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ПРОФЕССИОНАЛЬНО-ОРИЕНТИРОВАННЫЙ АНГЛИЙСКИЙ ДЛЯ СТУДЕНТОВ МАГИСТРАТУРЫ ЗАОЧНОГО ОТДЕЛЕНИЯ

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«Нижегородский государственный архитектурно-строительный университет»

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В пособии раскрываются концептуальные основы активного обучения, обобщен и изложен опыт преподавателей по использованию активных методов обучения при организации профессионально ориентированного иноязычного общения студентов магистрантов различных направлений подготовки. Учебное пособие состоит из разделов, освещающих различные аспекты строительной деятельности.

Предназначено для студентов магистратуры заочного отделения направления 08.03.01 и 08.04.01. Строительство при подготовке к практическим занятиям (включая рекомендации по организации самостоятельной работы) по дисциплине «Деловой иностранный язык». Будет полезным аспирантам, а также преподавателям, интересующимся активными методами и формами обучения.

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СОДЕРЖАНИЕ

ВВЕДЕНИЕ

Данное учебное пособие предназначено для обеспечения дисциплины «Деловой иностранный язык» для студентов магистратуры заочного отделения направления подготовки 08.03.01 и 08.04.01. Строительство.

Учебное пособие «Профессионально-ориентированный английский для студентов магистратуры заочного отделения» состоит из двух разделов, раскрывающих концептуальные основы активного обучения, а также обобщающих опыт преподавателей по использованию активных методов обучения при организации профессионально ориентированного иноязычного общения студентов магистрантов различных направлений подготовки. В пособии представлены различные аспекты строительной сферы деятельности, а также содержится ряд коммуникативных и творческих заданий. Все аспекты строительной сферы деятельности были отобраны с помощью анализа практической значимости материала в профессиональной деятельности магистрантов.

В пособии представлены аутентичные тексты профессиональной направленности, а также разнообразные по форме и содержанию упражнения, основанные на активных технологиях обучения и направленных на активизацию изученного материала. Упражнения творческого характера имеют цель сформировать положительную мотивацию к изучению данной темы и предмета в целом, а также обеспечить формирование навыков устной и письменной коммуникации на иностранном языке. В процессе их выполнения студенты вовлечены в квазипрофессиональную деятельность, которая несет в себе черты их будущей профессиональной деятельности с использованием иностранного языка, формируя целостный образ будущей профессиональной ситуации. Кроме того, разработанные творческие задания направлены на стимулирование совместной работы, где каждый студент приобретает навыки социального взаимодействия, коллективную направленность, ценностные ориентации и установки, присущие специалисту.

Пособие рекомендуется для использования, как для аудиторной, так и для самостоятельной работы студентов-магистрантов заочной формы обучения.

Авторы выражают благодарность всему коллективу кафедры иностранных языков ННГАСУ, рецензентам, преподавателям специальных кафедр ННГАСУ и студентам-магистрантам за помощь и ценные замечания в процессе подготовке данного пособия.

РАЗДЕЛ 1. ОСНОВЫ ОРГАНИЗАЦИИ АКТИВНОГО ОБУЧЕНИЯ

1.1. ОПИСАНИЕ ТЕХНОЛОГИИ АКТИВНОГО ОБУЧЕНИЯ

Высокие темпы развития общества, стремительно меняющиеся требования к выпускнику вуза, большой объем информации, необходимой для усвоения к концу обучения, вынуждают использовать в вузовском образовании различные методы активного обучения. Активные методы обучения понимаются нами как методы, стимулирующие познавательную деятельность обучающихся, они строятся в основном на диалоге, предполагающем свободный обмен мнениями о путях разрешения той или иной проблемы, характеризуются высоким уровнем активности учащихся. Исследования показывают, что именно на активных занятиях – если они ориентированы на достижение конкретных целей и хорошо организованы – учащиеся часто усваивают материал наиболее полно и с пользой для себя. Это означает, что учащиеся думают о том, что они изучают, применяют это в ситуациях реальной жизни или для дальнейшего обучения и могут продолжать учиться самостоятельно. Обучение, которое можно использовать, обучение, которое является долговечным, – это гораздо более эффективное приложение времени педагога и средств общества, нежели обучение, которое оставляет учащихся пассивными, которое утомляет педагога однообразием и которое вскоре забывается, потому что оно не используется на практике и не развивается.

Возможности различных методов обучения в смысле активизации учебной деятельности различны, они зависят от природы и содержания соответствующего метода, способов их использования, мастерства педагога.

В данном пособии в качестве инструмента для организации активного обучения предлагается педагогическая технология «Развитие критического мышления через чтение и письмо» (далее РКМЧП), разработанная в середине 90-х годов американскими преподавателями-психологами (Дженни Д. Стилл, Кертис С.Мередит, Чарлз Темпл). В работах М.В. Кларина отмечается, что в США с 80-х годов, а в европейских странах с 90-х годов прошлого столетия, развитие критического мышления стало одной из основных целей образования

Под термином “критическое мышление” понимается система мыслительных характеристик и коммуникативных качеств личности, позволяющих эффективно работать с информацией.

Цель данной технологии – развитие мыслительных навыков учащихся, необходимых не только в учёбе, но и в обычной жизни. Умение принимать взвешенные решения, работать с информацией, анализировать различные стороны явлений и так далее. Данная технология направлена на

развитие ученика, основными показателями которого являются оценочность, открытость новым идеям, собственное мнение и рефлексия собственных суждений.

Особенности этой технологии заключаются в том, что:

- ✓ учебный процесс строится на закономерностях взаимодействия личности и информации, закономерностях и механизмах процессов познания;
- ✓ на этапах технологии могут применяться разнообразные формы и стратегии работы с текстом, организации дискуссий;
- ✓ стратегии технологии позволяют все обучение проводить на основе принципов сотрудничества, совместного планирования и рефлексии.

Обучающийся, способный критически мыслить, владеет разнообразными способами осмысления и оценки информации, может выделить противоречия, аргументировать свою точку зрения, опираясь не только на свои знания, но и на мнение собеседника. Он может осуществлять планомерный поиск ответов на вопросы, вскрывать причины и последствия фактов.

Формы занятий в РКМЧП отличаются от уроков в традиционном обучении. Обучающиеся не сидят пассивно, слушая преподавателя, а становятся главными действующими лицами занятия. Они думают и вспоминают про себя, делятся рассуждениями друг с другом, читают, пишут, обсуждают прочитанное. Тексту отводится приоритетная роль: его читают, пересказывают, анализируют, трансформируют, интерпретируют, дискутируют, наконец, сочиняют.

Роль преподавателя в данном процессе является в основном координирующей.

Технологическую основу составляет базовая модель трех стадий «вызов – осмысление – рефлексия», которая позволяет помочь обучающимся самим определять цели обучения, осуществлять активный поиск информации и размышлять о том, что они узнали.

На стадии вызова (evocation) в сознании учащихся происходит процесс актуализации имеющихся знаний и представлений о предмете изучения. Поскольку при этом сочетаются индивидуальная и групповая формы работы, участие студентов в образовательном процессе активизируется, формируется познавательный интерес. Результатом данных процессов яв-

ляется самостоятельное определение ими цели дальнейшей учебной деятельности.

На стадии осмысления (realization) обучающийся вступает в непосредственный контакт с новой информацией – носителем новых идей. Происходит ее систематизация. Студент получает возможность задуматься о природе изучаемого объекта, учится формулировать вопросы по мере соотнесения уже известной и новой информации и выработки собственных умозаключений. Очень важно, что уже на этом этапе с помощью ряда приемов преподаватель помогает учащимся отслеживать процесс собственного понимания новых идей.

Стадия рефлексии (reflection) характеризуется тем, что обучающиеся закрепляют новые знания и активно перестраивают собственные представления с тем, чтобы включить в них новые понятия. Таким образом, происходит "присвоение" нового знания и формирование на его основе своего аргументированного представления об изучаемом объекте. Анализ студентами развития и эффективности собственных мыслительных операций составляет сущность данного этапа.

В ходе работы по такой модели обучающиеся овладевают различными способами интегрирования информации, вырабатывают собственное мнение на основе осмысления различного опыта, идей и представлений, строить умозаключения и логические цепи доказательств, выражать свои мысли четко, понятно для других, уверенно и корректно по отношению к окружающим.

На методическом уровне технология представляет собой систему приемов и стратегий, объединяющих приемы учебной работы по видам учебной деятельности независимо от конкретного содержания. Базовая модель задает не только определенную логику построения занятия, но и последовательность, и способы сочетания конкретных методических приемов.

В рамках базовой модели «Вызов-Осмысление-Размышление» могут быть использованы разнообразные стратегии обучения, достаточно известные и апробированные в педагогической практике: стратегии кооперативного обучения, стратегии проблемного обучения, технологии организации учебной дискуссии.

Надо заметить, что обучение по технологии развития критического мышления становится продуктивным лишь тогда, когда сам преподаватель в процессе осознания собственной деятельности способен отказаться от

официально утвержденных и годами практикуемых методов работы. Необходимо разрушение таких педагогических стереотипов, как:

- ✓ оценка преподавателем обучаемых;
- ✓ студент не должен делать ошибок;
- ✓ преподаватель знает, как и что должен отвечать студент;
- ✓ преподаватель учит, а студент учится;
- ✓ преподаватель должен знать ответы на все вопросы, которые возникают на занятии;
- ✓ на вопрос преподавателя всегда должен быть ответ.

Кроме того, очевидно, что переход к учению, сосредоточенному на самом обучающемся, представляет для педагога значительные трудности, поскольку превращает его из механического «переносчика информации» в настоящего партнера по «процессу добычи знаний». Поэтому при всей своей, казалось бы, сухой технологичности, данная модель оставляет педагогу широкое поле деятельности для профессионального роста, и что немаловажно, для реализации своих личностных качеств.

Технологию развития критического мышления можно считать интегрирующей, в ней обобщены наработки многих технологий: она обеспечивает и развитие мышления, и формирование коммуникативных способностей, и выработку умения самостоятельной работы. В связи с большим арсеналом приемов и методов, входящих в технологию, каждый преподаватель может выбрать те, которые близки лично ему, не выходя за границы рамочного подхода данной технологии (разрешено все то, что не запрещено). То есть для любого педагога она может стать «своей». Это очень важно в том случае, когда педагогический коллектив стремится достичь позиционного единства всех преподавателей.

В этом пособии представлены возможности использования технологии развития критического мышления для студентов различных направлений магистратуры, позволяющие эффективно управлять педагогическим процессом.

1.2. ПРИЁМЫ ТЕХНОЛОГИИ АКТИВНОГО ОБУЧЕНИЯ

Приём «Маркировочная таблица»

Существует множество способов графической организации материала. Среди них самыми распространенными являются таблицы. Предлагаем рассмотреть форму концептуальной таблицы, сводной таблицы. Можно рассматривать данный прием, как прием стадии рефлексии, но в большей степени – это стратегии ведения занятия в целом.

При заполнении таблицы используется прием, который называется ИНСЕРТ (I.N.S.E.R.T. – «Interactive Notation System for Enhanced Reading and Thinking»)

Значки: √ – это я знал; + – новая информация; - – противоречит моим представлениям; ? – информация непонятна или недостаточна.

На чтение текста отводится 15-20 минут.

√	+	-	?
Я это знал	Я не знал этого	Информация о ... противоречит моим представлениям, потому что ...	Информация о ... непонятна или недостаточна для меня, потому что ...

Закончив читать, участники должны нарисовать и заполнить «Маркировочную таблицу», в каждую колонку которой следует внести не менее 3-4 пунктов.

После прочтения текста, обучающиеся делятся своими впечатлениями, сравнивают информацию, занесенную в таблицы.

Прием «Концептуальная таблица» помогает систематизировать информацию, проводить параллели между явлениями, событиями или фактами.

Данные сравнительные таблицы помогают увидеть учащимся не только отличительные признаки объектов, но и позволяют быстрее и прочнее запоминать информацию. Составление сравнительных таблиц можно использовать как на стадии вызова, так и на стадии осмысления.

Данная работа позволяет развивать у обучающихся помимо умения работы с текстом, следующие умения:

- ✓ выделять ключевые слова;
- ✓ систематизировать необходимую информацию;
- ✓ анализировать, сравнивать и обобщать информацию;
- ✓ развитие монологической речи;
- ✓ потребность в поиске дополнительной информации.

Эти вопросы могут остаться в качестве домашнего задания, которое принимает форму увлекательной работы с информацией.

Прием «Составление кластера»

Кластер – прием систематизации материала в виде схемы (рисунка), когда выделяются смысловые единицы текста. Правила построения кластера очень простые.

Кластер оформляется в виде модели планеты со спутниками. В центре располагается основное понятие, мысль, по сторонам обозначаются крупные смысловые единицы, соединенные с центральным понятием прямыми линиями. Это могут быть слова, словосочетания, выражающие идеи, мысли, факты, образы, ассоциации, касающиеся данной темы. Вокруг «спутников» центральной планеты могут находиться менее значительные смысловые единицы, более полно раскрывающие тему и расширяющие логические связи. Важно уметь конкретизировать категории, обосновывая их при помощи мнений и фактов, содержащихся в изучаемом материале. Система кластеров охватывает большое количество информации.

Прием «Кластеры» используются как на стадии вызова, так и на стадии рефлексии, т.е. может быть способом мотивации к размышлению до изучения темы или формой систематизирования информации при подведении итогов.

В зависимости от цели может быть организована как индивидуальная самостоятельная работа, так и коллективная – в виде общего совместного обсуждения.

Этот прием развивает умение строить прогнозы и обосновывать их, учит искусству проводить аналогии, устанавливать связи, развивает навык одновременного рассмотрения нескольких вариантов, столь необходимый при решении жизненных проблем. Способствует развитию системного мышления.

Прием «Зигзаг»

Группа обучающихся разбивается на команды. Члену каждой команды присваивается номер в зависимости от количества текстов, заготавливаются таблички с соответствующими номерами на столы.

Затем распределяются задания, каждый член группы получает свой вопрос (текст) для изучения. На столы выставляются номера, согласно которым происходит перегруппировка: все первые номера садятся вокруг стола с цифрой 1, вторые номера занимают места вокруг стола №2 и т.д. После изучения своего вопроса (текста), составления кластера, оформления его на листе А3, обучающиеся возвращаются в свои группы, происходит взаимообучение, т.е. обмен полученной информацией в группе. Сведения, поступившие от всех членов группы обсуждаются, оформляются в «Сводную таблицу», в которой перечислены те категории, по которым мы предполагаем сравнивать какие-то явления, события или факты. В колонки, расположенные по левой стороне, заносится информация, которую предстоит сравнивать. Каждая группа озвучивает результат своей работы.

По итогам урока у каждого обучающегося в тетради получается конспект по изучаемой теме, сразу по нескольким вопросам.

На этапе рефлексии, обучающиеся делятся впечатлениями о ходе урока, о своем вкладе в общий результат, о преимуществах или недостатках такой формы изучения нового материала.

Преимуществом стратегии «Зигзаг» является то, что за одно занятие каждый обучающийся, вне зависимости от его способностей, усваивает большой объем информации, всю работу на занятии обучающийся выполняют в сотрудничестве с другими членами группы и ответственность за результат является основной составляющей занятия. Обучающимся предлагается прочитать тему занятия или посмотреть на картинку, на которой эта тема изображена, и ответить на вопрос:

- ✓ О чем может пойти речь?
- ✓ Какая ассоциация у вас возникает, когда вы смотрите на эту картинку?

Обучающиеся перечисляют все возникшие ассоциации, которые преподаватель записывает на доске

Прием «Пометки на полях»

Обучающиеся получают текст и делают в нем соответствующие пометки:

«**+**» – поставьте на полях, если информация, которую вы изучаете, соответствует тому, что вы знаете;

«-» – поставьте на полях, если информация, которую вы изучаете, противоречит тому, что вы знали об этом вопросе;

«√» – поставьте на полях, если информация, которую вы изучаете, является новой для Вас;

«**?**» – поставьте на полях, если информация, которую вы изучаете, является непонятной или Вы хотели бы получить более подробные сведения по данному вопросу.

Таким образом, в процессе чтения текста, обучающиеся делают четыре типа пометок на полях, в соответствии со своими знаниями и пониманием. Время на работу отводится в зависимости от объема текста

Прием «Ключевые слова»

На стадии вызова из рассказа выбираются ключевые слова, и в группах предлагается составить с ними свой собственный рассказ, опираясь на собственные предположения

На стадии осмысления нами были выделены отрывки и в паузах между отрывками нами задавались вопросы, стимулирующие различные уровни познания.

На стадии рефлексии возможно возвращение к ключевым словам, представленным в начале занятия и корректировка рассказов в соответствии с прочитанным рассказом или написание сочинения, обозначая проблемы, затронутые в рассказе.

Прием «Шесть шляп критического мышления Эдварда де Боно»

Это задание обычно используется мною на стадии обобщения и систематизации, т.е. на стадии рефлексии. Этот прием является удобным способом управлять мышлением и переключать его.

Он является одним из инструментов развития творческого мышления.

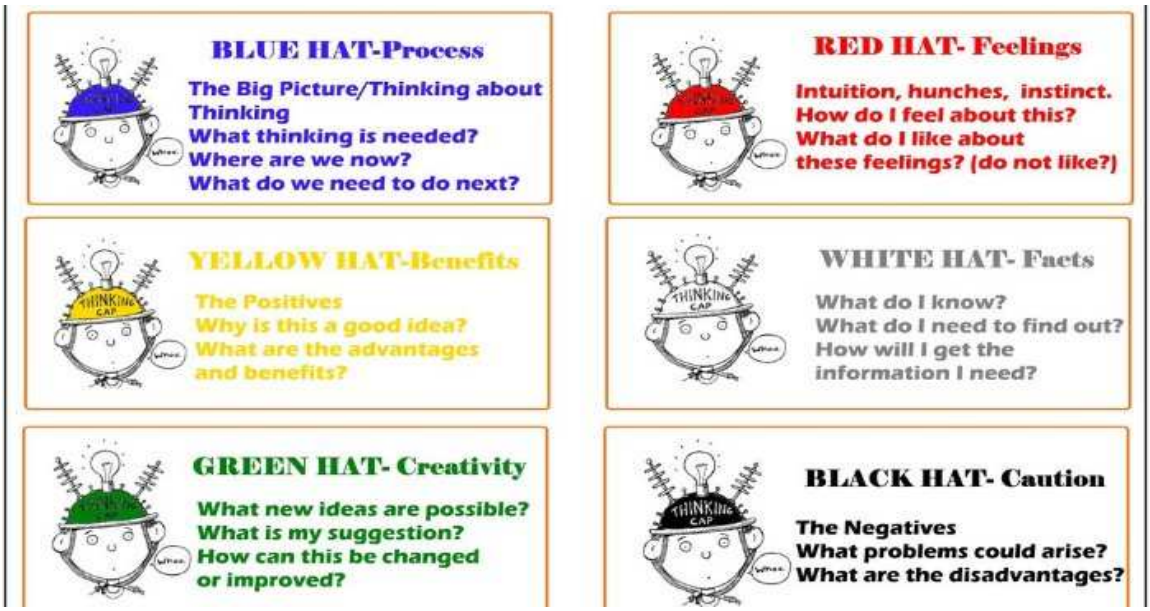
Метод позволяет разделить мышление на шесть типов, или режимов, каждому из которых отвечает метафорическая цветная "шляпа". Такое де-

ление позволяет использовать каждый режим намного эффективнее, и весь процесс мышления становится более сфокусированным и устойчивым.

Надевая, снимая, сменяя шляпу, мы принимаем на себя определенную роль, на которую эта шляпа указывает.

Метод шести шляп – это применение того же принципа в мышлении: попытка научиться уделять внимание разным аспектам мышления по одному за раз. В результате сочетание этих различных аспектов дает мышление в полном объеме.

Шесть шляп критического мышления Эдварда де Боно



Теперь поподробнее что означает каждая шляпа.

Красная шляпа. Красная шляпа связана с эмоциями, интуицией, чувствами и предчувствиями. Здесь не нужно ничего обосновывать. Ваши чувства существуют, и красная шляпа дает возможность их изложить.

Желтая шляпа. Под желтой шляпой мы стараемся найти достоинства и преимущества предложения, перспективы и возможные выигрыши, выявить скрытые ресурсы.

Черная шляпа. Черная шляпа – это режим критики и оценки, она указывает на недостатки и риски и говорит, почему что-то может не получиться.

Зеленая шляпа. Зеленая шляпа – это режим творчества, генерации идей, нестандартных подходов и альтернативных точек зрения.

Белая шляпа. В этом режиме мы сосредоточены на той информации, которой располагаем или которая необходима для принятия решения: только факты и цифры.

Синяя шляпа. Философская шляпа. Это режим наблюдения за самим процессом мышления и управления им (подведение итогов). Обобщение всех точек зрения на предмет обсуждения.

Метод шести шляп обогащает наше мышление и делает его более всесторонним.

Если мы просто просим других о чем-то подумать, часто они приходят в растерянность. однако если их приглашают исследовать предмет, используя схему шести шляп, широта их восприятия быстро возрастает.

Достоинствами этого приема заключается в следующем:

- ✓ наглядность, простота освоения и применения;
- ✓ умение видеть ситуацию и решение с нескольких точек зрения;
- ✓ позволяет отстранить свое эго от мышления;

К недостаткам представленного приема относится:

- ✓ для эффективного применения требуется развитое воображение и тщательная тренировка;
- ✓ большая психологическая нагрузка;
- ✓ ожидаемый результат.

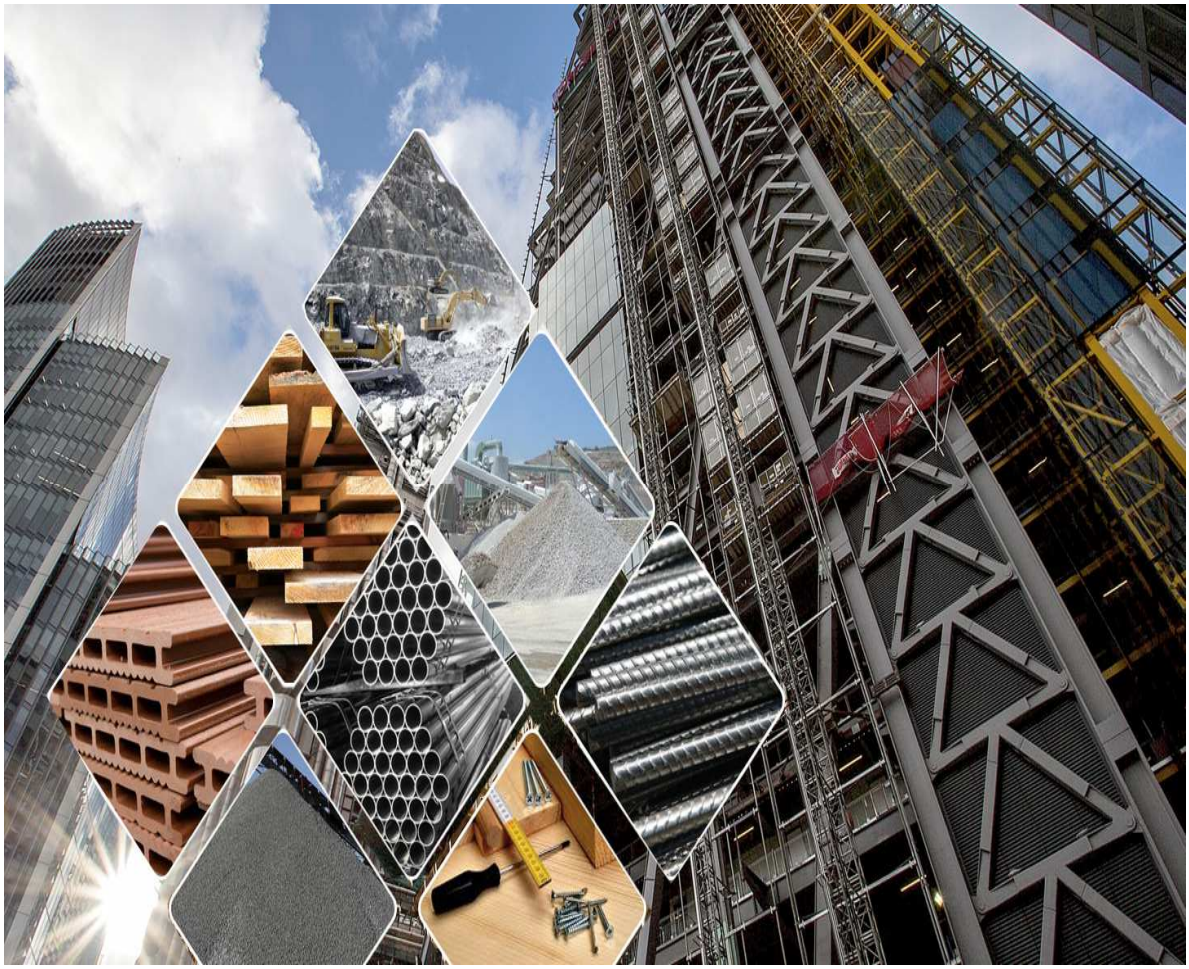
На занятиях мы используем метод шести шляп на отчетных занятиях по проектам, где студенты представляют презентации своих проектных работ.

Данный прием помогает нам:

- ✓ разнообразить деятельность студентов на занятии;
- ✓ рассмотреть представляемые проблемы с разных сторон;
- ✓ развивать разностороннее критическое мышление у студентов;
- ✓ сложить с преподавателя функцию оценки, эта функция возлагается целиком и полностью на студентов (peer assessment).

РАЗДЕЛ 2. ИСПОЛЬЗОВАНИЕ АКТИВНЫХ МЕТОДОВ В ПРОФЕССИОНАЛЬНО ОРИЕНТИРОВАННОМ ОБУЧЕНИИ МАГИСТРАНТОВ.

2.1. BUILDING MATERIALS



Lead in

1. What types of building materials do you know? What are their special features? What are the advantages and disadvantages of building materials?
You can use the words from the list below:
Types of building materials:
timber, stone, concrete, metals, iron, copper, mortar, cement, masonry, limestone, brick, glass, steel, clay, plastic, alloys, polymers, sand, aggregate, gravel, marble, wood, rubber, slag, bar reinforcement, fiber, gypsum, foam, synthetics

2. Study the properties of different building material. What materials do they characterize? Why?

to be durable,
to be lightweight,
to have waterproofing properties,
to be easily prefabricated,
to carry heavy loads,
to be subject to (susceptible to) corrosion,
to have affordable price,
to be fragile,
to burn easily,
to withstand continuous dump,
to have resistance to freezing and thawing,
to be toxic,
to have high absorption properties,
to have low resistance to heat,
to have high cost of maintenance,
to pollute environment,
to be noncombustible,
to be easily dismantled,
to be difficult in recycling,
to be economical,
to have high availability,
to have ductility
to be infected by insects,
to be flammable,
to be tensile,
to be exposed to deformation,
to have high elasticity,
to be hard,
to be soft,
to be resistant to cracking,
to be weak under tension,
to be transparent
to be resistant to rusting
to have good insulating properties
to have high strength-to-weight ratio
to be flexible (bent easily without breaking
to deteriorate easily

Reading task

1. The table below contains the specific features of different construction material. Complete the table with specific features of different types of building materials. Match the specific feature to the building material it belongs to. Explain your choice.

Concrete	1. It is unaffected by noise, air, water and most and it makes the building look beautiful. 2. It has particularly high strength, low water absorption and good acid resistance.
Wood	3. It is well-known for its ductility and is less likely to fail during earthquakes than other building materials.
Brick	4. It is a very durable, low maintenance material and can provide thermal mass, helping reduce the energy consumption of buildings in operation. 5. It is renewable material. It is durable, reusable and recyclable.
Glass	6. The most remarkable application of this material was the construction of the skyscrapers.
Steel	7. It is readily available and economically competitive, as well as being extremely strong in relation to its weight. 8. It does not rust so it does not degrade by time with chemicals and surroundings.
	9. It consists of organic compounds which are composed mainly of carbon and hydrogen. They can combine with oxygen and burn. 10. It is still in common use today for the construction of walls and paving and for more complex features such as columns, arches, fireplaces and chimneys. 11. It does not corrode in pure, dry air at room temperature, but can corrode in moist and contaminated environments. 12. It can be solid, or can have holes perforated through it to reduce the amount of material used. 13. It is a nutritional product for some plants, animals and insects which drill holes and drive lines into it. 14. Its characteristics are determined by the aggregate used, or by the method that is used to produce it.

2. Group work (expert group): Each group will read one of the texts about some types of building materials and will make a summary of its specific features.

CONCRETE

Concrete is the most commonly used man-made material on earth. It is an important construction material used extensively in buildings, bridges, roads and dams. Its uses range from structural applications, to paviours, kerbs, pipes and drains.

Concrete is a composite material, consisting mainly of Portland cement, water and aggregate (gravel, sand or rock). When these materials are mixed together, they form a workable paste which then gradually hardens over time.

A material similar to concrete was first developed by the Egyptians, consisting of lime and gypsum. Typically, lime, chalk or oyster shells continued being used as the cement forming agent until the early-1800s. In 1824, Portland cement, a mixture of limestone and clay was burned and ground, and since then, this has remained the predominant cementing agent used in concrete production.

Benefits of concrete

It is a relatively cheap material and has a relatively long life with few maintenance requirements. It is strong in compression. Before it hardens it is a very pliable substance that can easily be shaped. It is non-combustible.

The limitations of concrete include:

Relatively low tensile strength when compared to other building materials. Low ductability. Low strength-to-weight ratio. It is susceptible to cracking.

Characteristics of concrete

The characteristics of concrete are determined by the aggregate or cement used, or by the method that is used to produce it. The water-to-cement ratio is the determining factor in ordinary structural concrete with a lower water content resulting in a stronger concrete.

This, however, reduces the workability (and pumpability) of the concrete, which can be measured using the slump test. The grading, shape, texture and proportion of aggregate can also have a similar affect. If a particularly strong concrete is required, the amount of aggregate can be reduced in relation to the cement. However, cement is a significant cost factor, and increasing its proportion in the mix will increase the overall price.

Concrete strength

Concrete strength is determined by the force required to crush it and is measured in pounds per square inch or kilograms per square centimetre. Strength can be affected by many variables including moisture and temperature.

The tensile strength of concrete can be improved with the addition of metal rods, wires, cables or mesh. Where very high tensile stresses are expected (such as in wide unsupported spans in roofs or bridges) concrete can include pretensioned steel wires. This creates compressive forces in the concrete that help offset the tensile forces that the structure is subject to.

Formwork

Formwork is a temporary mould into which concrete is poured and formed. Traditional formwork is fabricated using timber, but it can also be constructed from steel, glass fibre reinforced plastics and other materials.

Formwork may be; temporary, re-usable, or stay-in-place. There are also a number of proprietary systems such as those used to support vertical formwork while concrete cures, consisting of a series of tubes and ties.

Efficiency within concrete construction is being improved by the adoption of hybrid solutions and innovations in formwork such as self-climbing forms.

Sustainability

Concrete has a relatively high embodied energy, resulting from its extraction, manufacture and transportation. Waste materials can be included within the concrete mix such as Recycled Crushed Aggregate (RCA), Ground Granulated Blast-Furnace Slag (GGBS) and Pulverised Fuel Ash (PFA).

Concrete is a very durable, low maintenance material and can provide thermal mass, helping reduce the energy consumption of buildings in operation.

BRICK AND MASONRY

Bricks are small rectangular blocks that can be used to form parts of buildings, typically walls. The use of bricks dates back to before 7,000 BC, when the earliest bricks were formed from hand-moulded mud and dried in the sun. During the Industrial Revolution, mass-produced bricks became a common alternative to stone, which could be more expensive, less predictable and more difficult to handle.

Bricks are still in common use today for the construction of walls and paving and for more complex features such as columns, arches, fireplaces and chimneys. They remain popular because they are relatively small and easy to handle, can be extremely strong in compression, are durable and low maintenance, they can be built up into complex shapes and can be visually attractive.

However, more recently, other materials have been developed that can be used as alternatives for building walls or for cladding facades and for some building types, particularly larger buildings, bricks can be seen as time consuming, expensive (although this is disputed by the Brick Development Association), structurally limiting, and requiring too much on-site labour. Some of these difficulties have been overcome by the introduction of reinforcement systems and by the development of pre-fabricated brick panels.

In the UK, standard bricks are 215 mm long × 102.5 mm wide × 65 mm high. This gives a ratio of 3:2:1.

Bricks are most typically made from clay, although they are also commonly made from calcium-silicate and concrete.

Soft mud or dry-press bricks are formed by pressing the brick mixture into moulds and then firing them in a kiln. Soft-mud bricks are made from a thin mix whereas dry-press bricks are made from a thicker mix that gives crisper defini-

tion. Greater strength is achieved by using greater force when pressing the brick and by firing it for longer, but this increases the cost.

Extruded bricks are formed by pushing the brick mixture through a die to create an extrusion that is then wire cut to produce bricks of the required length.

Bricks can be solid, or can have holes perforated through them to reduce the amount of material used. Alternatively they may have an indentation on one surface (or two surfaces) commonly called a 'frog'. The frog must be filled with mortar when bricks are laid otherwise the structural and acoustic performance of the wall will be affected. For this reason it is best practice to lay bricks with the frog facing upwards so that it is easy to fill. Where there are two frogs, the larger frog should face upwards.

Other than the standard rectangular block, a number of special shapes exist for particular circumstances that may be encountered when building with bricks. Engineering bricks have particularly high strength, low water absorption and good acid resistance. They are generally used for civil engineering applications.

Masonry is generally used to form the walls and other solid elements of buildings and structures such as bridges, tunnels and so on. It may be load bearing, forming an integral part of the structure, or non-load bearing, such as a partition wall or cladding.

Generally the size of the units is suitable for being laid by one person, although, increasingly, masonry is delivered to site in prefabricated panels that are craned into position. Masonry is often formed by laying a number of interlocking units, bound together by mortar, however, dry set masonry relies on the friction between the units to prevent movement, and does not require mortar.

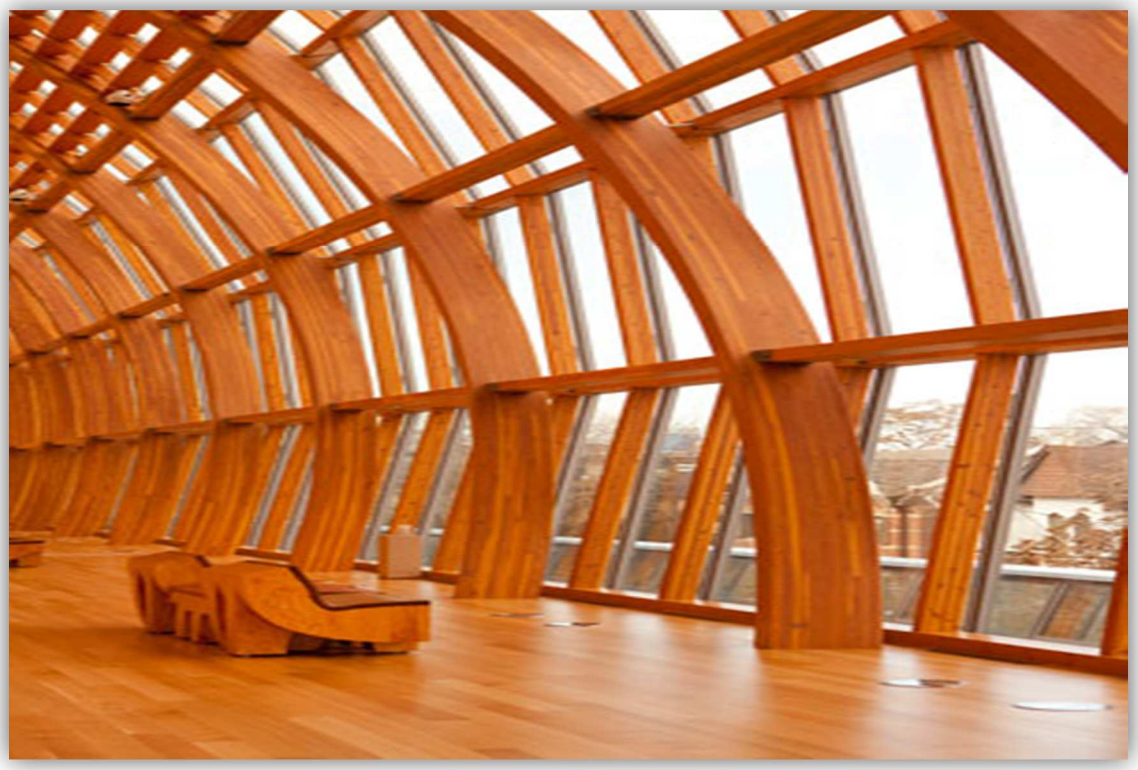
Masonry is very strong in compression, but less effective at resisting lateral loading or tension forces. Additional strength can be achieved by increasing the thickness of the masonry, by the addition of piers or buttresses, or by the incorporation of reinforcement.

Masonry walls may have complex constructions to optimise performance, that may include hollow sections in the masonry itself, a cavity between internal and external leaves of the wall, insulation, a vapour barrier and internal and external finishes and decoration.

However, generally masonry does not require finishing and decorating and is very durable, so is relatively inexpensive to maintain and repair. It tends to offer good thermal mass, high acoustic insulation and good resistance to fire.

Masonry tends to be heavy, and so requires strong foundations. It can be prone to frost damage, staining and disintegration of joints.

WOOD



Wood has been used in construction for thousands of years and is still one of the most widely used building materials. Certain properties of wood can be complex in terms of use for construction, but despite this, engineers have successfully harnessed this natural resource to build a variety of structures. From houses to boats and other shelters, as well as furniture and décor, the construction industry has exploited the potential of wood to the fullest.

Wood is favoured as a material because of the wide variety of properties depending on type. It is readily available and economically competitive, as well as being extremely strong in relation to its weight.

Wood is generally classified as hardwood and softwood. Hardwood is typically heavier and denser than softwood and is usually utilised for construction of walls, ceilings and floors. The highest possible grade of hardwood contains 83% usable material on one face and is suitable for high-quality furnishings, solid wood mouldings and interior joinery.

Softwoods are generally used to make more of the inner structures to the frame of hardwoods, such as doors and window frames. It is also used to produce furniture.

The words ‘lumber’ and ‘timber’ are often used to refer to wood used specifically in construction work, however there is debate as to which terms should apply to different scenarios. As a rule of thumb, wood which is smaller than five inches wide by five inches thick is referred to as lumber. These pieces are usually machine-planed and sawn for certain dimensions primarily being used in residential construction.

Pieces of wood over the lumber dimensions, regardless of length are timber, although any timber pieces that are more than eight inches wide and eight inches thick are called beams. As timber is usually larger in dimension it is used for the frames of structures in buildings and bridges, as well as being used in railroad ties, mine shaft support and crossbeams on utility poles.

Wood is 'renewable' when responsibly sourced. It is durable, reusable and recyclable. Some other benefits include: Thermal insulation. Acoustic insulation. Adaptability. Health benefits due its subjective comfort. Structural stability. Easy of manufacturing. Strengthens rural development and industry. Better fire resistance due to low thermal conductivity.

There are some disadvantages of wood but they are easy to disregard, and eliminate as long as the cause is known.

Wood is a hygroscopic material. This means that it will adsorb surrounding condensable vapors and loses moisture to air below the fiber saturation point.

Woods are organic goods. Like any organic good, wood is a nutritional product for some plants and animals. Insects drill holes and drive lines into wood.

Coating provides protection to wood used both indoors and outdoors. Coating prevents rapid uptake and loss of moisture and reduces shrinking and swelling that can lead to surface cracking and other problems. But coating does not totally prevent changes in moisture content. Coating slows, but does not halts moisture level.

Another disadvantage of wood is that it easily catches fire. Wood consists of organic compounds which are composed mainly of carbon and hydrogen. They can combine with oxygen and burns. Because of these properties, wood is classified as a combustible material.

It is impossible to make wood noncombustible like inorganic materials. In order to prevent potential dangers, wood can be processed in some fire retardants.

STEEL

Steel is one of the basic materials used in today's civil engineering industry due to its proven high strength and durability.

Though commercial carbon steels do not corrode in pure, dry air at room temperature, they do corrode in moist and contaminated environments. Corrosion of steel used in buildings causes structural failures that result in safety hazards. The relatively newly emerged stainless steels, which contain a high proportion of alloy elements such as chromium, generally do not form rust on their surfaces and do not discolour at normal atmosphere.

As stainless steel possesses similar desirable properties to normal steel and eliminates their disadvantages, stainless steel has been widely used as a construction material. The rate of growth of stainless steel use in the civil engineering sector is rapid. It was estimated that in 2006, approximately 14% of the world's total stainless steel production went into the construction industry.

The use of iron in human history can be traced to around 4,000 years BC when early civilizations in Asia and Africa used iron ore to make tools for agricultural purposes. In about 1400 BC, people learned to strengthen iron by heating iron ore and charcoal in simple furnaces.

Britain started to manufacture large amounts of iron in the early 15th century. During the 15th century, improvements of furnaces accelerated the development of the iron industry in England; between the 16th and 18th centuries, the lack of charcoal in England gave rise to a large amount of iron import from Sweden, America and Russia. Europeans used iron for roofing members in the 18th century.

The industrial revolution in the 19th century led to rapid development of the steel industry as the demand for machinery and transportation increased.

The mass manufacture and use of steel in the 20th century brought great advance to urbanization; from street lights to telephones, from typewriter to railways, the world benefited greatly from steel.

The most remarkable application of steel was the construction of the sky-scraper which led the architectural world to a new era. Steel frames became commonly used from 1909 as their strength was proven. Though there were many attempts to develop iron alloys from the mid-19th century, applicable stainless steel was not developed until the first decade of 20th century.

Today, stainless steel is used extensively in roofing, cables of suspension bridges and flood barriers.

Stainless steel is iron alloys containing a minimum of approximately 11% chromium; this amount of chromium prevents corrosion in unpolluted atmosphere and this is the reason that the steel is named 'stainless'. As its name suggests, the corrosion resistance is one of the most important factors.

A few physical properties are important to stainless steels used for engineering purpose; specific gravity, electrical conductivity, magnetic susceptibility and thermal conductivity

Fracture toughness of a material is the resistance to fracture when small defects raise the stress locally to the breaking stress.

When a metal fractures under repeated stress at a level much lower than the ultimate tensile stress, it is called failure by fatigue.

There are over 200 kinds of stainless steel composition and there are new ones being developed each year. Each stainless steel can be distinguished by its response under heat treatment and the mode of fabrication.

Though stainless steel is known for its high corrosion resistance, corrosion can still occur.

Stainless steel is well-known for its ductility and thus is considered less likely to fail during earthquakes than other building materials such as concrete.

Recycling of stainless steel is economically important as it contains valuable alloy elements.

Today many buildings are renewed by over-cladding and over-roofing, where a new cover is installed over the existing one to improve energy efficiency, fix damage and enhance appearance. Stainless steel can be used as over-cladding roofing panels and brackets for connecting the old and new structures.

GLASS

If we use glass as a building material, it adds on 10 times more beauty and elegance to the look and feel of the building. Glass is a brilliant material which has various properties and uses, and it presents architects with various new designs and possibilities. It is mostly used as a transparent glazing material in construction and is also used in architectural features like windows, doors, and partitions in the office area.

A glass is basically a transparent hard substance that is created by the application of heat to sand. It is an inorganic, transparent or translucent material and can be easily molded into any shape with the help of high-temperature heat. A glass is a mixture of raw materials like sodium potassium carbonate, lime, Silica, and Manganese oxide.

Glass as a building material is the most versatile and oldest material trusted by architects to be used in the construction of a commercial glass building. And its role in architecture has evolved over the years. Traditionally, the glasses were defined as the supercooled liquids. And this is because the glasses do not behave like metals or plastics on cooling.

Archaeological evidence has been found of man-made glass dating back to 4000 BC in the form of decorative glazes. In prehistoric times, weapons were made using naturally occurring glasses found in volcanic regions and after lightning strikes. Around 1500 BC glass was first used as a material for making hollow containers. The Romans excelled at glassmaking. When the Roman Empire fell, the skills spread throughout Europe and the Middle East.

Since that period, glass manufacturing techniques have developed considerably with advancements in science and technology.

Properties of Glass:

1. Strength

A glass is a hard material but it is liable to break easily. Thus, one should be careful while using glass as a building material and in the home as well.

2. U value

U value is the measurement that calculates the amount of heat transferred through the window. The lower the U- values of glass, the better the insulation properties.

3. Workability

A glass can be used in various ways as it can be blown drawn and pressed. Thus, it can be molded into different shapes and serves various purposes.

4. Transparency

A glass is transparent and allows visual connection with the outside world. Though, its transparency can be altered just by adding admixtures and can leave the overall beautiful look of glass.

5. Greenhouse effect

The trapping of heat in the glass leads to a higher temperature and the trapping occurs due to the greenhouse effect.

6. Recyclable

The glass material is totally recyclable and the broken glass scrap is gathered and remelted to be used again.

Most common types of glasses used for glass buildings are toughened glass, laminated glass, tinted glass, double glazed glass.

A glass has a great number of advantages. It can absorb, refracts and transmits 80% of available natural daylight in both the directions. A glass can be made transparent or translucent, thus it adds extraordinary beauty to the building. It can be blown, drawn and pressed to any shape and hence it is used for various purposes. It is dustproof and can be easily cleaned because of smooth and glossy texture. Glass does not rust so it does not degrade by time with chemicals and surroundings. A glass is 100% recyclable and it does not degrade during the process of recycling. The broken pieces of glass can be gathered and melted and it becomes reusable. It is unaffected by noise, air, water and most of the acids thus, it makes the building look beautiful lifelong.

However, a glass is unsafe for earthquake proven area. Use of glass in a building enhances the cost of security because of the transparency. The glass is made of very rigid and easily breakable material so when it is subjected to stress, it breaks without strain. Glass absorbs heat and acts as a greenhouse, hence are not suitable for hot climates. In spite of all these shortcomings, glass usage helps with environment-friendly office buildings. A glass is 100% recyclable and sustainable; using glass is a great way to conserve the natural resources. The best part about using a glass is it can be recycled numerous times and will still not lose its quality and strength.

3. Group work (expert group):

Each expert group member will return to their home group and will retell the summary of their type of building material.

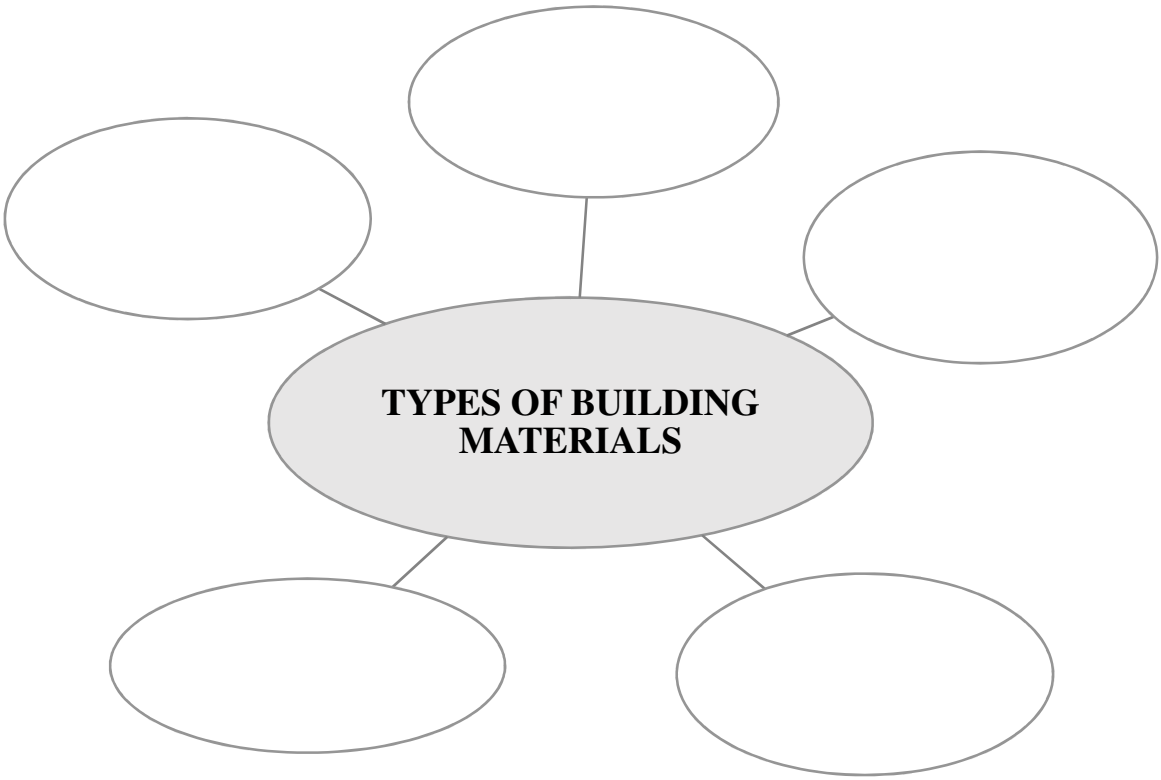
4. Group work (home group):

Return to your home group and correct the tables with building materials features.

Discuss, find the advantages and disadvantages of different types of building materials

5. Group work

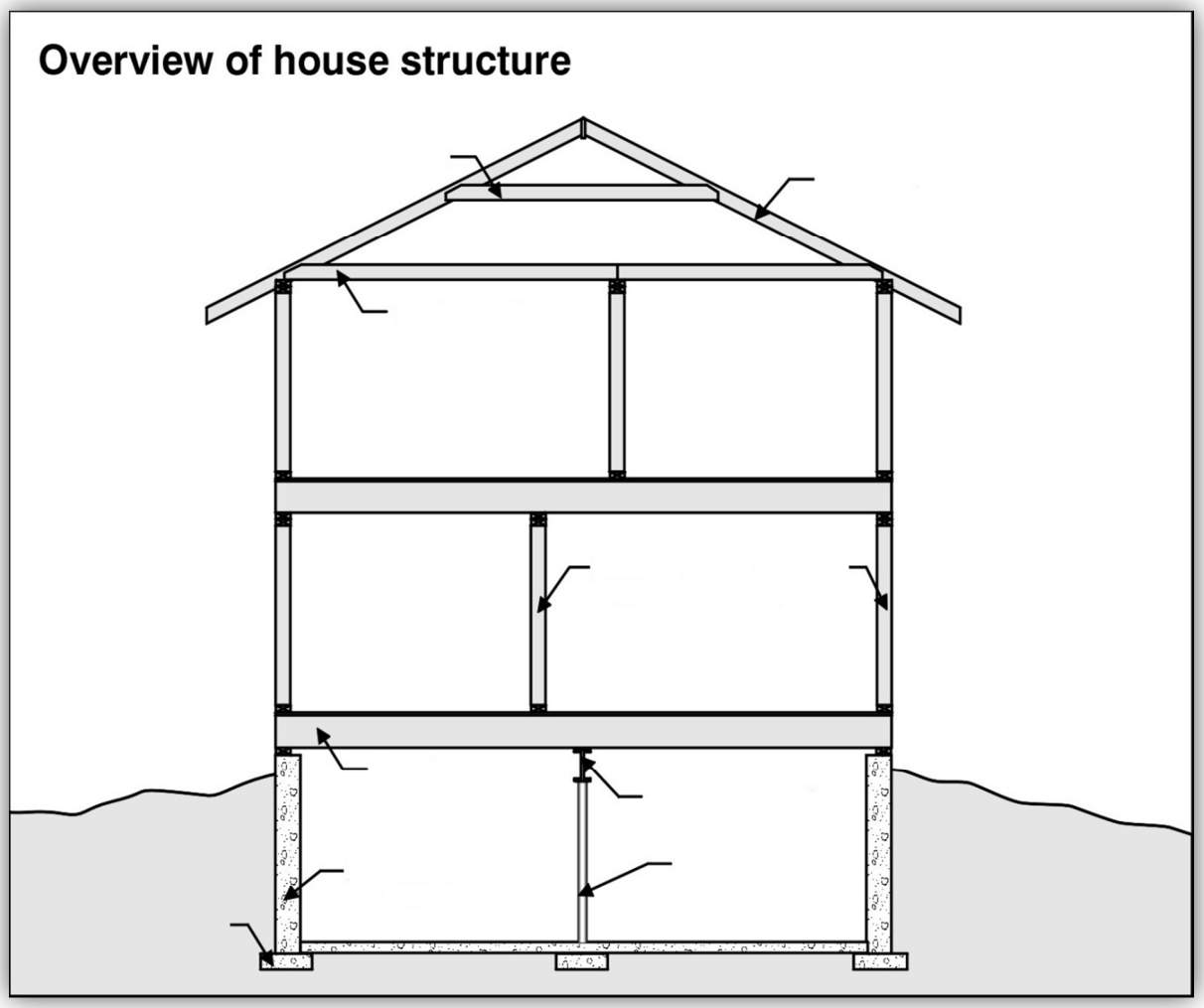
Make a cluster and present the most widely used building materials in your country.



2.2. BUILDING ELEMENTS

Lead in

1. What is framework? What structural elements can you name?



2. Put the following elements of the house into the right place in the picture:

collar tie	затяжка стропил
roof rafter	стропила крыши
ceiling joist	балка потолка
bearing wall	несущая стена
exterior wall	внешняя стена
floor joist	балка пола
bearing beam	несущая балка
column	колонна, стойка
foundation wall	фундаментная стена
footing	опора

Reading task

1. Read the following text and check your answers. While reading mark the information:

I knew this fact (V)

I didn't know this (+)

I was wrong about this (-)

I need some more information about this (?)

A building is a closed space built for the purpose of shelter and dwelling and can be made of steel, concrete, wood, masonry or clay mud. Buildings serve residential, commercial and industrial purposes. In order to properly serve as a shelter, buildings are designed to be robust enough to resist wind forces, earthquakes, snow and rain, floods and other natural calamities. Each material used to construct buildings is designed to support the building as a whole and provide shelter and other benefits to its occupants.

Slab

A slab is a technical term used for the floor. The number of slabs required is dependent on the number of stories in a building. Slabs are designed to be as thin as possible and cover maximum surface area. Slabs are usually made of concrete, concrete filled metal deck, wood, galvanized iron sheets or panels and often finished with tiles or screed for both protection and aesthetic value. A slab transferring weight in one direction is called a one way slab, while a slab transferring weight in two directions is called a two-way slab.

Beam/ Post

A beam carries the weight transfer from the slab. Beams support and frame the slabs so that the slabs won't deflect. Most beams do not resist axial forces. Wooden beams are often referred as posts. The size of the beam depends on gravity and lateral loadings. Concrete beams are usually of the rectangular cross section while the most effective steel beam section is wide flange beam. Connections and detailing of beams decide its continuity.

Column

The technical name for a pillar is a column. Columns are used to carry all the weight of a structure and transmit it to the foundation. Columns are slender and designed to resist axial forces. Columns are designed to have more stiffness than beam and resist all gravity and lateral weight. A typical cross section of a concrete column is square, rectangle and circular. A wide flange section and hollow steel section are standard steel column sections. Steel columns are also encased in concrete to give additional strength and aesthetics. Architectural columns may also be used in buildings for purely aesthetic reasons. Columns are most prone the earthquake and wind loadings.

Structural Walls

There are two types of structural walls: Shear walls and retaining walls.

Shear Walls.

Shear walls are intentionally designed to handle earthquake and wind loadings. They are the vertical elements with large surface areas that attract all lateral forces. Shear walls are located symmetrically around the building parameters to avoid torsion and twisting of the building. In some buildings, shear walls work alone to resist an earthquake, while in other buildings, columns also contribute.

Retaining Walls.

Retaining walls are designed to resist lateral loadings of soil and water. The triangular pressure loading acts along the height of the wall. The magnitude of pressure increases with depth. Retaining wall are a workout to resist overturning and uplifting. These are used to resist slope of embankments, pavements, basements and other underground structures.

Foundations

All the structural loads of the buildings are transmitted to the soil strata by mean of structural foundation. Concrete is the most widely used material used for the construction of foundation of all types of buildings. The size and type of foundation depend on loading and soil characteristics. The following are the types of foundation typically used in construction:

Isolated/ Spread Footing.

Isolated footing is shallow footing designed for single column loading.

Combined Footing.

Combine footing is designed for two column loads.

Strip Footing.

A footing connecting series of columns in a row is called strip footing.

Wall Footing.

Wall loads are transferred to soil by mean of wall footing.

Eccentric Footing.

The foundation of columns at edge to the adjacent buildings is workout as eccentric footing.

Strap Footing.

In order to avoid overturning of eccentric footing, a beam is tied. This beam is called strap beam and foundation is referred as strap footing.

Raft/ Mat Footing.

Raft or matt footing are foundations designed for various columns.

Pile Foundation.

Pile foundation is designed for high-rises with massive loading. Concrete piles are drilled or driven into the bore hole. Pile caps are provided to connect the group of pile.

Pedestal.

Pedestals are designed for poles or gate columns.

The foundation of a building sitting on soil of good bearing capacity is smaller in size. The settlement of soil is critical for the foundation of a large area such as raft. Friction, cohesiveness, and expansion are other important parameter affecting foundation size and design.

Partition Walls

Partition walls are not structural elements of the building. They just provide separation and closing. Partition wall can be made of block masonry, hollow block, timber, glass or brick. In a high-rise building, these partition walls are more prone to the lateral forces and could damage severely in case of such catastrophe. In such case, reinforcement bars are embedded into the hollow blocks to improve their performance. Structural framing is done such that there is a beam underneath the partition wall, but it is not necessary. The areas where partition walls are directly resting on slabs are designed for that much loading and strength. The smaller height walls around the periphery of roof and balconies serve for privacy are called parapet walls. They also lie in the category of non-structural walls.

Openings

It is necessary to leave compulsory open space around the building including doors, windows, and other types of ventilators. These openings provide lighting, aeration, ventilation and aesthetic.

Fixtures

There are electrical, mechanical and plumbing fixtures in most buildings. Electrical ducts are concealed, and wires are drawn through them before finishing. Similarly, plumbing lines are embedded through floorings, along with drinking and drainage supply facilities.

2.Put information into the table and discuss it with your partner.

√	+	-	?
I knew this	I didn't know this	I was wrong about this	I need some more information about this

3.Compare information from the table with your partner, add information to your water supply system scheme and describe it to your groupmates.

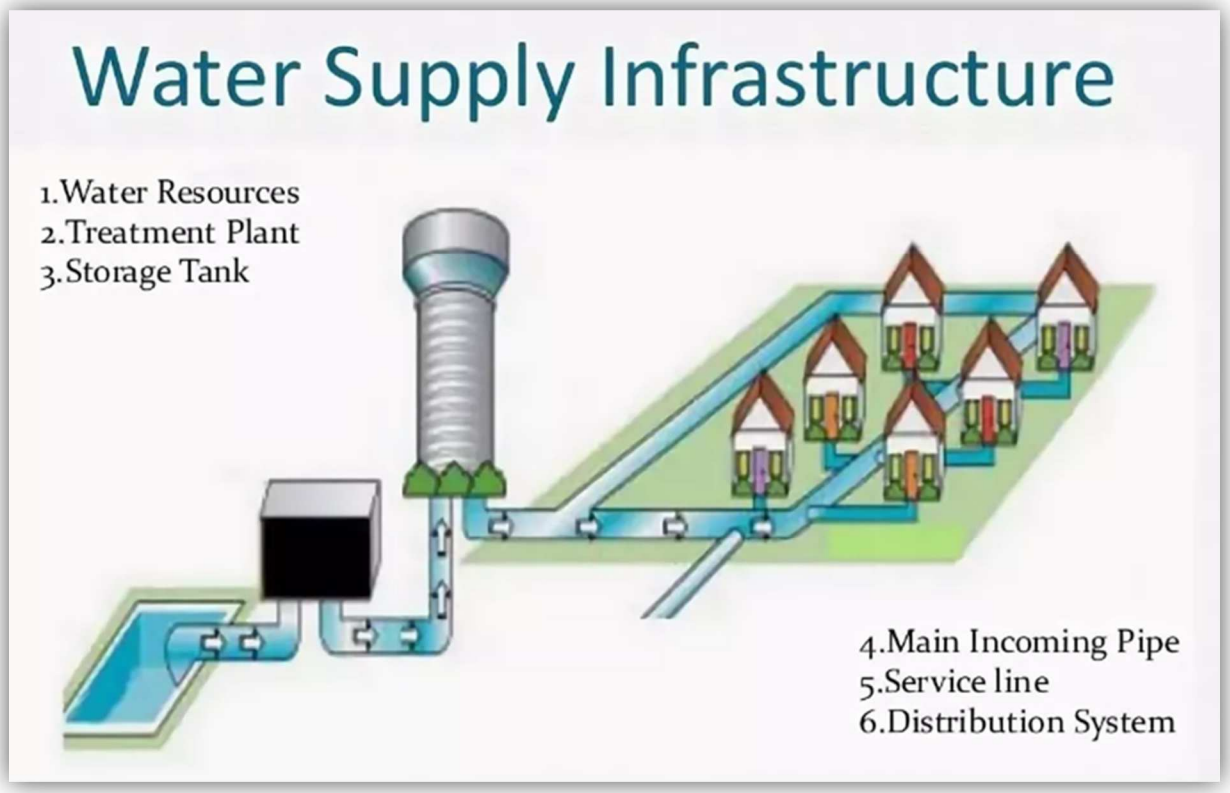
2.3. WATER SUPPLY AND WATER TREATMENT

Lead in

1. What do you know about Water Supply System?

– What are the functions of Water Supply System?

– What are its components? Put water treatment steps into the right place:



2. In groups draw up a picture representing water supply system scheme and present it to the group.

You can use the words from the list below:

water supply – водоснабжение
to provide – обеспечивать
drainage – канализация, сток
basin – резервуар, водоем
raw water – неочищенная вода
to accumulate – накапливаться
aquifer – водонапорный бассейн, водоносный коллектор
pipe – трубопровод, труба
water tank – резервуар, бак для воды
pressure vessel – резервуар высокого давления
pump – насос

outlet – сток
impractical – непроходимый
sewer – канализационная труба, коллектор
ditch – канава, траншея, котлован
downstream – находящийся ниже по течению

Reading task

1. Read the following text and check your answers.
While reading mark the information:

I knew this fact (V)

I didn't know this (+)

I was wrong about this (-)

I need some more information about this (?)

WATER SUPPLY NETWORK

A water supply system or water supply network is a system of engineered hydrologic and hydraulic components which provide water supply.

A water supply system typically includes:

A drainage basin.

A raw water collection point (above or below ground) where the water accumulates, such as a lake, a river, or groundwater from an underground aquifer. Raw water may be transferred using uncovered ground level aqueducts, covered tunnels or underground water pipes to water purification facilities.

Water purification facilities. Treated water is transferred using water pipes (usually underground).

Water storage facilities such as reservoirs, water tanks, or water towers. Smaller water systems may store the water in cisterns or pressure vessels. Tall buildings may also need to store water locally in pressure vessels in order for the water to reach the upper floors.

Additional water pressurizing components such as pumping stations may need to be situated at the outlet of underground or above ground reservoirs or cisterns (if gravity flow is impractical).

A pipe network for distribution of water to the consumers (which may be private houses or industrial, commercial or institution establishments) and other usage points (such as fire hydrants).

Connections to the sewers (underground pipes, or aboveground ditches in some developing countries) are generally found downstream of the water consumers, but the sewer system is considered to be a separate system, rather than part of the water supply system.

2. Put information into the table and discuss it with your partner.

√	+	-	?
I knew this	I didn't know this	I was wrong about this	I need some more information about this

3. Compare information from the table with your partner, add information to your water supply system scheme and describe it to your groupmates.

4. Why is it necessary to treat water? Do you know any water treatment techniques? Read the following text and check your answers.

WATER TREATMENT

Water in rivers or lakes is rarely clean enough for human consumption if it is not first treated or purified. Groundwater, too, often needs some level of treatment to render it potable. The primary objective of water treatment is to protect the health of the community. Potable water must, of course, be free of harmful microorganisms and chemicals, but public supplies should also be aesthetically desirable so that consumers will not be tempted to use water from another, more attractive but unprotected source. For domestic supplies, water should not be corrosive, nor should it deposit troublesome amounts of scale and stains on plumbing fixtures. Industrial requirements may be even more stringent; many industries provide special treatment on their own premises.

Surface water usually needs more extensive treatment than does groundwater, because most streams, rivers, and lakes are polluted to some extent.

Water is treated in a variety of physical and chemical methods. Treatment of surface water begins with intake screens to prevent fish and debris from entering the plant and damaging pumps and other components. Conventional treatment of water primarily involves clarification and disinfection. Clarification removes most of the turbidity, making the water crystal clear. Disinfection, usually the final step in the treatment of drinking water, destroys pathogenic microbes. Groundwater does not often need clarification, but it should be disinfected as a precaution to protect public health. In addition to clarification and disinfection, the processes of softening, aeration, carbon adsorption, and fluoridation may be used for certain public water sources. Desalination processes are used in areas where freshwater supplies are not readily available.

Sedimentation

Impurities in water are either dissolved or suspended. The suspended material reduces clarity, and the easiest way to remove it is to rely on gravity. Under still conditions, suspended particles that are denser than water gradually settle to the bottom of a basin or tank. This is called plain sedimentation. Long-term water storage (for more than one month) in reservoirs reduces the amount of suspended sediment and bacteria. Nevertheless, additional clarification is usually needed. In a treatment plant, sedimentation (settling) tanks are built to provide a few hours of storage or detention time as the water slowly flows from tank inlet to outlet. It is impractical to keep water in the tanks for longer periods, because of the large volumes that must be treated.

Modern sedimentation tanks are equipped with mechanical scrapers that continuously push the sludge toward a collection hopper, where it is pumped out.

Coagulation and flocculation

Suspended particles cannot be removed completely by plain settling. Large, heavy particles settle out readily, but smaller and lighter particles settle very slowly or in some cases do not settle at all. Because of this, the sedimentation step is usually preceded by a chemical process known as coagulation. Chemicals (coagulants) are added to the water to bring the nonsettling particles together into larger, heavier masses of solids called floc. Aluminum sulfate (alum) is the most common coagulant used for water purification. Other chemicals, such as ferric sulfate or sodium aluminate, may also be used.

After flocculation the water flows into the sedimentation tanks. Some small water-treatment plants combine coagulation and sedimentation in a single prefabricated steel unit called a solids-contact tank.

Filtration

Even after coagulation and flocculation, sedimentation does not remove enough suspended impurities from water to make it crystal clear. Filtration is a physical process that removes these impurities from water by going through a layer or bed of porous, granular material such as sand. Suspended particles become trapped within the pore spaces of the filter media, which also remove harmful microorganisms.

Disinfection

Disinfection destroys pathogenic bacteria and is essential to prevent the spread of disease. Typically the final process in drinking-water treatment, it is finished by applying either chlorine or chlorine compounds, ozone, or ultraviolet radiation to clarified water.

Chlorination

The addition of chlorine or chlorine compounds to drinking water is called chlorination. Chlorine compounds may be applied in liquid and solid forms – for instance, liquid sodium hypochlorite or calcium hypochlorite in tablet or granular form. However, the direct application of gaseous chlorine from pressurized steel containers is usually the most economical method for disinfecting large volumes of water.

Taste or smell problems are minimized with proper dosages of chlorine at the treatment plant.

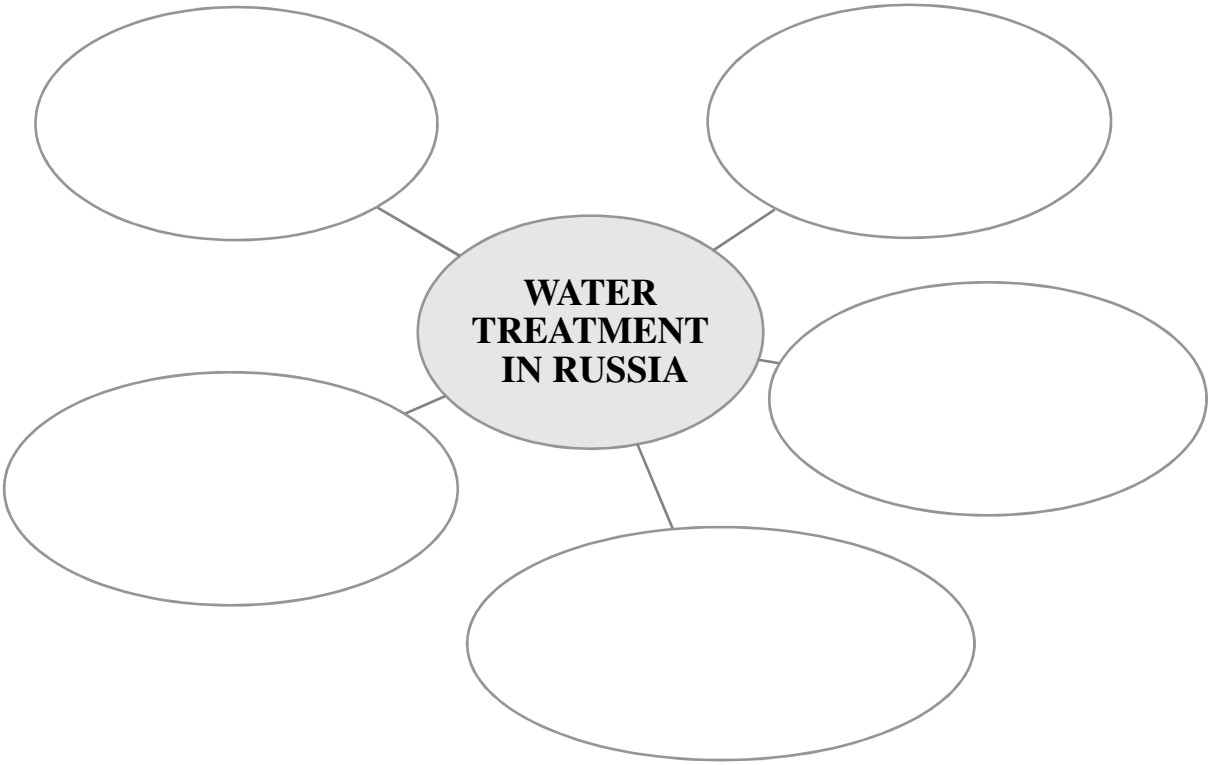
Ozone

Ozone gas may be used for disinfection of drinking water. However, since ozone is unstable, it cannot be stored and must be produced on-site, making the process more expensive than chlorination. Ozone has the advantage of not causing taste or smell problems; it leaves no residual in the disinfected water. The lack of an ozone residual, however, makes it difficult to monitor its continued effectiveness as water flows through the distribution system.

Ultraviolet radiation

Ultraviolet radiation destroys pathogens, and its use as a disinfecting agent eliminates the need to handle chemicals. It leaves no residual, and it does not cause taste or smell problems. But the high cost of its application makes it a poor competitor with either chlorine or ozone as a disinfectant.

5. Group work. Make a cluster and present the water treatment techniques used in your country.



2.4. HEATING SYSTEMS

Lead in

1. How can you define a heating system? What types of heating systems do you know? What types of heating systems are presented in the pictures? What are their specific features?

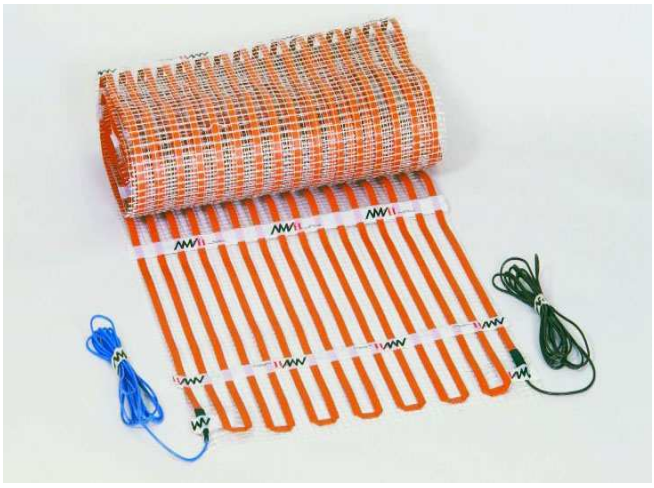
a)_____

b)_____

c)_____

d)_____

e)_____



f)_____

2. Study the following vocabulary. What types of heating systems does it characterize? How do you understand the abbreviation HVAC?

ambient temperature
furnace
ducts
blower fan
be fueled
maintenance
radiant heating system
plastic water tubing
piping
hydronic heating
boiler and radiator system
reheating
remain unobstructed
heat pump
wall-mounted units
evaporator coils
baseboard heaters
convection

Reading task

1. Read the following text and check your answers. While reading mark the information:

I knew this fact (V)
I didn't know this (+)
I was wrong about this (-)
I need some more information about this (?)

TYPES OF HEATING SYSTEMS

There are several types of systems used to provide heat in a home, and within each broad type there are many variations. Some heating systems share components with the home's cooling equipment, and some systems provide both heating and cooling. The term HVAC—heating, ventilation, and air-conditioning—is used to describe the overall climate control system in a home.

No matter what HVAC system is used, the purpose of all heating appliances is to tap the thermal energy from a fuel source and transfer it to living spaces to maintain a comfortable ambient temperature. Heating systems can use a variety of fuel sources, including natural gas, propane, fuel oil, biofuel (such

as wood), and electricity. Some homes have more than one heating system, such as when an addition or finished basement is heated by a different system than the rest of the house.

Forced Air Heating/Cooling Systems

By far the most common HVAC system in modern North American homes is the forced-air system that uses a furnace with a blower fan that delivers warmed air to the various rooms of the home through a network of ducts. Forced air systems are very quick at adjusting the temperature of a room, and because air conditioning systems can share the same blower and ductwork, this is an efficient overall HVAC System.

Fuel sources: The furnaces that power forced-air systems can be fueled by natural gas, liquid propane (LP), fuel oil, or electricity.

Distribution: Air that is warmed in by the furnace's burner or heating element air is distributed through a network of ducts to heating registers in individual rooms. Another system of ducts returns air back to the furnace through cold-air returns.

Advantages:

Forced air systems can be filtered to remove dust and allergens. However, they also can increase the amount of allergens that are airborne.

Humidifier (or dehumidifier) equipment can be integrated into the forced air system.

Forced air furnaces are relatively inexpensive.

These furnaces can achieve the highest AFUE (Annual Fuel Utilization Efficiency) ratings of any heating system (but that does not necessarily mean this is the most efficient way to heat a home).

Forced air systems can combine cooling with heating capability.

Disadvantages:

Requires ductwork and takes up space in walls.

Furnace fans can be noisy.

Moving air can distribute allergens.

Moving air can become dry unless it is humidified.

Because forced air systems heat the air and not the objects in a room, it is not considered the most comfortable form of heating.

Gravity Air Furnace Systems

A precursor to forced air systems, gravity air furnaces also distribute air through a system of metal ducts, but rather than forcing the air via a blower,

gravity air systems operate by the simple physics of warm air rising and cool air sinking. A gravity air furnace in a basement heats air, which then rises into the various rooms through ducts. Cool air returns to the furnace via a system of cold-air return ducts. The so-called "octopus" furnaces found in many older homes are gravity air furnaces.

Gravity air systems are no longer installed, but in many older homes they continue to perform effectively.

Fuel source: Forced air furnaces can be fueled by natural gas, liquid propane (LP), fuel oil, or electricity.

Distribution: Conditioned air is circulated through a network of metal ducts.

Advantages:

Gravity systems have no moving parts and can last for many decades.

The system equipment is very dependable and requires little maintenance.

Disadvantages:

Air cannot be filtered effectively.

Energy efficiency is lower than with newer furnaces.

Temperature adjustments are slow because the systems operate by simple convection currents.

In-Floor Radiant Heating Systems

Modern in-floor heating is a type of radiant heating system. Radiant heating is different from forced air heat in that it heats objects and materials, such as furniture and flooring, rather than just the air. Most whole-home radiant systems distribute heat via hot water heated in a boiler or hot water heater.

In-floor heating involves plastic water tubing installed inside concrete slab floors or attached to the top or bottom of wood floors. It is quiet and generally energy efficient. It tends to heat more slowly and takes longer to adjust than forced air heat, but its heat is more consistent.

There are also in-floor systems that use electrical wiring installed under flooring materials, typically ceramic or stone tile. These are less energy efficient than hot water systems and are typically used only in small rooms such as bathrooms.

Fuel sources: Hot water tubing systems are usually heated by a central boiler, which can be fueled by natural gas, liquid propane (LP), or electricity. Hot water also can be provided by solar hot water systems, which are commonly used to supplement fuel-based systems.

Distribution: In-floor systems are usually distributed by hot water flowing through plastic tubing.

Advantages:

Radiant systems provide comfortable, even heat.

When heated by boilers, radiant systems can be very energy efficient.

Disadvantages:

Radiant systems are relatively slow to heat up and adjust to temperature changes.

Installation of in-floor systems can be expensive.

It is difficult access to hidden piping if maintenance problems emerge.

Boiler-based systems cannot be combined with air conditioning.

Traditional Boiler and Radiator Systems

Older homes and apartment buildings in North America often are heated with traditional boiler and radiator systems. These include a central boiler that circulates steam or hot water through pipes to radiator units positioned strategically around the house. The classic radiator – a cast-iron upright unit usually positioned near windows – is often called a steam radiator, although this term is sometimes inaccurate.

In reality, there are two types of systems used with these older radiators. True steam boilers actually do circulate gaseous steam through pipes to individual radiators, which then condenses back to water and flows back to the boiler for reheating. Modern radiator systems circulate hot water to radiators via electric pumps. The hot water releases its heat at the radiator, and the cooled water returns to the boiler for more heating. Hot water radiator systems are very common in Europe.

Fuel sources: Boiler/radiator systems can be fueled by natural gas, liquid propane, fuel oil, or electricity. Original boilers may even have been fueled by coal.

Distribution: Heat is produced by steam or hot water circulating through metal pipes to radiators shaped to facilitate the transfer of thermal energy.

Advantages:

Radiant heat is quite comfortable and does not dry out the air as forced-air heat does.

Radiators can be updated to low-profile baseboard or wall-panel radiators.

When old boilers are replaced, modern boilers can offer very good energy efficiency.

Disadvantages:

Radiators can be unsightly.

Radiator locations may limit furniture placement and window coverings.

Boiler-based systems cannot be combined with air conditioning.

Hot Water Baseboard Radiator

Another more modern form of radiant heat is a hot water baseboard system, also known as a hydronic system. These systems also use a centralized boiler to heat water that circulates through a system of water pipes to low-profile baseboard heating units that radiate the heat from the water out into the room via thin metal fins surrounding the water pipe. This is essentially just an updated, evolved version of the old upright radiator systems.

Fuel Sources: Boilers for hydronic systems can be fueled by natural gas, liquid propane (LP), fuel oil, or electricity. They can also be aided by solar heating systems.

Distribution:

Hot water heated by a boiler and piped to "fin-tube" baseboard units mounted along walls. The fins increase the surface area of heat dissipation for efficiency.

Heat is distributed by natural convection: Heated air rises from the baseboard unit, while cold air falls toward the unit for heating.

Advantages:

Hydronic systems can offer excellent energy efficiency.

Hydronic systems are quiet because there are no fans or blowers.

Temperature can be precisely controlled.

Radiator systems are very durable and need little maintenance.

Disadvantages:

Baseboard radiation/convection units must remain unobstructed and can provide challenges in furniture placement and drape design.

Radiators are slow to heat up.

Hot water systems cannot be combined with air conditioning systems.

If the heat goes out for an extended period, heating pipes may be at risk of freezing.

Heat Pump Heating Systems

The newest home heating (and cooling) technology is the heat pump. Using a system that is similar to an air conditioner, heat pumps extract heat from

the air and deliver it to the home via an indoor air handler. Standard home systems are air-source heat pumps that draw heat from the outdoor air. There are also ground-source, or geothermal, heat pumps that pull heat from deep in the ground as well as water-source heat pumps that rely on a pond or lake for heat.

A popular type of air-source heat pump is the mini-split, or ductless, system. This has a relatively small outdoor compressor unit and one or more indoor air handlers that are easy to add to room additions or remote areas of a home. Many heat pump systems are reversible and can be switched to air conditioning mode in the summer. Heat pumps can be energy efficient, but they are suitable only for relatively mild climates; they are less effective in very hot and very cold weather.

Fuel sources: Heat pumps are usually powered by electricity, although natural gas models are also available.

Distribution: Heat (and cooling) are provided by wall-mounted units that blow air across evaporator coils linked to an outdoor pump that extracts or absorbs heat from the outdoors.

Advantages:

Systems offer both heating and cooling.

Heat pumps can be very energy efficient.

Individual wall units allow for precise control of each room.

Fans are quieter than central forced-air systems.

No ductwork is required.

Disadvantages:

Heat pumps are best suited for relatively mild climates.

Distribution of heated or cooled air can be limited because it comes from a single unit (in each room or area).

Electric Resistance Heating Systems

Electric baseboard heaters and other types of electric heaters are not commonly used for primary home heating systems, mostly due to the high cost of electricity. However, they remain a popular option for supplemental heating in finished basements, home offices, and seasonal rooms (such as three-season porches and sunrooms). Electric heaters are easy and inexpensive to install, and they require no ductwork, pumps, air handlers, or other distribution equipment. The units are inexpensive and have no moving parts and require virtually no maintenance.

In addition to conventional baseboard heaters, there are electric radiant heaters that heat with radiation. These typically are installed near the ceiling and

are directed toward the room occupants, providing more focused heat than you get with baseboard units. Radiant heaters also are more energy efficient than baseboard units.

Distribution: Baseboard heaters use natural convection to circulate heat throughout the room. Wall-mounted heaters and many specialty heaters (like toekick heaters) usually have internal fans that blow out heated air.

Advantages:

Heater units are versatile and can be installed almost anywhere.

Systems need only an electrical circuit for power.

Units without fans work silently.

Radiant electric heaters heat room objects, similar to in-floor radiant heat.

No ductwork or expensive installation is needed.

Disadvantages:

Electric heaters are very expensive to operate.

They use a lot of electricity and therefore contribute disproportionately to over-use of the electric utility grid and related problems.

Most electricity is generated by coal-fired power plants, so electric heaters, while clean to operate, contribute significantly to air pollution and atmospheric carbon.

2.Put information into the table and discuss it with your partner.

√	+	-	?
I knew this	I didn't know this	I was wrong about this	I need some more information about this

3.Compare information from the table with your partner. What other heating systems types do you know about?

4.Use the information from the texts and complete the following table. Add more information about the types of heating systems you know about. Continue the table and think about their advantages and disadvantages.

Type	***Advantages***	***Disadvantages***
Forced Air Heating/Cooling Systems	- - -	- - -
Gravity Air Furnace Systems	- - -	- - -
In-Floor Radiant Heating Systems	- - -	- - -
Traditional Boiler and Radiator Systems	- - -	- - -
Hot Water Baseboard Radiator	- - -	- - -
Heat Pump Heating Systems	- - -	- - -
Electric Resistance Heating Systems	- - -	- - -

5. Group work: Make a cluster and present the most widely used HVAC systems in your country.

2.5. MY MASTER DEGREE WORK

Lead in

- Have you ever given presentations in English?
- Was it a successful presentation? Why? Why not?
- What examples of good presentations can you give
- What is important when you present
- something? Give your tips

Compare your tips with those that presented in the diagram.

Presentation tips

Listening

Listening. Starting your presentation

1. The project manager of a construction company is giving a presentation to his colleagues. Put the sentences in the right order. Then listen and check.

a) This morning I'd like to update you on the current status of work at the construction site. The information I give you today should help you with planning your next steps.

b) For those of you who don't know me, my name is Gordon Selfridge. Let me just write that down for you. OK. I'm the project manager in charge of the Bak Tower building project in Dubai.

c) I've divided my presentation into three parts.

d) Hello, everyone.

e) Then I'll move on to the problems we're facing with our local suppliers.

f) First of all, let me thank you for coming here today. I'm aware that you're all busy preparing for the annual meeting this week, so I really appreciate you taking the time to be here.

g) I'll start off by showing you some photos of the building site and discussing the progress we've made since January.

h) My talk should take about 30 minutes. Please feel free to interrupt me at any time with questions.

i) I'll end with some ideas for reducing labour costs that we've been looking into.

j) Oh, and don't worry about taking notes. I'll be handing out copies of the PowerPoint slides.

2. Put these points in the order in which Gordon mentions them.

reducing labour costs	*30 minutes for presentation*
update on current status	*handout after presentation*
problems with local suppliers	*progress made since January*
welcome and introduction	*questions during presentation OK.*
	three main parts

My Master Degree Project (thesis, paper)

1. Answer the following questions which will help you to prepare to speak about your master degree work.

1) Would you introduce yourself? What is your full name? What is your surname?
2) Where are you from?
3) How old are you?
4) Do you work or just study?
5) What is your current post/position?
6) What are you busy with now at your workplace?
7) What do you do for promotion?
8) What are your likes and dislikes?
9) What do you enjoy doing in your free time? Have you got a hobby?...
10) Do you study full-time or part-time?
11) At what department/chair will you take the master degree course?
12) Who is your research advisor? Who will supervise your studies and your research?
13) Are you a graduate of Nizhny Novgorod State University of Architecture and Civil Engineering?
14) What university or institution did you graduate from?
15) Do you have a bachelor degree? In what field?
16) When did you graduate?
17) Did you take some other course of studies after that?
18) What subjects were you particularly good at?
19) What was your major?
20) Why did you choose this subject field?
21) What degree/ diploma/ certificate did you receive?
22) Did you have some practical experience in the area?
23) What problems were of special interest to you?
24) Do you have any job as a professional?
25) What made you take your master's degree studies?
26) What is the theme of your research? What is its title?
27) What is the subject of your present study? What do you actually investigate?
28) What objectives are you planning to attain?
29) What key issues are included in your research?
30) What results do you expect to obtain?
31) Is the theme widely treated in literature?

32) *Are you familiar with international literature on these problems?*
33) *Is your work relevant/of real significance today?*
34) *What are the innovative aspects in you work?*
35) *Have you got any published papers yet? When and where were they published?*
36) *What are your plans for the future?*

2. Plan your topic as follows:

First, let me introduce myself.
My name is…
I am a master degree student at the department of …
*My **scientific advisor** is Prof….*
My tutor is ....
*I work in the **field** of ....*
*My main **motivation** for getting my master's degree was that I wanted to ...*
*I **major** (specialize) in the field of …*
*The **title** of my future thesis is....*
***The subject of my research** is …*
*I began with the study of **literature** on the subject including some basic works written by…*
*I have used many different **sources of information**, such as ...*
These problems … are widely discussed (treated) in literature.
***The object of my research** is the operation (behaviour/ processes) of ….*
*The main **purpose/goal/aim** of it is...to find out/to define/to characterize/explore/ to investigate/to analyse/to gain/.....*
It is very important and interesting to examine (analyze/ evaluate/ describe) the complex interaction between … and …. .
(Объект исследования - это носитель проблемы, на который направлена исследовательская деятельность. Предмет исследования - это конкретная часть объекта, внутри которой ведётся поиск (явления, отдельные их стороны, некоторые аспекты и т.д.))
*I set myself a **task** to/of...*
*The **methods and techniques** we apply in this research include experiments (observations, laboratory tests, field and pilot plant study ….)*
*This work is devoted to an important **problem** of …*
The most challenging problems I have faced with are ...
Earlier studies of this subject show that the problem has not been yet properly explored.
*I consider my work to be **relevant** nowadays because ...*
*I think they will be of considerable **practical significance**, because …*
*I expect to obtain the following **results** ...*
***In the future** I'm going to continue my studies and take a postgraduate course*
***In conclusion** I would like to say that ...*

ПРИЛОЖЕНИЕ 1

Words/Phrases for Presentations

Introducing yourself	**Let me introduce myself. My name is …** **I would like to tell you about …**
Outlining a presentation	**I am going to divide my talk into four parts.** **First I'll give you some basic information about …** **After that I'll talk about …** **Next, I want to look at …** **Finally, I'll …**
Giving background information	**I'll give you some background information about …** **Let's start with the background.**
Referring to the audience	**As you know** **As you can see**
Changing the topic	**Let's now move on to …** **Now I'll look at …**
Referring to visuals	**If you look at the graph … you can see …** **Could I draw your attention to the chart?** **If you look at the table you'll see …**
Ending	**Thank you very much for your attention.** **Thanks very much for listening to my talk.**
Inviting questions	**If you have any questions, don't hesitate to ask.** **I'll be glad to answer any questions.**

ПРИЛОЖЕНИЕ 2

Six Hats of Thinking

THE WHITE HAT *gives factual information about the presentation.*

1. What was the subject of the presentation? The subject of presentation is …
2. How long did it last? It lasted for … minutes.
3. How many parts did it consist of? The presentation consisted of … parts.
4. Was it computer or paper presentation? It was a … presentation.
5. Was it colored or black-white? It was …
6. Was it joined or single-handed work? It was … work.
7. How many people took part in the presentation? … people/person took part in it.

THE YELLOW HAT *states positive points of the presentation.*

What are the good points?

What are the benefits?

How will it help us?

I liked …

… was interesting

1. to manage to develop a successful report;
2. to cope with the task;
3. to do something in the original way;
4. to express one's own professional view concerning …;
5. to show knowledge/skills;
6. to deliver a speech professionally;
7. to raise important issues;
8. to cover all the points of the presentation;
9. to be rich in professional lexis;

10. to be worthy of special attention;

11. well-prepared, thought-provoking, informative, colorful, thought-out

12. to succeed in …

THE BLACK HAT *states negative points of the presentation.*

There are some disadvantages.

I didn't like …

… was a weak point.

1. to fail to develop ;
2. it has limited professional lexis;
3. to fail to show knowledge and skills;
4. to fail to present the graphical part;
5. to overlook the main project parts;
6. Your report leaves much to be desired.
7. You failed to cover all the points of the presentation.

THE RED HAT *expresses all the feelings which the presentation arouses.*

1. I feel interested/ excited/ confused/ indifferent/disappointed
2. The presentation was interesting/ exciting/ confusing/ ordinary/disappointing
3. I have different feelings;
4. The report created a feeling of surprise/admiration/disappointment– вызывать чувство удивления/восхищения/разочарования;
5. It aroused our interest;
6. There was a disappointing/ confusing moment.
7. There was a moment that gladdened us very much.

THE GREEN HAT *suggests ways to improve the presentation.*

1. The presentation would be improved if …;
2. It would be better if …
3. To make it more professional you should …;
4. I would suggest (doing) …
5. It is necessary to …

THE BLUE HAT *sums up points of view of all the hats and expresses the overall impression of the presentation.*

1. In general the presentation created a favourable (positive)/ unfavourable (negative) impression;
2. You develop a successful/unsuccessful project;
3. In spite that you fail to consider … the presentation is a success because …;
4. The presentation arouse different emotions, such as interest/ excitement/ confuse/ indifference/ disappointment
5. It will improve considerably if you add ...
6. In conclusion I would like to say that …

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ЗАКЛЮЧЕНИЕ

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ПРОФЕССИОНАЛЬНО-ОРИЕНТИРОВАННЫЙ АНГЛИЙСКИЙ ДЛЯ СТУДЕНТОВ МАГИСТРАТУРЫ ЗАОЧНОГО ОТДЕЛЕНИЯ

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