411
```

```
sd(thetas$e)
```

```
## [1] 0.923672
```

```
teachers=nrow(thetas)/classize
teachers
```

```
## [1] 2413
```

```
tfact=as.factor(rep(seq(1:teachers),each=classize))
thetas=cbind(thetas,tfact)
str(thetas)
```

```
## 'data.frame': 69977 obs. of  5 variables:
##  $ theta1: num  0.153 0.882 -1.744 -0.196 -0.375 ...
##  $ theta2: num  0.75 1.478 -1.147 0.4 0.222 ...
##  $ tval  : num  0.597 0.597 0.597 0.597 0.597 ...
##  $ e     : num  0.153 0.882 -1.744 -0.196 -0.375 ...
##  $ tfact : Factor w/ 2413 levels "1","2","3","4",..: 1 1 1 1 1 1 1 1 1 1 ...
```

```
df3=cbind(df,thetas)
tn=1:teachers
teff=thetas$tval[seq(from=1,to=nrow(thetas),by=classize)]
str(teff)
```

```
##  num [1:2413] 0.597 0.269 0.594 0.286 -0.295 ...
```

```
ceff=NULL
for(j in 1:teachers){
  lo=1+(j-1)*classize
  hi=lo+classize-1
  ceff=c(ceff,mean(thetas$e[lo:hi]))
}
str(ceff)
```

```
##  num [1:2413] -0.0473 -0.1612 -0.2382 -0.0332 -0.0978 ...
```

```
df3=data.frame(tn,teff,ceff)
for(j in 2:ncol(df)){
  m=NULL
  te=NULL
  classe=NULL
  for(k in 1:teachers){
    lo=1+(k-1)*classize
    hi=lo+classize-1
    m=c(m,median(df[lo:hi,j]))
  }
#print(m)
df3=cbind(df3,m)
}
str(df3)
```

```
## 'data.frame': 2413 obs. of  203 variables:
##  $ tn  : int  1 2 3 4 5 6 7 8 9 10 ...
##  $ teff: num  0.597 0.269 0.594 0.286 -0.295 ...
##  $ ceff: num  -0.0473 -0.1612 -0.2382 -0.0332 -0.0978 ...
##  $ m   : int  81 70 84 73 24 52 47 23 59 86 ...
##  $ m   : int  79 71 83 61 31 55 45 24 60 84 ...
##  $ m   : int  82 69 84 64 32 49 45 16 60 79 ...
##  $ m   : int  89 61 80 74 31 56 46 25 59 87 ...
##  $ m   : int  85 52 82 62 26 43 41 18 43 83 ...
##  $ m   : int  84 56 81 66 40 51 46 18 60 82 ...
##  $ m   : int  83 79 75 73 28 50 37 17 60 88 ...
##  $ m   : int  81 69 80 71 42 57 37 22 64 90 ...
##  $ m   : int  88 71 75 63 25 39 31 21 65 87 ...
##  $ m   : int  78 65 75 65 21 47 45 21 50 82 ...
##  $ m   : int  79 66 80 68 28 54 51 26 51 81 ...
##  $ m   : int  81 55 84 68 27 47 44 19 43 89 ...
##  $ m   : int  81 64 78 74 33 46 36 20 58 86 ...
##  $ m   : int  82 63 74 80 24 52 47 26 57 88 ...
##  $ m   : int  79 63 78 70 21 53 55 18 67 79 ...
##  $ m   : int  86 67 85 66 30 48 43 25 46 74 ...
##  $ m   : int  86 78 87 74 23 49 41 21 51 86 ...
##  $ m   : int  79 69 81 63 37 54 45 24 59 84 ...
##  $ m   : int  89 73 84 73 28 42 32 13 53 84 ...
##  $ m   : int  85 67 86 63 20 57 41 18 54 87 ...
##  $ m   : int  84 69 87 77 22 57 34 22 53 94 ...
##  $ m   : int  80 71 77 68 30 54 47 15 54 85 ...
##  $ m   : int  81 74 77 69 21 43 42 17 50 85 ...
##  $ m   : int  90 70 84 71 30 49 40 14 58 88 ...
##  $ m   : int  81 73 77 65 27 55 46 24 53 84 ...
```

```
##  $ m   : int  76 72 81 69 30 40 27 30 64 81 ...
##  $ m   : int  86 65 87 65 25 42 55 16 50 86 ...
##  $ m   : int  83 54 83 60 49 51 46 28 52 78 ...
##  $ m   : int  86 67 88 81 25 55 33 23 62 87 ...
##  $ m   : int  83 69 83 60 34 41 44 23 56 87 ...
##  $ m   : int  83 66 85 72 25 54 46 20 49 85 ...
##  $ m   : int  75 71 84 60 27 45 47 24 53 85 ...
##  $ m   : int  88 63 82 65 31 51 49 13 54 88 ...
##  $ m   : int  86 72 82 67 31 55 27 22 54 82 ...
##  $ m   : int  81 60 81 71 22 57 44 18 59 83 ...
##  $ m   : int  92 71 82 71 20 55 34 18 54 89 ...
##  $ m   : int  79 66 77 68 20 44 38 21 48 86 ...
##  $ m   : int  82 66 81 76 30 55 40 17 47 88 ...
##  $ m   : int  80 63 83 71 29 45 48 18 64 77 ...
##  $ m   : int  85 52 80 59 31 54 35 25 56 87 ...
##  $ m   : int  88 53 92 70 23 47 37 20 65 87 ...
##  $ m   : int  83 69 87 69 27 41 38 23 64 81 ...
##  $ m   : int  89 65 88 78 25 45 37 19 67 84 ...
##  $ m   : int  83 72 83 66 26 34 47 26 49 92 ...
##  $ m   : int  85 57 77 67 20 55 31 18 64 83 ...
##  $ m   : int  81 62 90 65 29 54 48 26 53 79 ...
##  $ m   : int  78 59 91 70 27 47 49 20 54 89 ...
##  $ m   : int  74 63 84 61 30 47 54 27 59 88 ...
##  $ m   : int  81 73 82 68 35 41 40 17 66 84 ...
##  $ m   : int  89 66 89 61 30 54 43 21 62 87 ...
##  $ m   : int  83 71 81 71 29 54 45 23 64 82 ...
##  $ m   : int  84 54 80 77 34 62 37 18 67 88 ...
##  $ m   : int  87 66 85 72 29 42 38 25 52 81 ...
##  $ m   : int  81 65 83 59 24 61 46 18 61 87 ...
##  $ m   : int  84 71 88 65 28 53 43 15 55 91 ...
##  $ m   : int  85 65 80 66 29 48 37 14 53 84 ...
##  $ m   : int  81 64 74 62 38 48 43 26 59 81 ...
##  $ m   : int  84 64 85 75 23 54 54 22 49 82 ...
##  $ m   : int  83 66 76 70 28 43 38 13 59 84 ...
##  $ m   : int  84 68 77 66 30 49 42 20 44 88 ...
##  $ m   : int  89 74 85 70 23 44 47 16 60 89 ...
##  $ m   : int  88 74 83 68 28 44 40 30 60 83 ...
##  $ m   : int  91 78 82 69 34 45 39 20 57 82 ...
##  $ m   : int  81 74 87 65 24 49 41 16 60 84 ...
##  $ m   : int  79 67 79 71 26 56 48 23 59 82 ...
##  $ m   : int  80 68 89 59 35 57 34 22 66 90 ...
##  $ m   : int  80 69 75 73 39 54 41 40 61 85 ...
##  $ m   : int  79 74 91 74 22 56 36 30 65 87 ...
##  $ m   : int  81 76 86 68 20 63 34 18 67 90 ...
##  $ m   : int  86 66 83 75 22 56 46 22 51 86 ...
```

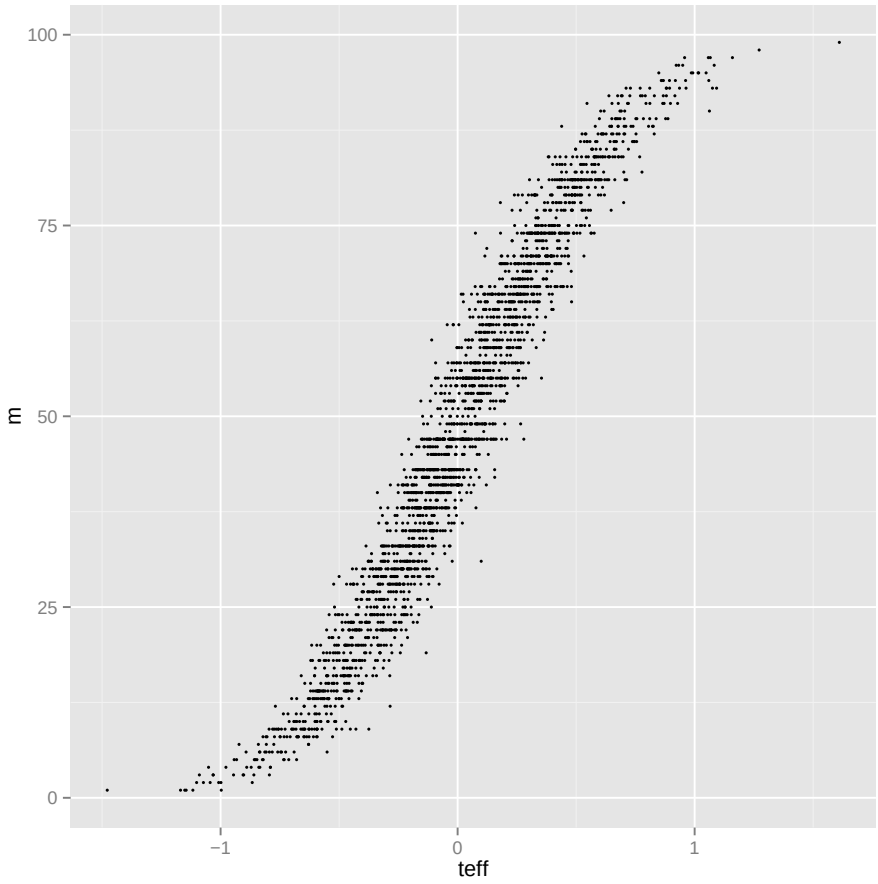
```
##  $ m   : int  81 71 77 65 29 46 42 22 53 88 ...
##  $ m   : int  88 66 83 66 32 46 36 22 54 86 ...
##  $ m   : int  82 69 83 72 35 46 42 14 56 86 ...
##  $ m   : int  79 68 84 74 37 54 45 25 53 81 ...
##  $ m   : int  81 65 85 67 25 55 42 19 50 82 ...
##  $ m   : int  78 77 79 62 30 51 45 22 51 89 ...
##  $ m   : int  81 64 86 64 24 49 47 21 61 89 ...
##  $ m   : int  77 79 78 72 31 46 37 15 67 89 ...
##  $ m   : int  88 62 81 64 32 43 44 20 54 74 ...
##  $ m   : int  88 59 84 71 23 54 38 30 62 84 ...
##  $ m   : int  86 66 88 71 24 33 38 30 61 85 ...
##  $ m   : int  84 72 80 65 24 54 34 20 64 81 ...
##  $ m   : int  89 68 83 66 24 47 44 19 50 90 ...
##  $ m   : int  78 57 71 66 28 55 38 19 66 84 ...
##  $ m   : int  89 68 86 69 30 43 47 13 55 87 ...
##  $ m   : int  88 74 79 62 28 63 45 17 67 86 ...
##  $ m   : int  80 72 80 75 36 48 46 24 59 91 ...
##  $ m   : int  81 66 82 71 23 42 35 22 52 80 ...
##  $ m   : int  83 68 84 59 34 45 30 18 49 90 ...
##  $ m   : int  88 68 86 68 22 45 41 16 47 84 ...
##  $ m   : int  84 68 73 61 36 42 36 20 54 85 ...
##  $ m   : int  82 64 77 70 18 47 46 15 51 88 ...
##  $ m   : int  83 70 78 62 26 46 40 20 50 85 ...
##  $ m   : int  85 64 86 61 23 47 54 19 60 87 ...
##  $ m   : int  75 67 89 72 23 37 46 24 63 82 ...
##  $ m   : int  79 64 83 65 26 50 40 18 45 81 ...
##   [list output truncated]
```

Plot median growth against teacher effect:

```
library(ggplot2)
df4=df3[,1:4]
str(df4)

## 'data.frame': 2413 obs. of  4 variables:
##  $ tn  : int  1 2 3 4 5 6 7 8 9 10 ...
##  $ teff: num  0.597 0.269 0.594 0.286 -0.295 ...
##  $ ceff: num  -0.0473 -0.1612 -0.2382 -0.0332 -0.0978 ...
##  $ m   : int  81 70 84 73 24 52 47 23 59 86 ...

p=ggplot(df4,aes(x=teff,y=m))
p+geom_point(size=0.8)
```



Compute the mean of the median growth scores for each class

```
means=apply(df3[,5:ncol(df3)],1,mean)   #compute vector of row means exclude first column
df4=cbind(df4,means)
str(df4)

## 'data.frame': 2413 obs. of  5 variables:
##  $ tn   : int  1 2 3 4 5 6 7 8 9 10 ...
##  $ teff : num  0.597 0.269 0.594 0.286 -0.295 ...
##  $ ceff : num  -0.0473 -0.1612 -0.2382 -0.0332 -0.0978 ...
##  $ m    : int  81 70 84 73 24 52 47 23 59 86 ...
##  $ means: num  83.2 66.5 82.8 67.5 27.6 ...

mean(df4$teff)

## [1] 0.004355163

sd(df4$teff)
```

```
## [1] 0.3862637

mean(df4$ceff)

## [1] -0.001374411
```

Plot the mean of the median growth scores against teacher effect

```
library(ggplot2)
p=ggplot(df4,aes(x=teff,y=means))
p+geom_point(size=0.8)
```