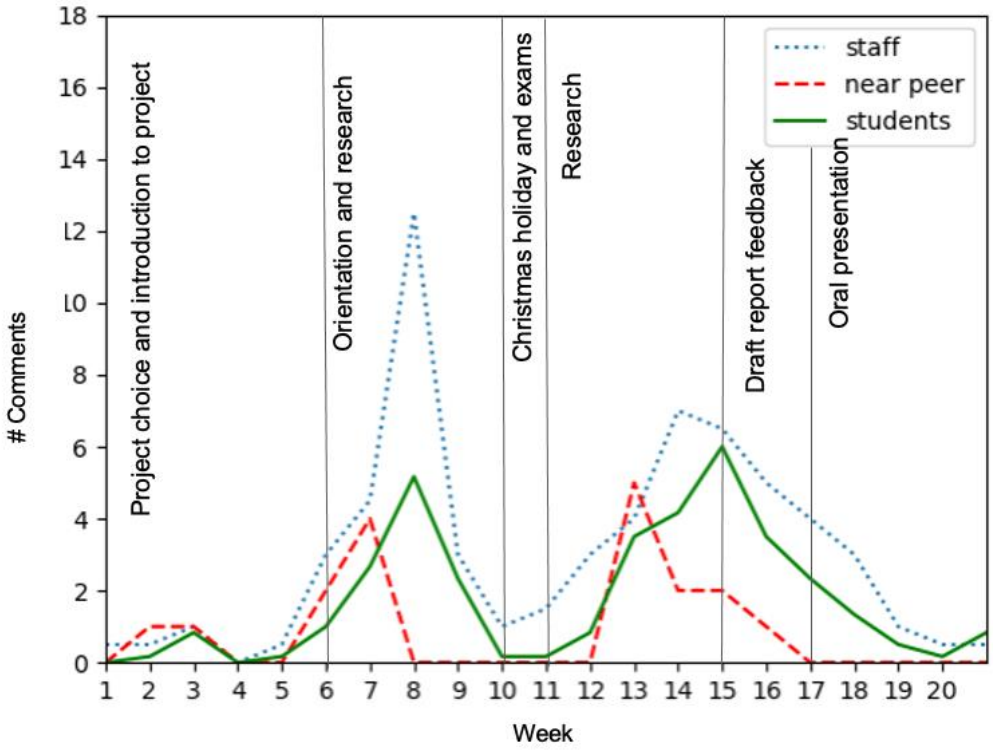
Supplementary material

Figure S1

a)



b)

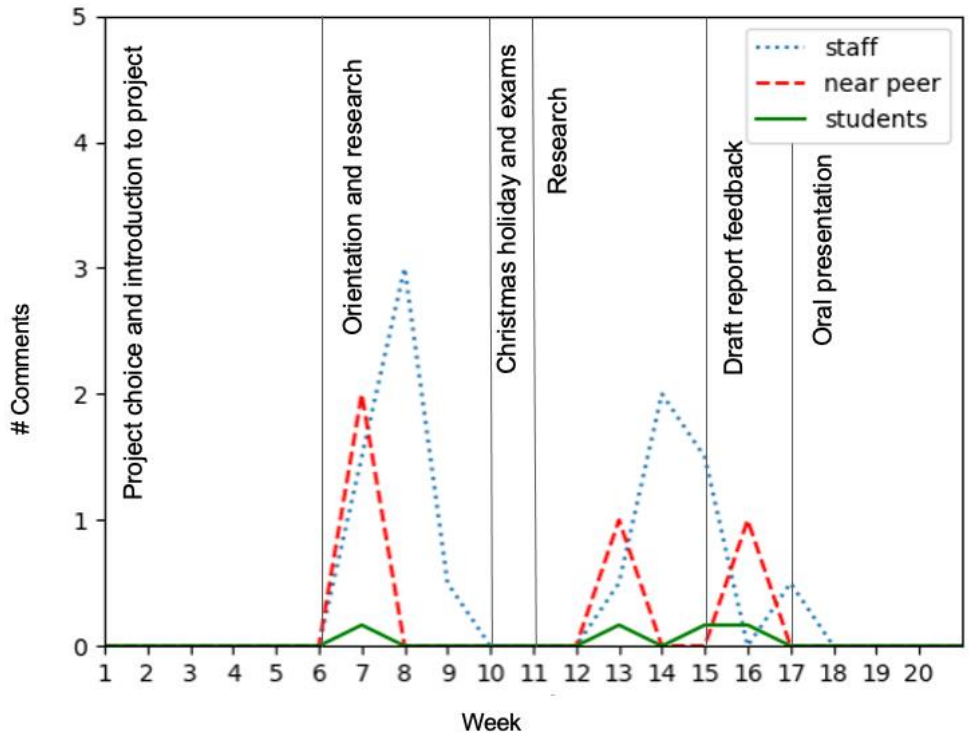


Figure S1a and S1b: Aggregate weekly totals of comments by academic staff, near peer and students (2017-18), displaying their aggregate total of a) most collaborative and b) most critical comments within the Slack environment.

Script S2

Python code for data visualisation

```
# set up libraries
import matplotlib.pyplot as plt
import pandas as pd
import numpy as np

# set up variables
file_name = "18_19.csv"
staff = ["staff1", "staff2"]
near_peers = ["np1", "np2"]
students = ["student1", "student2", "student3", "student4", "student5", "student6", "student7"]
all = staff+near_peers+students

# characteristic groups
collaborative_one = ["Offering resources", "Asking questions", "Inviting critique", "Agreeing with
ideas of others", "Expanding ideas of others", "Critiquing & challenging ideas of others",
"Acknowledging contributions of others", "replying", "referring to another message", "information
sharing / progress updates", "Affective responses (motivation and commitment)"]
collaborative_two = ["Negotiating & interpreting", "Summarising previous contributions", "Proposing
actions based on developed ideas", "Organisational matters (fixing meetings etc.)"]
collaborative_three = ["Making declarative statements", "Supporting positions on issues", "Adding
examples", "Articulating & Explaining", "Reflecting personal experience", "Re-evaluating personal
positions", "Defining", "Proposing ideas or making suggestions (not based on developed ideas)",
"further explanation", "clarification"]
critical_one = ["Supporting positions on issues", "Adding examples", "Reflecting personal experience",
"Re-evaluating personal positions", "Expanding ideas of others", "Critiquing & challenging ideas of
others", "Proposing actions based on developed ideas", "Proposing ideas or making suggestions (not
based on developed ideas)"]
critical_two = ["Offering resources", "Making declarative statements", "Articulating & Explaining",
"Inviting critique", "Agreeing with ideas of others", "Negotiating & interpreting", "Organisational
matters (fixing meetings etc.)", "further explanation", "clarification"]
critical_three = ["Asking questions", "Defining", "Summarising previous contributions", "Acknowledging
contributions of others", "replying", "referring to another message", "information sharing / progress
updates", "Affective responses (motivation and commitment)"]
replying = ['replying']

# import file into dataframe 'data'
data = pd.read_csv(file_name)

# main function merges categories and draws graphs
def counter (characteristic, title, max_y):
    title = title+' 2018-19'
    results = pd.DataFrame()
    for who in all:
        for week in range(17):
            count = 0
            for what in characteristic:
                total1 = (data[(data['who'] == who) & (data['week'] == week+1) &
(data['interaction_1'] == what)].shape[0])
                total2 = (data[(data['who'] == who) & (data['week'] == week+1) &
(data['interaction_2'] == what)].shape[0])
                count = count + total1 + total2
            results.at[week+1, who] = count
    results['staff'] = results[staff].mean(axis=1)
    results['near peer'] = results[near_peers].mean(axis=1)
    results['students'] = results[students].mean(axis=1)
    results['totals'] = results[['staff', 'near peer', 'students']].sum(axis=1)
    results['staff stack'] = (results['staff'] / results['totals'])*100
    results['near peer stack'] = (results['near peer'] / results['totals'])*100
    results['students stack'] = (results['students'] / results['totals'])*100

# line plot of normalised (per individual) data
    ax = plt.gca()
    results.plot(kind='line', style=':', y='staff', ax=ax)
    results.plot(kind='line', style='--', y='near peer', color='red', ax=ax)
    results.plot(kind='line', y='students', color='green', ax=ax)
    plt.xticks(np.arange(1, 17, step=1))
    plt.xlabel('week')
    plt.ylabel('# interactions')
```

```
    plt.ylim([0, max_y])
    plt.title(title)
    plt.savefig(title+'_line.png')
    plt.close()

#stacked bar chart to 100%
    barchart = pd.DataFrame(results, columns=['staff stack', 'near peer stack', 'students stack'])
    ax = plt.gca()
    barchart.plot(ax=ax, kind='bar', colormap='Pastel2', legend=False, stacked=True)
    categories = ('staff', 'near peer', 'students')
    bars = ax.patches
    hatches = ''.join(h*len(barchart) for h in 'xo/')
    for bar, hatch in zip (bars, hatches):
        bar.set_hatch(hatch)
    ax.legend(loc='lower right', labels=categories)
    plt.xlabel('week')
    plt.ylabel('% interactions')
    plt.title(title)
    plt.savefig(title+'_bar.png')
    plt.close()

#analyses to be carried out: list of categories, title of graph, max y axis value
counter (collaborative_one, 'most collaborative', 18)
counter (collaborative_two, 'somewhat collaborative', 6)
counter (collaborative_three, 'least collaborative', 9)
counter (critical_one, 'most critical', 5)
counter (critical_two, 'somewhat critical', 12)
counter (critical_three, 'least critical', 14)
```

Table S1

Classification scheme table for coding of comments within Slack channels

Type of interaction based on (Fox and Mackeogh, 2003)	Collaborative Score	Criticality Score
Offering resources	most	somewhat
Making declarative statements	least	somewhat
Supporting positions on issues	least	most
Articulating & Explaining	least	somewhat
Asking questions	most	least
Reflecting personal experience	least	most
Re-evaluating personal positions	least	most
Expanding ideas of others	most	most
Agreeing with ideas of others	most	somewhat
Critiquing & challenging ideas of others	most	most
Negotiating & interpreting	somewhat	somewhat
Adding examples	least	most
Inviting critique	most	somewhat
Defining	least	least
Summarising previous contributions	somewhat	least
Proposing actions based on developed ideas	somewhat	most
Acknowledging contributions of others	most	least
replying	most	least
referring to another message	most	least
Proposing ideas or making suggestions (not based on developed ideas)	least	most
information sharing / progress updates	most	least
Organisational matters (fixing meetings etc.)	somewhat	somewhat
Affective responses (motivation and commitment)	most	least
further explanation	least	somewhat
clarification	least	somewhat