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Comparison of three instructional strategies in food and nutrition education: developing a diet plan for a diabetic case

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ABSTRACT

This study examines the performance of dietitians-in-training on developing a diet plan for a diabetic patient either independently or after peer discussion. Participants ($n = 58$) from an undergraduate program in food and nutrition were divided into two groups based on their prior knowledge before being randomly assigned into three conditions: (1) peer discussion with just-in-time information (JIT information), (2) peer discussion without JIT information), and (3) independent performers. The learners' performance in the three conditions was analyzed. The results presented here describe the role of prior knowledge and JIT information across the conditions and the interaction of the two factors as well as the instructional implications of the findings.

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Food and nutrition; complex performance; independent performance; just-in-time information; peer discussion; prior knowledge; training dietitians

In the medical field today, seeking another opinion on symptoms or the diagnosis of symptoms is not uncommon. Some patients, at the request of the health professional or the insurer, seek second opinions (Moumjid, Gafni, Bremond, & Carrere, 2007). A health professional may request a second opinion for the patient as a means of consultation. Consultation, as defined by Cai, Bruno, Hagedorn, and Desbiens (2003), is 'a process whereby a physician obtains medical advice from another physician for better management of patient care' (p. 34). Through this process, the health professionals use the knowledge and expertise of each other to confirm their ideas. At the same time, many professionals prefer to do their task independently and rely on their own diagnosis for solving a problem.

This study focuses on discussion and consultation as a collaborative instructional strategy in teaching a complex skill in a food and nutrition undergraduate program. In a scenario-based dietary treatment of a diabetic case, the dietitians-in-training discussed their ideas with their peers before developing a diet prescription for the patient. The results were then compared to those of learners who individually studied the same case and prescribed a diet plan as the performance outcome. Furthermore, the mediation effect of participants' prior knowledge and the instructor's just-in-time information (i.e. information provided at different stages of task performance; JIT information) was examined.

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Literature review

Collaborative learning

Peer discussion and collaboration as an instructional strategy motivates learners to actively engage in learning tasks. Drawing from their individual understanding of the learning task, learners exchange information with peers and thus are provided with the opportunity to renew or expand their perspectives on solving the assigned problems. Learning and instruction literature has long recognized the significance of this approach as a highly effective learning strategy. Dillenbourg (1999) defines the collaborative strategy as ' … a situation in which two or more people learn or attempt to learn something together' (p. 1). Brandon and Hollingshead (1999) refer to the cognition process resulting from collaboration and contend that the strategy allows learners to jointly reach an understanding of a given issue through the exchange of ideas and reflecting on them by collectively working on the elements of the problem instead of splitting the work into various portions. Collaboration allows for individuals to draw a better understanding of a problem by comparing different learners' viewpoints, reduce the mental effort each learner must exert, address their own conflicts and conflicts among group members, and allow individuals to learn from one another in both content and technique (Dillenbourg, 1999; Gillies, 2003).

When done properly, collaborative strategies promote qualities sought after in an effective learning environment. Adams, Carlson, and Hamm (1990) state that efficient collaborative environments promote active engagement, critical thought, and higher level thinking skills such as analysis and evaluation (see also Johnson & Johnson, 1999; Slavin, 1999; Uribe, Klein, & Sullivan, 2003). Johnson and Johnson (1999) state that, 'Working together to achieve a common goal produces higher achievement and greater productivity than does working alone' (p. 72). However, task type and overall goal of instruction can make a difference when applying this strategy (Tutty & Klein, 2008). For instance, in an investigation of how the structure of problems impacts the students' ability to transfer their knowledge, Kapur (2008) found that ill-structured tasks improve students' abilities to solve problems of varying structure tasks versus those who solely solve well-structured tasks. These findings were corroborated by various other studies focusing on collaboration in science and mathematics (Kapur, 2009; Kapur & Kinzer, 2009) and when compared to direct instruction (Kapur & Bielaczyc, 2012). Haake and Pfister (2010) also found that scripting the tasks did not play a significant role in the performance of learners on collaborative writing tasks. Contrary to this, Gillies and Ashman (1998), studying both first and third grade students, found that structured groups (e.g. groups that had received training on how to interact in a cooperative setting) were more effective in cooperating than unstructured groups.

The literature also states that collaborative learning tasks are mostly complex and require higher level thinking skills (Kapur & Kinzer, 2009; Uribe et al., 2003) and if they require a deep and intricate understanding of the concept, they lead to more retention (van Boxtel, van der Linden, & Kanselaar, 2000). The higher the task complexity, the more suited the task is for collaborative strategies (Kirschner, Paas, & Kirschner, 2009). Task complexity, Kirschner et al. (2009) argue, due to its intrinsic cognitive load, is the most appropriate determining factor for whether or not to use collaboration as a learning strategy. For the same reasons, van Merriënboer, Clark, and de Croock (2002) also find that complex learning tasks are appropriate for applying JIT

information strategy. He introduces the concept of JIT information in his discussion of the '4C/ID Model of designing instruction'. It refers to information provided to the learners at different stages of performing a learning task to facilitate the learners' progress throughout.

Based on these arguments, one can easily conclude that just placing students together does not ensure collaboration as various factors affect the collaboration process. The role of these mediating factors is well documented in the literature. They include: student characteristics, effective communication, purposeful interaction, reflective thinking, opportunity for interaction within the environment, and task complexity (van Boxtel et al., 2000; Francescato et al., 2006; Lowyck & Pöysä, 2001; So & Brush, 2007; Wang, 2009). An important learner characteristic to consider is the level of prior knowledge of the collaborating group (Uribe et al., 2003). Another one is group dynamics where personal relationships (i.e. friendship) have increased individual accountability and interdependence within the group (Wang, 2009). However, in some instances, collaborative strategies lose their effectiveness to the point where individuals can perform the task better or just as well.

Group versus individual learning performance

Kirschner et al. (2009) state that working together to perform a task is not always an effective learning activity. Tasks with few interactive elements, or simple tasks, are better suited for individual learners, whereas more complex or interactive learning tasks lead to better outcomes in a group learning environment (Kirschner et al., 2009). The latter statement is in agreement with the findings of studies focusing on improving learners' performance (van Boxtel et al., 2000; Kapur & Kinzer, 2009; Uribe et al., 2003). Given this differentiation, Kirschner, Paas, Kirschner, and Janssen (2011) examined how groups and individuals compared in solving problems and doing worked examples. Their findings supported the previous statements as collaborative groups did better on the complex problems, while individuals had higher performance than groups on the worked examples.

At times, individuals can perform at the same level as those who learn collaboratively, despite the task complexity. Leidner and Fuller (1997), in their investigation of how students using computer-supported collaborative learning differed in their performance on a case analysis assignment, found that individuals working alone outperformed those working in groups. Harskamp and Ding (2006) examined students' work on solving physics problems with the use of hints, and found that by incorporating structure (i.e. hints) both individuals and groups improved their performance in the problem-solving tasks.

Even though collaboration does not always improve performance, it can change other factors influencing the learning process. It can improve students' attitudes towards content (Leidner & Fuller, 1997; Shibley & Zimmaro, 2002), make their problem-solving process more structured (Harskamp & Ding, 2006), improve their work ethic (Shibley & Zimmaro, 2002), improve their argumentation (Heng, Surif, & Seng, 2015), and improve their ability to cooperate (Gillies, 2003; Gillies & Ashman, 1998). As it is indicated by these studies, even when it is not directly affecting performance, group work still has positive benefits for learners.

JIT information and prior knowledge in collaborative learning

When designing collaborative experiences designers should consider how they want the task to be structured. An example would be having instructor guidance during the task performance, which can promote argumentation and brainstorming within groups (Onrubia & Engel, 2012). This type of instructor guidance can come in various forms. One way involves delivering information exactly when it is needed or JIT information (see van Merriënboer et al., 2002). However, for JIT information to be effective, learners must be given supporting information prior to starting the task (van Merriënboer et al., 2002; van Merriënboer, Kirschner, & Kester, 2003). Supportive information is necessary because it initiates the process where, '… non-arbitrary relations are established between new information elements and the learner's prior knowledge' (van Merriënboer et al., 2003, p. 9). This supportive information pertains to how the learners solve the problem. In contrast, JIT information serves as the procedures, or the 'how-to', to be used for the problem (van Merriënboer et al., 2002, 2003). JIT information, when incorporated into individual performance on complex tasks, shows significant results (Hulshof & de Jong, 2006; Kester, Kirschner, & van Merrienboer, 2006).

Prior knowledge of the instructional content is an important student characteristic to consider when designing collaborative experiences. Placing students together homogenously based on their prior knowledge should lead to successful task performance because members are working from a similar point (Fuchs, Fuchs, Hamlett, & Karns, 1998; Uribe et al., 2003). Heterogeneous groups on the other hand may have difficulties collaborating as Gijlers and de Jong (2005) documented. These authors found that learners with different levels of prior knowledge had difficulties collaborating due to the fact that the learner with higher prior knowledge had the added tasks of scaffolding the information for the learner with lower prior knowledge, which occupied more of the higher prior knowledge learner's mental resources. The research on learners' cognitive load as they are actively constructing knowledge is in support of this argument (Verhoeven, Schnotz, & Paas, 2009). However, other researchers have found that learners work best in mixed-ability groups (Gabbert, Johnson, & Johnson, 1986; Gillies, 2003) or that the level of prior knowledge does not have an impact at all on the group's performance (Kapur & Kinzer, 2009).

JIT information does not differentiate between levels of prior knowledge because ideally, 'The JIT information is specified at the entry level of the learners, that is, at a level that is suitable to present to the lowest-level ability learner' (van Merriënboer et al., 2002, p. 51). Even though JIT information does not need to differentiate between different levels of prior knowledge, it has been found to be more effective for students with lower prior knowledge (Hulshof & de Jong, 2006).

Study's purpose

The purpose of this study is to examine how peer discussion and group work impact learners' performance of a complex task. We first examine the difference between learners performing a task in peer discussion groupings and those who perform the same task individually. We then examine how JIT information and prior knowledge interact regarding the performance outcome of learners engaged in peer discussion. For learners

performing individually and independently, we examined the role of their prior knowledge in their performance on a complex task. Following the presentation of the methods and results, we will discuss the findings.

Method

Participants

Out of 65 students enrolled in an undergraduate course from the Department of Nutrition, Food and Exercises at a university in the southeastern United States, a total of 58 students (13 males and 45 females) participated in this study for an extra credit on their assignments.

Learning task

Following the design structure of this study described in the procedure section, students were given the task to create a healthy meal plan for a 16-year-old pre-diabetic high school student with slightly high body mass index (see Appendix 1) using the given resources. Depending on their assigned conditions, the learners either discussed the case with their peers or independently suggested a meal plan consisting of no more than 500 calories, with at least 25 grams of proteins, and low carbohydrates. The groups were instructed on the expectations from their collaboration and their activities were monitored and facilitated to accomplish that goal. Further details of the grouping and task performance are provided in the procedure section. The case scenario and the learner instruction for performing the task are presented in Appendix 1.

Resources and materials

All participants were given the United States Department of Agriculture (USDA) nutrition Daily Intake Guidelines (see Appendix 2) and were instructed to follow the guidelines when creating their meal plans. They were also provided a list of food options with corresponding nutritional information from three sources: home pantry and menus from two campus-based restaurants (Chick-fil-And Chipotle). The students were instructed to choose from one source and not mix and match items from different sources.

Design and procedures

Aggregate scores of students' performance on previous assignments were used as the measure of their prior knowledge. Students were categorized into groups of high and low prior knowledge (HPK and LPK) using their median score as the cutoff point. From each of these two groups, students were then randomly assigned to three performance conditions: (1) peer discussion with JIT information, (2) peer discussion without JIT information, and (3) no peer discussion and no JIT information (independent learners). Table 1 demonstrates the design of the study's conditions and group assignments of participants.

In the two class sessions prior to the study, the instructor taught the topic of instruction to all participants as the supportive information on the learning task. Following the

teaching sessions, we formed a training session for the four teaching assistants and trained them on how to monitor the groups' collaboration and discussion, and when to provide the JIT information. The JIT information, as van Merriënboer et al. (2002) prescribe, included procedural information and feedback on how to proceed and use the provided resources. The rubric that guided the instructor and her assistants called for JIT information to be provided to discussants at certain points of their discussion aiming at keeping the learners on track and advancing the discussion further through the procedures at the decision points. The rubric was developed by instructors in collaboration with the authors. It described the type of information and where in the discussion the information should be provided.

After preparing the instructor and her assistants, we conducted the study over three sessions for logistic reasons. Each session started with a clear description of the task scenario and how the learners are expected to use the provided resource materials to develop their diet plans.

In the first study session, learners in LPK-1 and LPK-2 were instructed to perform the learning task. Learners in LPK-1 received the JIT information during their peer discussion from the instructor and her assistants according to the instructional rubric. Participants in LPK-2 followed the instruction on performing the task without receiving JIT information. In the second session, we followed the same procedure for participants in HPK-1 and HPK-2. Lastly, in the third session, students in LPK-3 and HPK-3 completed the same task independently – without peer discussion or JIT information.

Performance measure

In a training session, the course instructor trained two of her assistants to rate the students' recommended diet plans submitted at the end of the session. Following a collective practice session with a few cases, the two raters and the instructor scored the learners' performance plans according to the nutrition criteria set in advance. The inter-rater reliability of the scorers was 0.9. At the completion of individual ratings of the student plans, the raters computed the mean score of the three rating for each individual participant as the learner's performance score.

Data analysis and results

In our analysis of the data produced in this study, we excluded five individuals due to missing data. For all analyses, we used an alpha level of .05 to distinguish statistical

Table 1. The study design.

			Task performance conditions		
Classification on prior knowledge	*N*	Groups	Peer discussion	JIT information	Performance measure
HPK[a]	29	HPK-1	X	X	0
		HPK-2	X	–	0
		HPK-3	–	–	0
LPK[b]	24	LPK-1	X	X	0
		LPK-2	X	–	0
		LPK-3	–	–	0

[a]High Prior Knowledge
[b]Low Prior Knowledge

significance. We also calculated and reported Cohen's (1988) *d*, eta-squared, and omega-squared effect sizes as appropriately suggested for various analyses. Across the learners' performance conditions, we examined performance, prior knowledge, and JIT information for a total of 53 participants as follows.

Performance across groups

To contrast the learners' performance outcomes across the three conditions (i.e. peer discussion, Independent, and peer discussion with JIT information), we conducted a one-way analysis of variance (ANOVA). To verify our assumptions of homogeneity among groups and justify using the ANOVA test, we first conducted Levene's *F* test. If Levene's *F* test result is not significant at the .05 level, one can assume homogeneity and proceed with comparing the means by using ANOVA. Otherwise, one has to use a more generalized test that does not require the homogeneity assumption. Both eta-squared (as reported with SPSS one-way ANOVA) and Cohen's *d* are reported to determine the effect size.

In our case, Levene's test was not significant ($F(2, 50) = 0.86$, $p < .431$) and thus equal variances among the conditions were assumed. The ANOVA results indicated a significant difference ($F(2, 50) = 16.6$, $p < .001$, $\eta^2 = .399$) among the groups and further examination of the data showed that learners in the independent condition ($\bar{X} = 47.37$) outperformed both those in the peer discussion group ($\bar{X} = 43.56$, $d = 1.67$) and JIT information group ($\bar{X} = 44.75$, $d = 1.41$). The difference among the latter two groups was not significant and the effect smaller than each group compared with the independent group ($d = -0.58$). These statistics are reported in Table 2.

Level of prior knowledge of independent performers

We further examined to see if there were any differences in independent learners' performance with respect to their level of prior knowledge. We ran a *t*-test comparing HPK learners ($\bar{X} = 47.85$) against the LPK learners ($\bar{X} = 47$) performing in this condition. Our results indicated no statistically significant difference between the two categories of learners ($t(19) = -0.92$, $p = .37$, $d = 0.405$).

Prior knowledge and JIT information of learners in peer discussion condition

Given the above results, we continued to analyze the performance of the two peer discussion groups in relation to the mediating variables. We conducted a two-way ANOVA with interaction using prior knowledge and JIT information as fixed factors. In spite of the significance of Levene's test results ($F(3, 28) = 11.1$, $p < .001$), we proceeded with the analysis

Table 2. Comparison of means across groups.

Group	Comparison group	Mean difference	*t*	*p*	*d*
Independent	PD[a]	3.8	5.54	.000	1.67
	PD & JIT information[b]	2.62	3.81	.000	1.41
PD	Independent	–	–	–	–
	PD & JIT information	−1.19	−1.62	.111	−0.58

[a]Peer discussion.
[b]Just-In-Time information.

first because of the robustness of the two-way ANOVA and second the fact that this time we were more interested in the interaction of these variables in relation to groups' performance. We also calculated eta-squared and omega-squared values for each of the factors. We chose to use eta-squared over partial eta-squared because it places the factors on a common base and accounts for the variation caused by error (Cohen, 1973). Also, as Pierce, Block, and Aguinis (2004) recommend, we calculated omega-squared effect sizes to counter the potential bias of eta-squared when sample sizes are small. As depicted by the results, the eta-squared values were not impacted greatly by the small sample size.

We found the level of prior knowledge to be significant in relation to the learners' performance with or without JIT information and it distributed a large effect ($\eta^2 = .243$, $\omega^2 = .219$). However, within either group, LPK learners outperformed HPK participants. The analysis did not find JIT information as a significant factor in learners' performance and had a small effect ($\eta^2 = .035$, $\omega^2 = .015$). However, there was a clear interaction between the prior knowledge and JIT information and this interaction posed a medium effect ($\eta^2 = .128$, $\omega^2 = .106$). Figure 1 demonstrates this interaction. JIT information was beneficial for HPK participants alone. So while JIT information alone was not a significant predictor, the interaction between it and prior knowledge, specifically for HPK participants, was significant. The results of this analysis are reported in Table 3.

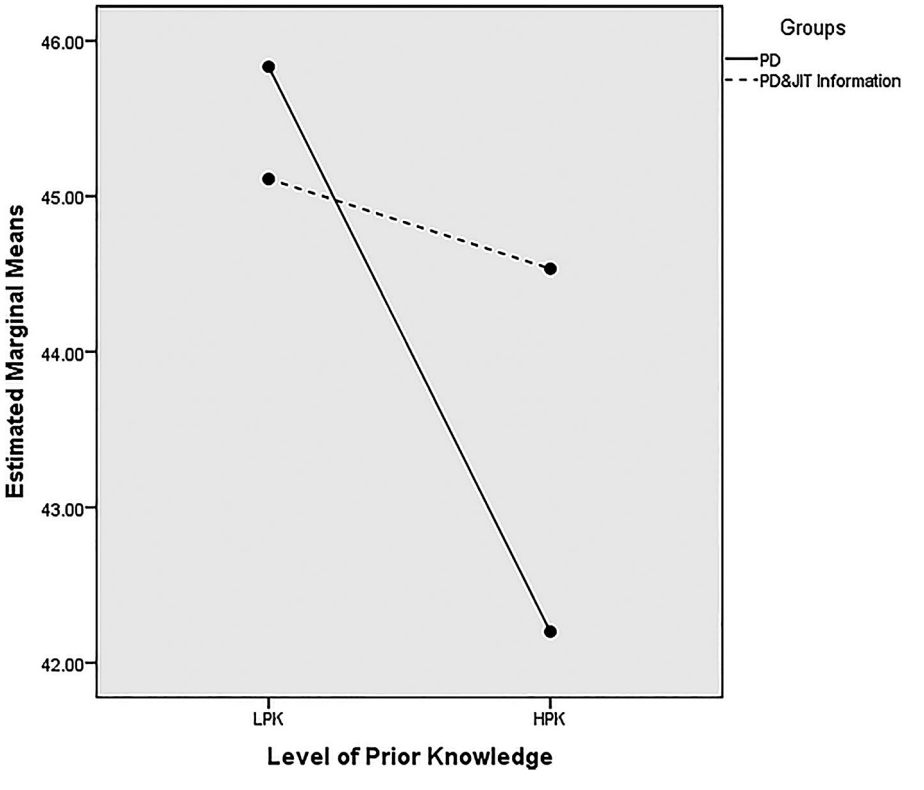

Figure 1. Estimated marginal means of performance score for the peer discussion group. This figure demonstrates the interaction between the two factors, prior knowledge and JIT Information.

Discussion

According to our results, the independent learners performing the task individually performed better than their counterparts in either of the discussion groups (groups with or without JIT). We suggest that these participants when performing the learning task individually were more engaged in the absence of JIT information or peer discussion. This resulted in the learners having more time to examine the materials independently and gain a better understanding for how to develop their plans. Conversely, the participants in the discussion groups were outperformed due to their discussion and collaboration conditions. As noted by Kirschner et al. (2009), one of the reasons for introducing collaborative learning is that the learners can adequately distribute the cognitive load required by complex tasks. At the same time, scholars in the cognitive load field caution about extraneous cognitive load (van Merriënboer et al., 2003; Sweller, 1994) caused by the design of group work and discussion aimed at distributing the load. This latter point might have been the case in our study because of the unstructured group work including discussion, debating, and consensual decision-making which might have introduced more extraneous load for the learners in discussion groups. Additionally, in terms of performance, the loose group structure of the two discussion groups also might have contributed to the lack of significant difference between them and the individual participants. Contrary to Gillies and Ashman's (1998) well-structured grouping of learners that led to their better performance, we only instructed the subjects to discuss the given case, use the resource material, and collaboratively design the appropriate diet plan. No other rules were provided for students to follow. Our lack of more restrictive parameters might have caused the learners to spend more of their mental efforts in discussing peripheral issues rather than essential ones. Our speculation becomes more plausible when one considers Weinberger, Stegmann, and Fischer's (2010) findings that well-structured online collaborative groups outperformed individual learners. When the structure was removed, individual learners outperformed their group counterparts.

Moreover, according to Gillies (2003) and Gabbert et al. (1986), homogeneity of our discussion groups could have influenced their lower levels of performance. These authors note that mixed-ability levels can allow for better performance and perhaps the learning task in our study was better suited for more heterogeneous discussion groups. However, much of Gillies' work focused on younger learners, whereas this study investigated college students. A further study could use a similar task type with both homogenous and heterogeneous ability groups' performance analyzed or present a more complex task.

Our further analysis of the individual learners' performance in relation to their prior knowledge revealed no significant difference. Given their better overall performance against the discussion groups, this finding indicates that, in the absence of group discussion and consensus-building distractions, both the HPK and LPK learners found the individually performing condition engaging enough. In other words, the lack of extraneous factors

Table 3. Two-way ANOVA results for the effects of collaboration.

Source	DF	Mean square	*F*	*p*	Eta-squared	Omega-squared
Prior knowledge	1	33.25	12.4	.001	.243	.219
JIT information	1	4.87	1.82	.189	.035	.015
Prior knowledge by JIT information	1	17.506	6.53	.016	.128	.106
Total	31					

emanating from group discussion provided an opportunity for the learners to solve the problem by evading the extraneous cognitive load imposed by the discussion and collaboration conditions (Kirschner et al., 2009).

Conversely, the learners in our discussion groups could not evade the burden of discussing, debating, and group decision-making to produce a solution superior to the individual learners. When compared as two groups, receiving JIT or not, these learners' performance did not show a significant difference (Table 2). However, when combined as one discussant group (with and without JIT), learners' prior knowledge seemed to make a significant difference in learners' performance. Following this lead with further examination, we found that the significant difference emanated from the difference in learners' prior knowledge. Interestingly, in the discussion group condition, LPK learners performed better than their HPK counterparts (Table 3).

For our speculation about these findings, we refer to the original work of Dreyfus and Dreyfus (1986). In their discussion of 'five steps from novice to expert', they suggest that novice learners gain the rules for making decisions based on the 'objective facts' that are relevant to the skills required for solving a problem. These elements are so objectively clear for the inexperienced individuals that they can be easily recognized without reference to the overall situation. The 'experienced' and 'proficient' individuals, on the other hand, are immersed in the process of coping with the environment and do not attend to these features.

Considering our LPK learners as novices and HPK learners as more proficient performers, we can use Dreyfus and Dreyfus' (1986) description to rationalize our findings of LPK's better performance accordingly. Learners with LPK picked up the clues and obvious facts and features based on which they made their decisions. Whereas the HPK learners had to evaluate the whole situation before they put forward their decisions. Furthermore, the abundance of support information might have contributed to this situation where LPK learners used the resource documents and fact sheets more effectively than the HPK learners who might have relied on their own prior knowledge.

However, we found a significant interaction of JIT information with prior knowledge (Figure 1). The HPK learners who received JIT information performed better than their counterparts who carried out the discussion without receiving JIT information indicating that in a discussion condition, JIT information benefits HPK learners. For understanding this difference, we refer to Ericsson's (2002) argument that no matter the performance level, those learners who possess cognitive representations in support of their 'planning, reasoning, and evaluation' of what they are trying to accomplish will be better in making the right adjustments to their performance. The cognitive load literature supports the idea that more proficient learners are better prepared to determine what information is relevant to the problem and to benefit from that information. These learners possess the sufficient quantity of 'domain-specific Schemas' to be able to categorize the related information (Kalyuga, Ayres, Chandler, & Sweller, 2003).

Implications and limitations

The instructional design implications of these findings can highlight several issues to be considered in developing instructional strategies. Depending on the learning tasks, students working independently seem to perform better when they have ample resources to examine in order to provide a solution to the assigned problem. Apparently, having

to discuss the issues in a group and seeking consensus in the decision-making process, as it was the case in this study, can hamper the performance of the group members compared to their counterparts who deal with the issues independently.

The other implications focus on providing feedback or JIT information that may actually add to the distractions of the group members assigned to a group discussion condition. More importantly, JIT information, when considered as a sole factor, seems to make no difference among learners while discussing the issues among themselves specially when examining multiple resources to formulate a solution. However, HPK learners can use the JIT information to their advantage due to their proficiency in the domain. Therefore, these learners have sufficient cognitive resources available to deal with the information and evade distractions. Designers should consider the significant interactions between learners' prior knowledge and specific instructional strategies (e.g. JIT information and peer discussion) when designing learning experiences.

Conducting an experiment as part of classroom activities will always present problems due to the confines of the teaching environment. The most important one in our case was the number of students participating in the study. We had a less than ideal sample size for the assignment method used in this study. Even though we have considerable effect sizes for our analysis, we concede that a larger number of participants would have been more beneficial. Future studies on this topic should attempt to increase the power by including more participants, if possible.

The time allocated to these conditions should have been proportional to the task performance activities, meaning that the discussion groups should have been given time for discussion and feedback in addition to the time for examining the resources. Lastly, the benefits of JIT information could have been more detailed and more defined if a subset of the independent learners had received this information during their performance.

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Disclosure statement

No potential conflict of interest was reported by the authors.

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Appendix 1

Supportive Materials for Learning

Following instructions were provided to the participants for different groups.

Welcome: Please sit in the assigned seats. Before you begin, please read the instructions.

1. *Go through the scenario provided to you.*
2. *After completing, begin discussing with your team mates about the possible solutions for the problem provided to you*
3. *Make use of the supplementary guidelines provided to you.*
4. *You have maximum of 20 minutes to discuss the solutions within your group.*
5. *Once you are finished with the discussions, Use it in creating a solution for the problems while taking consideration of the discussed elements.*

Case and Scenario Description

Kay is a 16 year-old high school student, who is 5′8″ tall and weighs 186 lbs. (her BMI is 28.3). Kay has been diagnosed with pre-diabetes and has a semi-active lifestyle. Kay needs a hefty snack to replenish her energy levels before starting homework after school. There are a variety of free food options in her home pantry to choose from. However, Kay would most like to make a stop on her walk home at an eating establishment near her neighborhood for a small meal. Kay does not eat breakfast. For lunch, she had a small ham and cheese sandwich, a banana; a small bag of plain lays chips and a 12 oz. bottle of orange juice. She has $8 available and would like to make the most nutritious and money-saving decision. She would like this small meal to be no more than 500 calories, with at least 25 grams of protein, taking the carbohydrate portion of it into consideration. It is also important to her that the meal to be balanced because she would also like to have consumed the appropriate servings from all of the food groups by the end of the day. Kay will eat dinner later in the evening and eats approximately 1850 calories per day.

Given the options presented below, come up with a plan for how Kay can design the best small meal. Please use the menus and nutrition information provided to you from the following sources along with the USDA Nutrition Daily Intake Guidelines, for a person Kay's age, to create a suitable plan.

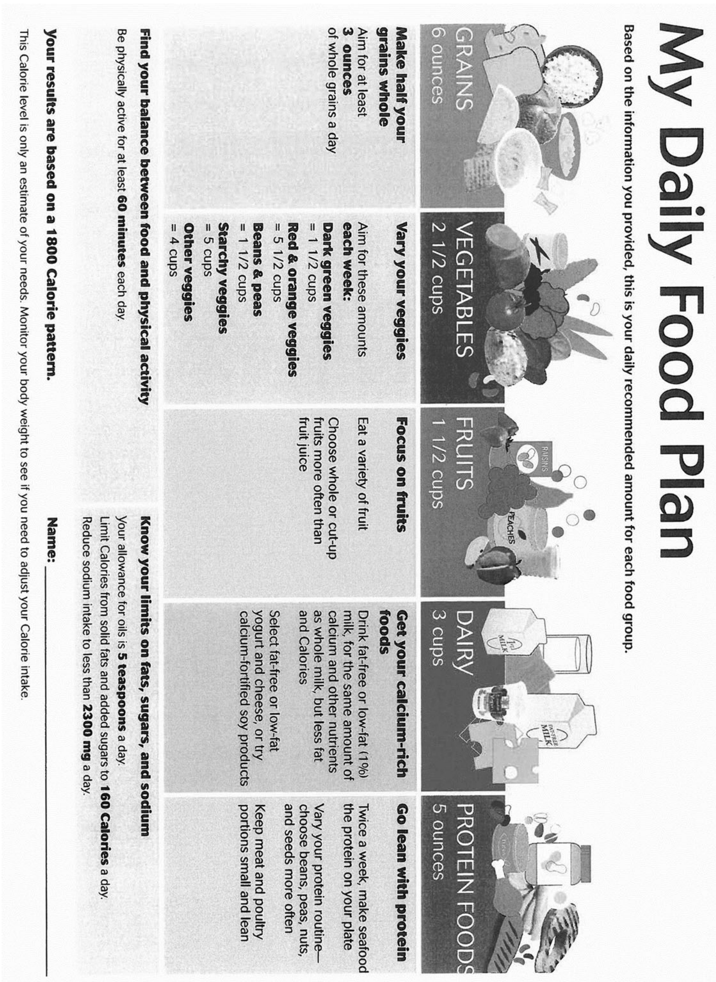
Food Sources:

- Home Pantry Menu and Nutrition Guide
- Chipotle Menu and Nutrition Guide
- Chick-fil-a Menu and Nutrition Guide

Appendix 2

Materials Provided to Participants

USDA Nutrition Daily Intake Guidelines



My Daily Food Plan

Based on the information you provided, this is your daily recommended amount for each food group.

GRAINS 6 ounces	VEGETABLES 2 1/2 cups	FRUITS 1 1/2 cups	DAIRY 3 cups	PROTEIN FOODS 5 ounces
Make half your grains whole Aim for at least **3 ounces** of whole grains a day	**Vary your veggies** Aim for these amounts **each week:** **Dark green veggies** = 1 1/2 cups **Red & orange veggies** = 5 1/2 cups **Beans & peas** = 1 1/2 cups **Starchy veggies** = 5 cups **Other veggies** = 4 cups	**Focus on fruits** Eat a variety of fruit Choose whole or cut-up fruits more often than fruit juice	**Get your calcium-rich foods** Drink fat-free or low-fat (1%) milk, for the same amount of calcium and other nutrients as whole milk, but less fat and Calories Select fat-free or low-fat yogurt and cheese, or try calcium-fortified soy products	**Go lean with protein** Twice a week, make seafood the protein on your plate Vary your protein routine—choose beans, peas, nuts, and seeds more often Keep meat and poultry portions small and lean

Find your balance between food and physical activity
Be physically active for at least **60 minutes** each day.

Know your limits on fats, sugars, and sodium
Your allowance for oils is **5 teaspoons** a day.
Limit Calories from solid fats and added sugars to **160 Calories** a day.
Reduce sodium intake to less than **2300 mg** a day.

Your results are based on a 1800 Calorie pattern.

Name: ____________

This Calorie level is only an estimate of your needs. Monitor your body weight to see if you need to adjust your Calorie intake.